NASA Ames Development Plan

Final Programmatic Environmental Impact Statement

Appendix E: Biological Assessment and Wetland Delineation

Nasa Ames Research Center

July 2002

design, community & environment

NASA AMES DEVELOPMENT PLAN

FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

APPENDIX E

NASA AMES RESEARCH CENTER

JULY 2002

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BAY AREA ECONOMICS

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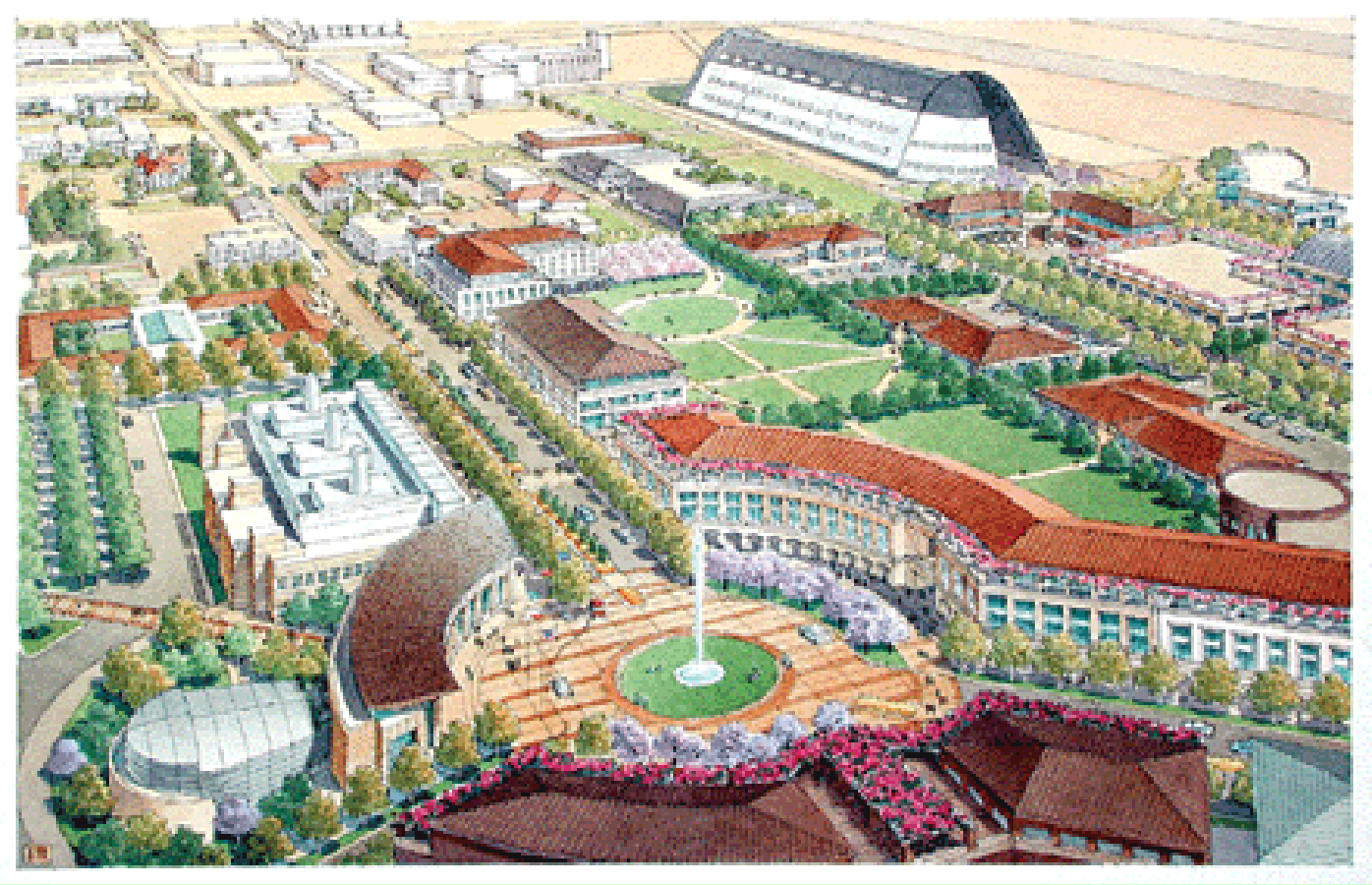
APPENDIX E I

BIOLOGICAL ASSESSMENT

Biological Assessment for the NASA Ames Development Plan

Evaluation of potential effects on threatened and endangered species and identification of avoidance and mitigation measures



August 2001, revised November 2001 and May 2002

1 INTRODUCTION

NASA Ames Research Center (ARC) is located at the southern tip of San Francisco Bay (Figures 1 and 2). The facility was originally built as the Ames Aeronautical Laboratory under the National Advisory Committee for Aeronautics (NASA's predecessor). In 1958, Congress created NASA with the National Aeronautics and Space Act of 1958 (42 U.S.C. § 2451 et seq.) and the facility was renamed Ames Research Center. As a result of the Base Realignment and Closure Act (10 U.S.C. § 2687 et seq), in 1994, ARC acquired the adjacent former Naval Air Station Moffett Field and now controls a total of approximately 1800 acres of land (Figure 3).

As described in the NASA Ames Development Plan (NADP, NASA 2001), NASA is proposing to redevelop its lands to create a world-class, shared-use educational and research and development (R&D) campus focused on astrobiology, life sciences, space sciences, nanotechnology, information technology, and aeronautics. As part of the NADP, NASA would create partnerships with Federal, state, and local government agencies, universities, private industry and non-profit organizations in support of NASA's mission to conduct research on and develop new technologies.

As required by the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. § 4321 et seq.), NASA is currently evaluating the environmental consequences of the proposed development and preparing an Environmental Impact Statement (EIS). An integral part of the EIS process is an evaluation of potential effects on species protected by the Endangered Species Act (ESA, 16 U.S.C. § 1536 et seq).

This biological assessment (BA) was prepared in order to review the development planned under the NADP in sufficient detail to determine whether the proposed action may affect any of the threatened, endangered, proposed or candidate species listed in Section 2. This BA was prepared in accordance with the legal requirements set forth under Section 7 of ESA, and follows the standards established in NASA's implementing regulations for NEPA (14 CFR, Part 1216), NASA's Provisions for Implementing the National Environmental Policy Act (NASA Handbook 8800.11), and NASA's draft Procedures and Guidelines for Implementation of the National Environmental Policy Act and Executive Order 12114 (NPG 8840).

FIGURE 1

REGIONAL CONTEXT MAP

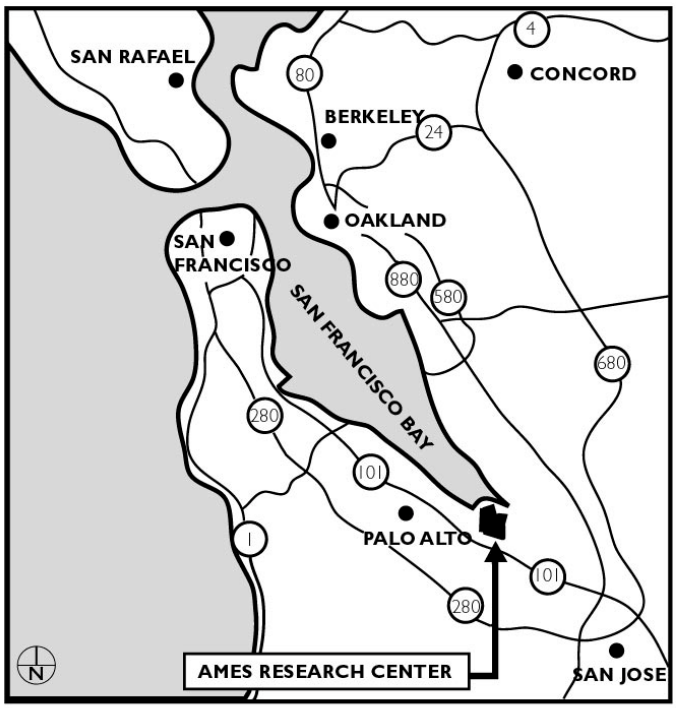


FIGURE 2

LOCAL CONTEXT MAP

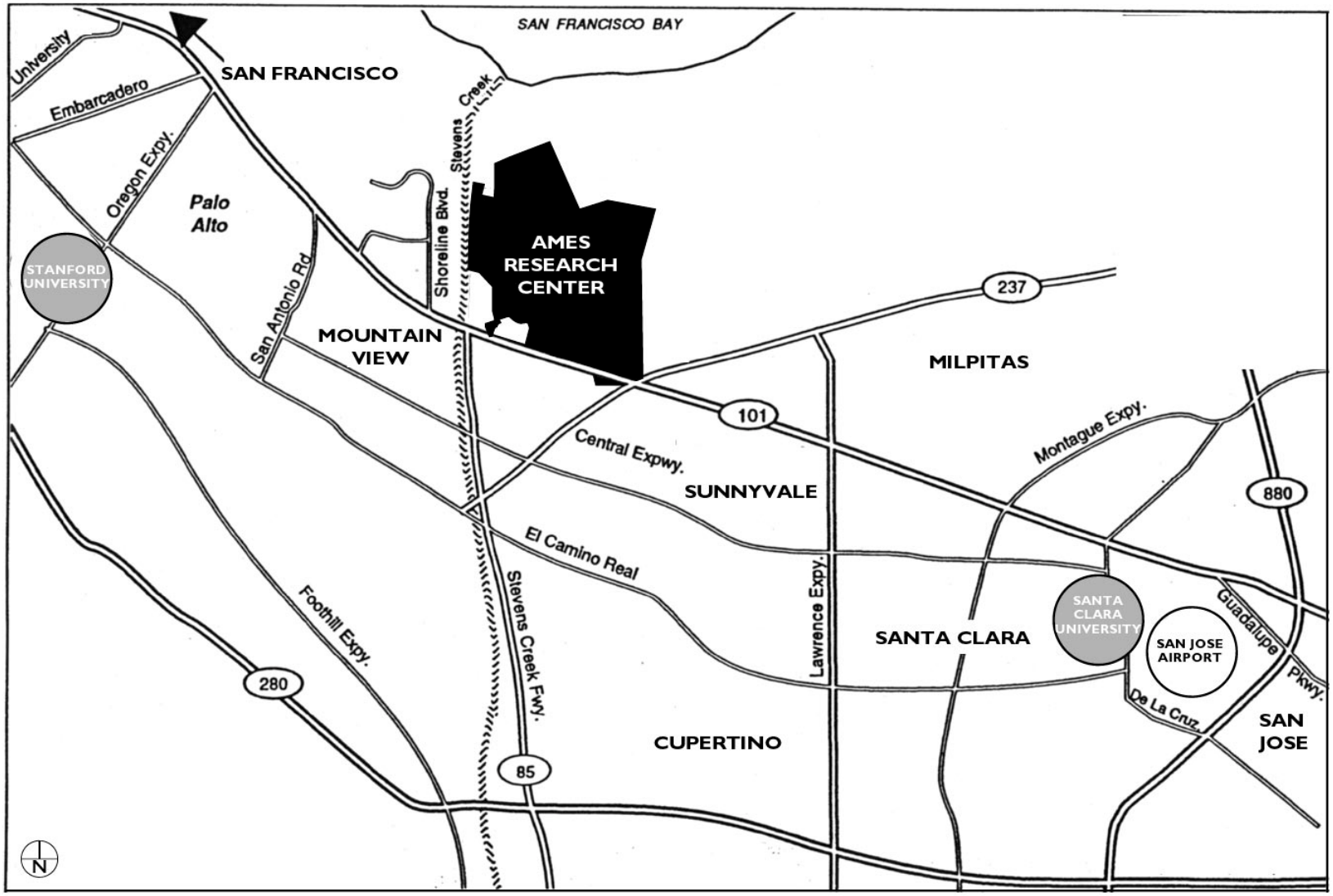


FIGURE 3: Ames Research Center and surrounding lands

2 THREATENED, ENDANGERED, PROPOSED THREATENED AND PROPOSED ENDANGERED SPECIES

A screening analysis was performed to determine which threatened, endangered, candidate, or proposed species have a potential to occur on Ames Research Center (ARC) or on adjacent lands, and thus could be affected by the development proposed under the NADP. This analysis was based primarily on a United States Fish & Wildlife Service list of special status species that may occur in or be affected by projects in the Mountain View, California Quadrangle (USFWS facsimile, April 2001).

This species list included 14 threatened and endangered species and two species that are candidates for listing under ESA. The list did not include any species proposed for listing under ESA. Besides these 16 species, two additional species known to occur on ARC property or on adjacent lands were included in the screening analysis. Thus a total of 18 species were analyzed. Through this process, 13 of these species have been excluded from further examination in this BA because they are either highly unlikely to exist on ARC or within the impact area of the NADP due to a lack of suitable habitat. Table 1 summarizes the results of the screening analysis. The five threatened or endangered species that are evaluated in detail in this BA are:

- salt marsh harvest mouse
- California clapper rail
- California least tern
- western snowy plover
- California brown pelican

The proposed action does not fall within Critical Habitat for any of the five species considered in this BA. A final rule on Critical Habitat for western snowy plover was published by the USFWS on December 7, 1999 (64 FR 68507 68544). ARC is not included in this designation. Critical Habitat has not been designated for salt marsh harvest mouse, California clapper rail, California least tern, or California brown pelican. Because no Critical Habitat is present on ARC for any listed species, there would be no effect of the proposed development on Critical Habitat, and it is not discussed further.

Table 1: Results of Screening Analysis

SPECIES	FEDERAL STATUS	INCLUDE IN IMPACT ANALYSIS?
MAMMALS		
Salt marsh harvest mouse *(Reithrodontomys raviventris)*	E	Yes. Known exist on ARC property and adjacent lands.
BIRDS		
California clapper rail *(Rallus longirostirs obsoletus)*	E	Yes. Known exist on lands adjacent to ARC.
California least tern (*Sterna antillarum (=albifrons) browni*)	E	Yes. Known exist on lands adjacent to ARC.
Western snowy plover *(Charadrius alexandrinus nivosus)*[1]	T	Yes. Known exist on lands adjacent to ARC.
California brown pelican (*Pelecanus occidentalis)* [1]	E	Yes. Known exist on ARC property and adjacent lands.
AMPHIBIANS		
California red-legged frog (*Rana aurora draytonii)*	T	No. Surveys in 1994 (Layne and Harding-Smith 1995) and 2001 (Scott and Alderete 2001) determined that no red-legged frogs are present at ARC. Moreover, high water salinities and/or seasonal drying and the presence of predators make their occurrence at ARC extremely unlikely.
California Tiger Salamander *(Ambystoma californiense)*	C	No. Surveys in 1994 and 2001 determined that no tiger salamanders are present at ARC. Moreover, high water salinities and/or seasonal drying and the occurrence of predators make their presence at ARC extremely unlikely.
FISH		
Delta smelt *(Hypomeusus transpacificus)*	T	No. The National Marine Fisheries Service (NMFS) indicated that the proposed project has no potential to affect fish species that are threatened, endangered, proposed, or candidates for listing (Gary Stern, pers. com., 2001).
Coho salmon, central California coast *(Oncorhynchus kisutch)*	T	No. The NMFS indicated that the proposed project has no potential to affect fish species that are threatened, endangered, proposed, or candidates for listing.

1 Not listed on species list for Mountain View Quadrangle provided by USFWS, but known to exist onsite or on adjacent lands.

Central California Coastal steelhead *(Oncorhynchus mykiss)*	T	No. The NMFS indicated that the proposed project has no potential to affect fish species that are threatened, endangered, proposed, or candidates for listing.
Winter-run chinook salmon *(Oncorhynchus tshawytscha)*	E	No. The NMFS indicated that the proposed project has no potential to affect fish species that are threatened, endangered, proposed, or candidates for listing.
Central Valley spring-run chinook salmon *(Oncorhynchus tshawytscha)*	T	No. The NMFS indicated that the proposed project has no potential to affect fish species that are threatened, endangered, proposed, or candidates for listing.
Critical Habitat, Central Valley spring-run chinook salmon *(Oncorhynchus tshawytscha)*	T	No. The NMFS indicated that the proposed project has no potential to affect fish species that are threatened, endangered, proposed, or candidates for listing.
Sacramento splittail *(Pogonichthys macrolepidots)*	T	No. The NMFS indicated that the proposed project has no potential to affect fish species that are threatened, endangered, proposed, or candidates for listing.
Central Valley fall/late fall-run Chinook salmon (*Oncorhynchus tshawytscha)*	C	No. The NMFS indicated that the proposed project has no potential to affect fish species that are threatened, endangered, proposed, or candidates for listing.
INVERTEBRATES		
Bay checkerspot butterfly *(Euphydryas editha bayensis)*	T	No. Not expected to exist at ARC or within the impact area of its operations. This butterfly is restricted to patches of native grassland that support its native host plants (*Plantago erecta* and *Castilleja purpurascens*) and adult nectar sources (including *Lomatium*, *Lasthenia*, *Layia*, and others). These plants are not found at ARC. The patches of supporting native grassland are located on outcrops of serpentine soil, which are not present at ARC. The nearest known population is approximately 6 miles away at Stanford University's Jasper Ridge Biological Preserve (CDFG 2001).
San Bruno elfin butterfly *(Callophrys mossii bayensis)*	E	No. Not expected to exist at ARC or within the impact area of its operations. The San Bruno Elfin Butterfly inhabits rocky outcrops and cliffs in coastal scrub on the San Francisco peninsula, a habitat not present on ARC. Its host plant is stonecrop (Sedum spathulifolium), which is not found at ARC. The nearest known population is over 25 miles away at Montara Mountain (CDFG 2001).
PLANTS		
California sea-blite (*Suede California)**	E	No. This species has probably been extirpated from the Mountain View quad and the rest of the San Francisco Bay Area. Moreover, a recent survey (Zippin and Engels

	1997) indicates this species is not present at ARC. The nearest known population is in Morro Bay, California, over 200 miles away (CDFG 2001).

E = Endangered T = Threatened

C = Candidate to become a *proposed species*

* = Extirpated (possibly extirpated from this Quadrangle)

3 CONSULTATION TO DATE

NASA initiated informal consultation with the USFWS via letter on February 13, 2001. Preliminary land use plans for the NADP were submitted at the same time. In response, USFWS requested preparation of a BA on February 21, 2001. Via telephone, on April 11, 2001, USFWS and NASA staff (Carmen Thomas and Brian Staab, pers. comm.) discussed the species to be addressed in this BA and some of the general impacts that should be considered. On April 23, 2001 the NMFS determined that the proposed project has no potential affect on anadromous fish species that are threatened, endangered, proposed, or candidates for listing (Gary Stern and Brian Staab, pers. com.). Consequently, no anadromous fish species are included in the analysis of potential effects, Section 9. To finalize decisions regarding the species that are analyzed in detail in this BA, on June 28, 2001 NASA submitted to the USFWS, via electronic mail, a summary of the screening analysis presented in Section 2. No response was provided by the USFWS. NASA mailed the original version of this BA, which was based on the Administrative Draft Environmental Impact Statement, to USFWS on August 29, 2001. The November 2001 version of the BA had been amended to reflect the analyses as presented in the Draft Environmental Impact Statement.

USFWS responded to NASA's letter of August 29, 2001 with a letter on April 9, 2002 which provided recommendations to assist NASA in meeting the standard of the Endangered Species Act. This version has been amended to update the description of the proposed action, and to add additional mitigations, as identified by USFWS in its letter of April 9, 2002.

4 CURRENT MANAGEMENT DIRECTION

NASA Ames has no applicable Resource and Land Management Plans or Action Plans pertinent to the species considered in this BA or their habitat.

5 DESCRIPTION OF THE PROPOSED ACTION

5.1 Five Alternatives for Development

NASA is proposing to develop four areas of Ames Research Center to produce a world-class, shared-use educational and R&D campus focused on astrobiology, life sciences, space sciences, nanotechnology, information technology, and aeronautics. These areas are shown in Figure 4 and are described below.

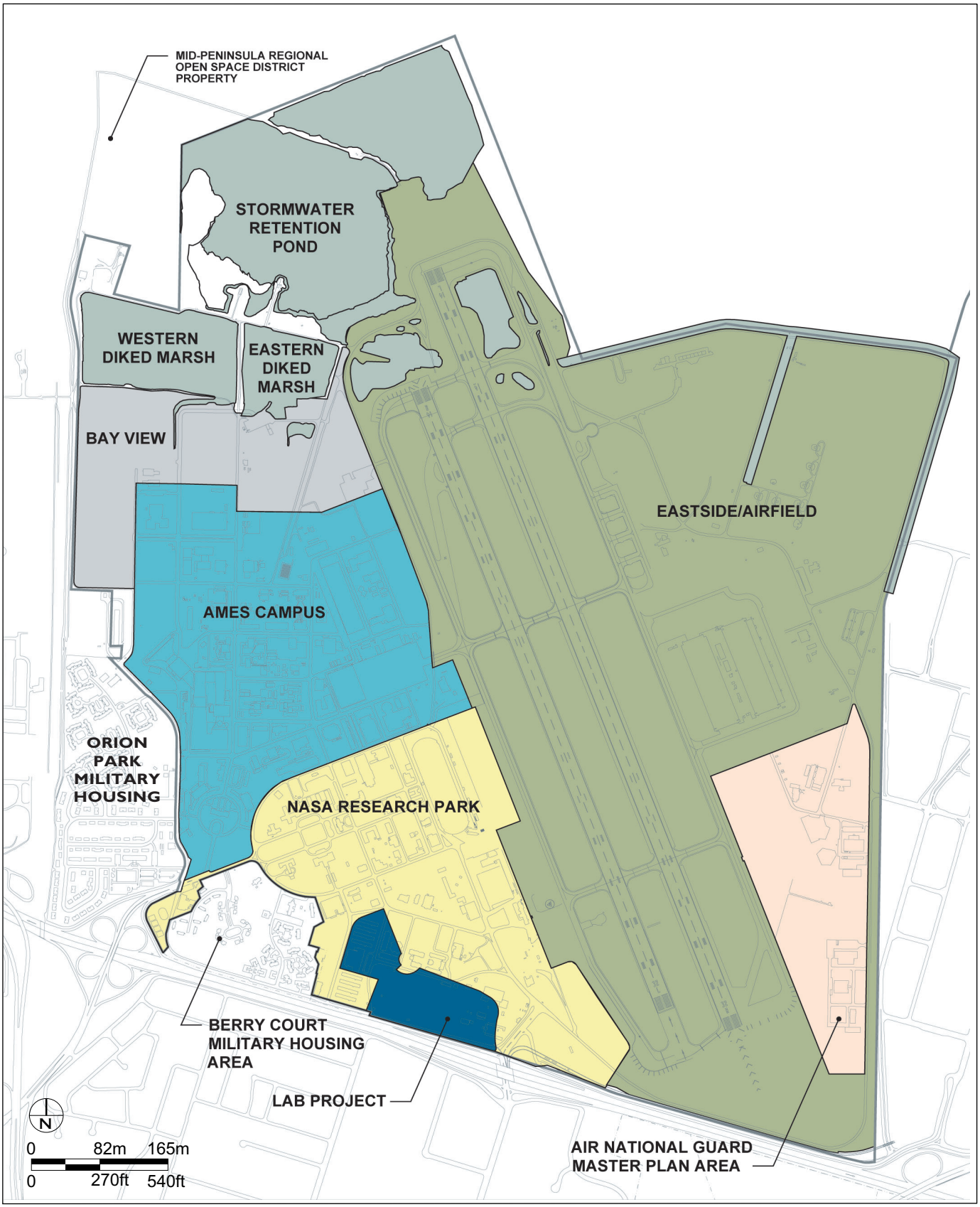
- **NASA Research Park:** an 86-hectare (213-acre), roughly triangular site located between the airfield, Highway 101, and the original Ames Research Center campus. This area includes most of the Shenandoah Plaza National Historic District, except for Berry Court Military Housing and Hangars 2 and 3. Current uses in the NASA Research Park (NRP) area include office space, retail and business services, airfield operations, vehicle maintenance, research facilities and storage. The 140 existing buildings within the NRP area contain approximately 146,000 square meters (1.58 million square feet) of space.

- **Eastside/Airfield:** a 385-hectare (952-acre) site comprised of the airfield and the lands to the east of it. Current uses include the golf course, Hangars Two and Three, airfield operations, and the fueling and munitions storage facilities of the California Air National Guard (CANG). CANG activities are not addressed in the NADP or this document. Development in this area is governed by the CANG Masterplan for Short-Range Projects (CANG 1997a) and associated environmental assessment (CANG 1997b).

- **Bay View:** a 38.0-hectare (94.6-acre) site immediately north of the original Ames Research Center campus. This land is predominantly undeveloped upland grassland containing a few research facilities such as the Outdoor Aerodynamic Research Facility (OARF).

- **Ames Campus**: the original 94-hectare (234-acre) site of Ames Research Center. Current uses in the Ames Campus area include office, research and development, and storage. The existing buildings in the Ames Campus area contain approximately 268,000 square meters (2.89 million square feet) of space.

As part of the environmental review process required by NEPA, NASA is evaluating five alternative development scenarios for the four planning areas. Alternative 5 is the preferred alternative under NEPA and is therefore considered the proposed action in this BA.



DEVELOPMENT AREAS

NASA AMES RESEARCH CENTER

NASA AMES DEVELOPMENT PLAN FINAL EIS

The NADP is a programmatic level document that establishes general development scenarios for the Center. More detailed land-use planning for specific projects will occur after these general plans are finalized and approved. Because the NADP is a programmatic document, the evaluation of impacts and identification of avoidance and mitigation measures presented in this BA are general. Additional environmental review under NEPA and ESA will be required for specific projects to ensure they are adequately addressed in this program level review.

5.2 Proposed Action

Alternative 5 is NASA's preferred alternative for development under NEPA and is therefore evaluated as the proposed action in this BA. Under Alternative 5, there would be some new construction in each of the four development areas, but it would be concentrated primarily in the already developed NRP area. Alternative 5 proposes the addition of approximately 140,000 square meters (1.5 million square feet) of new educational, office, research and development, museum, conference center, housing and retail space in the NRP Area, as well as the demolition of approximately 52,000 square meters (560,000 square feet) of non-historic structures and the renovation of approximately 56,000 square meters (600,000 square feet) of existing space. It also proposes the addition of approximately 93,000 square meters (1 million square feet) of new development in the Bay View area, primarily for housing. In the Eastside/Airfield area, Alternative 5 proposes the construction of approximately 1,115 square meters (12,000 square feet) of new space in a new control tower and the regional disaster training facility, as well as the renovation of Hangars 2 and 3. Finally, in the Ames Campus area, Alternative 5 includes the demolition of approximately 37,000 square meters (,000 square feet) of existing buildings to make way for 46,000 square meters (500,000 square feet) of high-density office and research and development space. Total build out under Alternative 5 would be approximately 780,000 square meters (8.4 million square feet). Figure 5 is the proposed land-use plan for this alternative and Table 2 provides details related to specific parcels.

Figure 5 shows a possible route for the San Francisco Bay Trail through ARC property. While this action may occur in the future, the Association of Bay Area Governments, not NASA, would undertake this action. Consequently, it is not considered part of NASA's proposed action and is thus not evaluated in this BA. Additional environmental review under ESA, NEPA, and/or the California Environmental Quality Act (CEQA) would be required for this project prior to its initiation.

The development proposed in the NADP is planned to occur between 2002 and 2013. Exact timing for individual projects has not yet been determined. Depending on the year, approximately 300,000 square feet of construction is planned each year. Construction would be performed by NASA and its academic, industry, and non-profit partners. NASA is planning to undertake the proposed action through its authority under the National Aeronautics and Space Act of 1958.

Construction would be accomplished through standard construction techniques and will include earth-moving activities such as grading and trenching. Because the NADP is a programmatic document, details of construction methods for specific projects in particular development areas are not yet known. Approximately 170,000 cubic meters (220,000 cubic yards) of fill, over approximately 280,000 square meters (3,000,000 square feet) of land, would be required for the Bay View area in order to ensure facilities are not in the 100-year floodplain. This would require approximately 17,000 truck trips. Access for these and other construction vehicles would be provided primarily by existing roadways on Center (Figure 5). No development is planned for the most important habitats at ARC, which are found in the North of Bay View area (Section 9.2.4).

5.3 Changes to the Proposed Action

The public review period for the Draft Programmatic EIS extended from December 10, 2001 to January 28, 2002. During that time, various agencies, organizations and individuals submitted comments on the Draft Programmatic EIS. NASA responded to substantive comments made during this review period in the Final Programmatic EIS as required under NEPA. Changes to the Proposed Action that resulted from comments are as follows:

5.3.1 Additional Housing as a Mitigation Measure

The most significant change to the Proposed Action is the addition of more housing units. Several commentors requested consideration of additional housing in the NADP to decrease the impact of the development on the Bay Area's existing jobs/housing imbalance. NASA has responded by adding 890 housing units to the proposed development, bringing the total on-site housing to 1,930 units. This includes 370 additional units in the Bay View area. Additional units have been added by increasing the density and building housing in the area that was previously planned for

educational support services; no additional open space is proposed for development in the Bay View area. See Figure 5a and Table 2a.

5.3.2 Recalculation of Fill Needed in Bay View

As described in Section 5.2, fill would be required in the housing portion of the Bay View area in order to prevent flooding. Fill would be used to bring the finished grade up to 2 meters (7 feet) along the northern edge of the Bay View area, and slope upward to the south to conform to the existing ground at higher elevations. A recalculation of fill requirements concluded that fill would be placed over a 102,000 square meter (1,100,000 square foot) area with fill ranging in depth from 0.15 meter (0.5 feet) to 1.4 meters (4.5 feet), with an average depth of 1.2 meters (4.0 feet). The total volume of fill required would be approximately 123,000 cubic meters (160,000 cubic yards). This amount of fill is significantly less than was calculated in Section 5.2.

5.3.3 Increase to Wetlands Buffer

The open space buffer between development and the wetlands in the Bay View area has been increased to 61 meters (200 feet).

5.3.4 Storm Water Drainage Changes

NASA has revised the conceptual plan for the storm drain system to reduce offsite flows and pollutant loading. In Bay View, storm water would be retained onsite in recreational areas, then flow through swales to a settling basin. From there, it would move on to the Eastern Diked Marsh and thence to the storm water retention pond, thereby eliminating the need to route water to Stevens Creek. In addition, there have been changes to the design of the NASA Research Park storm system to slow drainage flows to the storm water retention pond.

5.3.5 Air Quality Change

Implementation of the increased housing would cause the project to be built out over 11 years, instead of 10 years, to keep the NOx emissions below 100 tons/year, as required by the Clean Air Act.

5.3.6 Wetlands Delineation

The wetland delineation for NASA Ames Research Center was verified by the US Army Corps of Engineers (Corps) in March 2001. Some of the seasonal wetlands identified in the Bay View area in the preliminary wetland delineation were eliminated from the final verification based upon the human-induced ponding mechanism that, when removed, also removed wetland indicators from the ponded areas. Thus, the total area of verified wetlands in the Bay View area 2.1 hectares (5.3 acres) was less than that identified in the preliminary delineation 2.2 hectares (5.5 acres). After the verification, NASA altered the building envelope in the Bay View area to avoid direct impacts to wetlands as a result of implementing the proposed action. There are no wetlands in the revised Bay View area; no loss of wetlands would occur.

FIGURE 5

PROPOSED LAND USE PLAN
ALTERNATIVE FIVE

LEGEND:

- Partner Parcel
- Community Support
- University Reserve
- NASA Reserved
- Recreation
- Relocated AC Control Tower
- Housing
- California Air and Space Center
- Historic District Infill
- Historic District Renovation
- Historic Buildings
- Computer Museum
- Supporting Retail
- Light Rail
- Preserve (Burrowing Owl)
- Open Space
- Wetlands
- Fence Line
- Bay Trail Extension

Corridor Parcel Number as Noted on Table 2.11

- ① Ames Campus
- ① NASA Research Park
- ① Eastside / Airfield
- ① Bay View

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Table 2: Alternative 5 Land Use Summary

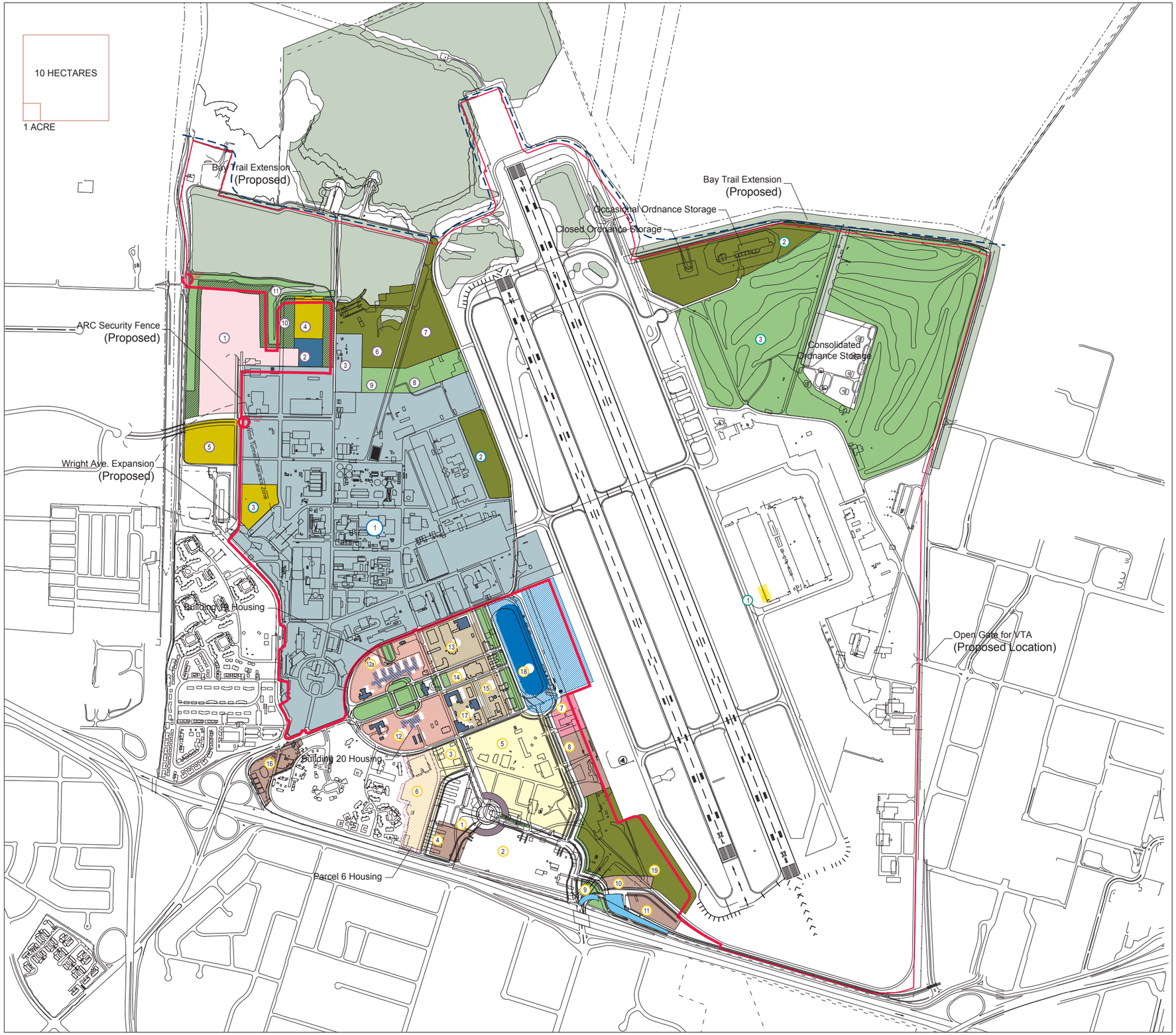
Parcel		Land Use		Parcel Area	Parcel Area (AC)	FAR	Developable Area	Developable Area (SF)
Ames Campu	1	ARC Facilities		89.98	*222.34*	0.31	277,748	*2,989,658*
	2	Preserve		3.15	*7.78*	N/A		*N/A*
	3	Recreation		1.62	*4.01*	N/A		*N/A*
		Sub Total		**94.8**	*234.1*		**277,748**	*2,989,658*
NASA Research Park	1	Lab Project	*	3.36	*8.31*	N/A	11,148	*120,000*
	2	Lab Project	*	7.90	*19.53*	0.71	55,742	*600,000*
	3	University Reserve		1.03	*2.53*	0.75	7,711	*83,000*
	4	Partner Parcel		1.50	*3.70*	0.18	2,661	*28,645*
	5	University Reserve		11.58	*28.60*	0.75	86,864	*935,000*
	6	University Reserve		2.88	*7.11*	0.75	21,554	*232,000*
	7	Computer Museum		1.26	*3.11*	0.88	11,148	*120,000*
	8	Partner Parcel		2.43	*6.00*	0.75	18,116	*195,000*
	9	Gateway Parcel		0.26	*0.65*	N/A	N/A	*N/A*
	10	Partner Shared		0.77	*1.91*	N/A	N/A	*N/A*
	11	Partner Shared		1.36	*3.35*	0.08	1,115	*12,000*
	12	Historic District	*	7.91	*19.55*	N/A	8,268	*89,000*
	12a	Historic District					17,280	*186,000*
	13	Historic District Infill		2.59	*6.40*	0.75	19,510	*210,000*
	14	Historic District Infill		0.87	*2.15*	0.27	2,323	*25,000*
	15	Historic District Infill		1.06	*2.62*	0.35	3,716	*40,000*
	16	Partner Parcel		1.85	*4.56*	0.35	6,503	*70,000*
	17	Historic Dist Reno		1.72	*4.26*	N/A	4,181	*45,000*
	18	C.Air & Space Cntr.		5.70	*14.09*	0.81	46,452	*500,000*
	19	Preserve		8.70	*21.50*	N/A	N/A	*N/A*
	X	No Change (H D)		N/A	*N/A*	N/A	869	*9,355*
		Sub Total		**64.7**	*159.9*		**325,161**	*3,500,000*
Eastside / Airfield	1	A/C Control Tower		0.19	*0.46*	0.60	1,114.8	*12,000*
	2	Preserve		59.53	*147.11*	N/A	N/A	*N/A*
	3	Open Space		9.82	*24.26*	N/A	N/A	*N/A*
	X	No Change		25.03	*61.84*	N/A	79,862.8	*859,636*
		Sub Total		**94.6**	*233.7*		**80,978**	*871,636*
	A	CANG Master Plan	**					
Bay View	1	Housing		7.35	*18.16*	1.14	83,613	*900,000*
	2	Education Reserve		1.93	*4.76*	0.48	9,290	*100,000*
	3	NASA Reserve		2.05	*5.06*	N/A	N/A	*N/A*
	4	Recreation		1.63	*4.02*	N/A	N/A	*N/A*
	5	Recreation		2.98	*7.37*	N/A	N/A	*N/A*
	6	Preserve		6.16	*15.22*	N/A	N/A	*N/A*
	7	Preserve		4.81	*11.89*	N/A	N/A	*N/A*
	8	Open Space		2.57	*6.35*	N/A	N/A	*N/A*
	9	Open Space		0.90	*2.23*	N/A	N/A	*N/A*
	10	Open Space		4.52	*11.17*	N/A	N/A	*N/A*
	11	Open Space		3.02	*7.46*	N/A	N/A	*N/A*
		Sub Total		**37.9**	*93.7*		**92,903**	*1,000,000*
Total							**776,790**	########
	A	CANG Master	**	44.52	*110.00*	N/A	6,020	*64,800*
		Existing CANG		N/A	N/A	N/A	20,717	*223,000*

* *"Preapproved pursuant to the 1994 NASA/MFA Environmental Assessment - Comprehensive Use Plan"*

** *"Preapproved pursuant to the CANG EA Master Plan - Square footage not included in totals*

FIGURE 5A

LAND USE FOR MITIGATED ALTERNATIVE FIVE



LEGEND:

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- Wetlands
- Fence Line
- Bay Trail Extension

Denotes Parcel Number as Noted on Table 2A

- (1) Ames Campus
- (1) NASA Research Park
- (1) Eastside / Airfield
- (1) Bay View

DMJMH+N EDAW

0 76m 152m 305m
0 250ft 500ft 1000ft

NASA AMES RESEARCH CENTER
NASA AMES DEVELOPMENT PLAN FINAL EIS

Table 2A: Potential Reconfiguration of Alternative 5 to Accommodate Additional Housing

Parcel		Land Use		Parcel Area	Parcel Area (AC)	FAR	Developable Area	Developable Area (SF)
Ames Campu	1	ARC Facilities		89.03	*220.01*	0.31	277,748	*2,989,658*
	2	Preserve		3.15	*7.78*	N/A		*N/A*
	3	Recreation		1.62	*4.01*	N/A		*N/A*
		Sub Total		**93.8**	*231.8*		**277,748**	*2,989,658*
NASA Research Park	1	Lab Project	*	2.43	*6.00*	N/A	11,148	*120,000*
	2	Lab Project	*	7.90	*19.53*	0.71	55,742	*600,000*
	3	University Reserve		1.03	*2.53*	0.75	7,711	*83,000*
	4	Partner Parcel		1.50	*3.70*	0.18	2,661	*28,645*
	5	University Reserve		11.58	*28.60*	0.75	86,864	*935,000*
	6	University Reserve		3.81	*9.42*	1.15	43,850	*472,000*
	7	Computer Museum		1.26	*3.11*	0.88	11,148	*120,000*
	8	Partner Parcel		2.43	*6.00*	0.75	18,116	*195,000*
	9	Gateway Parcel		0.26	*0.65*	N/A	N/A	*N/A*
	10	Partner Shared		0.77	*1.91*	N/A	N/A	*N/A*
	11	Partner Shared		1.36	*3.35*	0.08	1,115	*12,000*
	12	Historic District	*	7.91	*19.55*	N/A	8,268	*89,000*
	12a	Historic District					17,280	*186,000*
	13	Historic District Infill		2.59	*6.40*	0.75	19,510	*210,000*
	14	Historic District Infill		0.87	*2.15*	0.27	2,323	*25,000*
	15	Historic District Infill		1.06	*2.62*	0.35	3,716	*40,000*
	16	Partner Parcel		1.85	*4.56*	0.35	6,503	*70,000*
	17	Historic Dist Reno		1.72	*4.26*	N/A	4,181	*45,000*
	18	C.Air & Space Cntr.		5.70	*14.09*	0.81	46,452	*500,000*
	19	Preserve		8.70	*21.50*	N/A	N/A	*N/A*
	X	No Change (H D)		N/A	*N/A*	N/A	869	*9,355*
		Sub Total		**64.7**	*159.9*		**347,457**	*3,740,000*
Eastside / Airfield	1	A/C Control Tower		0.19	*0.46*	0.60	1,114.8	*12,000*
	2	Preserve		9.82	*24.26*	N/A	N/A	*N/A*
	3	Open Space		59.53	*147.11*	N/A	N/A	*N/A*
	X	No Change		25.03	*61.84*	N/A	79,862.8	*859,636*
		Sub Total		**94.6**	*233.7*		**80,978**	*871,636*
	A	CANG Master Plan	**					
Bay View	1	Housing		9.33	*23.06*	1.19	111,019	*1,195,000*
	2	Education Reserve		0.93	*2.30*	0.48	4,459	*48,000*
	3	NASA Reserve		2.05	*5.06*	N/A	N/A	*N/A*
	4	Recreation		1.63	*4.02*	N/A	N/A	*N/A*
	5	Recreation		2.98	*7.37*	N/A	N/A	*N/A*
	6	Preserve		6.16	*15.22*	N/A	N/A	*N/A*
	7	Preserve		4.81	*11.89*	N/A	N/A	*N/A*
	8	Open Space		2.57	*6.35*	N/A	N/A	*N/A*
	9	Open Space		0.90	*2.23*	N/A	N/A	*N/A*
	10	Open Space		4.52	*11.17*	N/A	N/A	*N/A*
	11	Open Space		3.02	*7.46*	N/A	N/A	*N/A*
		Sub Total		**38.9**	*96.1*		**115,478**	*1,243,000*
Total							**821,662**	*8,844,294*
	A	CANG Master	**	44.52	*110.00*	N/A	6,020	*64,800*
		Existing CANG		N/A	N/A	N/A	20,717	*223,000*

* *"Preapproved pursuant to the 1994 NASA/MFA Environmental Assessment - Comprehensive Use Plan"*

** *"Preapproved pursuant to the CANG EA Master Plan - Square footage not included in totals*

6 SPECIES ACCOUNTS

The following species accounts were derived largely from the Goals Project (2000) and Layne and Harding-Smith (1995).

6.1 Salt marsh harvest mouse

Salt marsh harvest mice are small, native rodents endemic to the salt marshes and adjacent diked wetlands of San Francisco Bay. They build ball-like nests of dry grasses and other vegetation on the ground or up in stands of pickleweed.

Salt marsh harvest mice are composed of two subspecies. The northern subspecies, *R. r. haliocoetes*, is found on the upper portions of the Marin Peninsula; in Petaluma, Napa and Suisun marshes; as well as a disjunct series of populations on the northern Contra Costa County coast. The southern subspecies, *R .r. raviventris*, is found in the more highly developed portions of the Bay from the Richmond area to South San Francisco Bay, and a disjunct series of small populations on the Marin Peninsula.

Salt marsh harvest mice have been observed in the ARC Stormwater Retention Pond (SWRP) in the North of Bay View area and on lands adjacent to ARC, including Crittenden Marsh (owned by Midpeninsula Regional Open Space District) and Steven's Creek (Figures 6). One individual was captured in the SWRP during three nights of trapping in 1991 (Pomeroy 1991) and one individual was trapped in Crittenden Marsh during 300 trap nights in July and September 1994 (Layne and Harding-Smith, 1995) (Figure 6). In 1985, no harvest mice were found during 300 trap nights in Crittenden Marsh and in 1987, no mice were found in Sunnyvale Baylands Park during 540 trap nights (Goals Project, 2000).

The major threats to salt marsh harvest mouse habitat include filling, diking, subsidence, and changes in water salinity. Various estimates have been made that at least 75% of all the tidal marshes around the Bay have been filled in or otherwise destroyed in the last 150 years. Most of the remaining marshes have been back-filled or diked-off, and hence most of the remaining tidal marshes are narrow strips along the

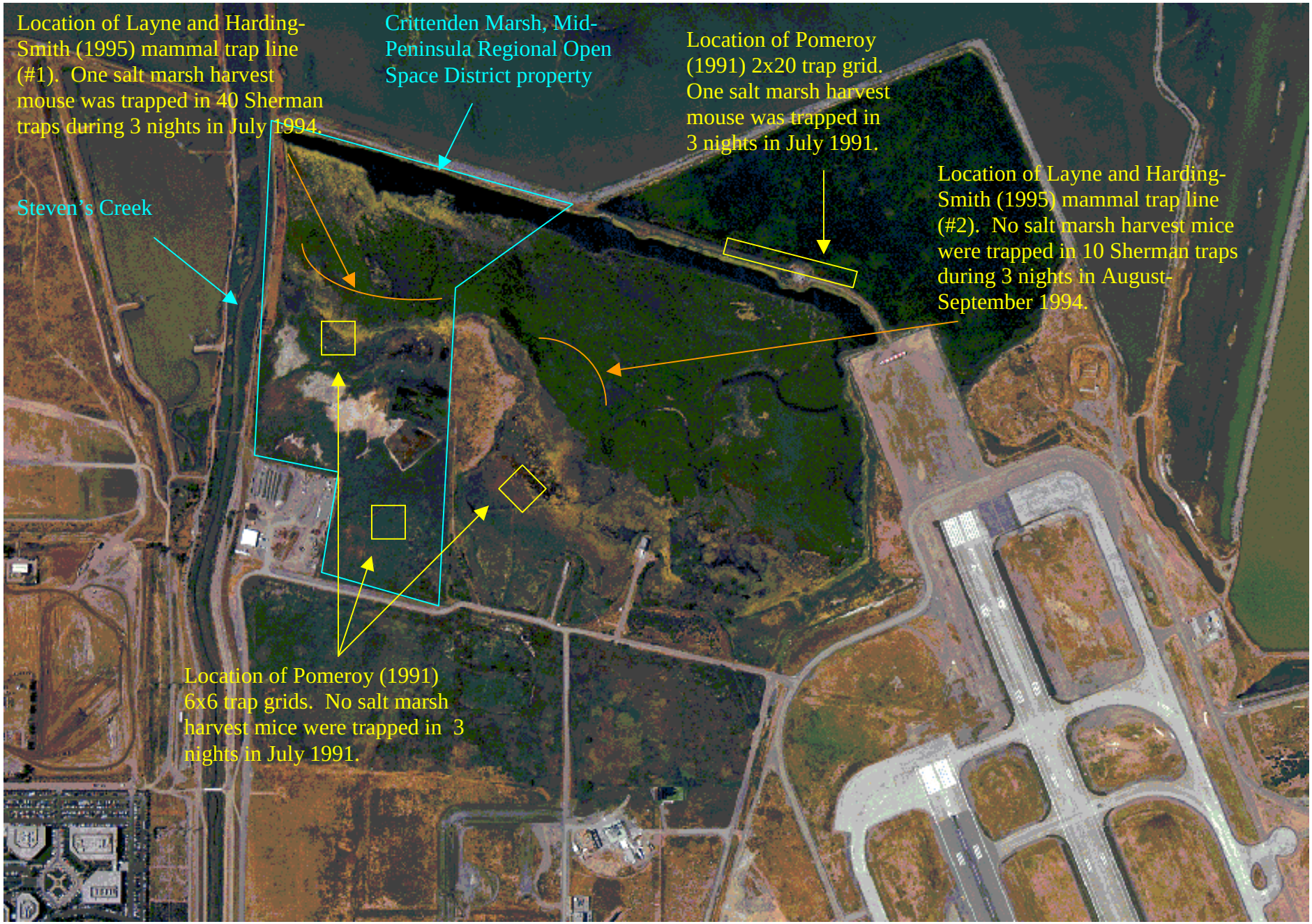


FIGURE 6:
Locations & results of salt marsh harvest mouse surveys at Ames Research Center

bay side of the levees. Those strip marshes and most of the remaining larger marshes have lost their upper and middle zones, such that little escape cover from high tides is available. In the southern end of the South San Francisco Bay, the combination of subsidence caused by excessive groundwater extraction and the freshening of that part of the Bay by massive amounts of non-saline, treated sewage effluent has changed the saline vegetation of that area to brackish and freshwater species such as bulrushes *(Scirpus sp.),* cattails *(Typha sp.),* and pepperweed *(Lepidium latifolium).* These species are not used by salt marsh harvest mice.

Diked wetlands adjacent to the Bay have grown in importance as the tidal marshes bayward of their outboard dikes have decreased in size and quality. Most of such diked marshes in the South San Francisco Bay are being threatened by urban and industrial development along their borders. In addition, most of these diked marshes are not managed to provide adequate vegetative cover of halophytic species or to maintain their salinity over time.

Salt marsh harvest mice are dependent on the thick, perennial cover of salt marshes and move in to the adjacent grasslands only in the spring and summer when the grasslands provide maximum cover. Their preferred habitats are the middle and upper portions of those marshes, i.e., the pickleweed *(Salicornia virginica)* and peripheral halophyte zones, and similar vegetation in diked wetlands adjacent to the Bay.

It is not known how much upland edge constitutes enough of a buffer to protect salt marsh harvest mice from alien predators (especially cats) and human disturbance. The USFWS Endangered Species biologists recommend 100 feet, but 100 feet of grassland, for example may not be enough of a barrier to keep out dogs, cats, red foxes, or humans. The impact of introduced red foxes is not known, but they have had a great impact on the California clapper rail, which is found in the same marshes with salt marsh harvest mouse.

Very little is known about the effects of predators on salt marsh harvest mice or about the impact of peppergrass on harvest mice numbers. Salt marsh harvest mice remain in mixed pickleweed-pepper grass communities, but no studies have been carried out in areas of 100% peppergrass, a condition that is becoming increasingly common in the southern end of South San Francisco Bay.

6.2 California clapper rail

The California clapper rail is a secretive, hen-like waterbird, indigenous to estuarine marshlands in San Francisco Bay. The clapper rail is found primarily in emergent and brackish tidal marshes. Their preferred habitat is subject to direct tidal circulation and is characterized by predominant coverage of pickleweed, with extensive stands of Pacific cordgrass *(Spartina foliosa).* California clapper rails also occur in brackish wetlands consisting of bulrush *(Scirpus spp.)*. In these areas, rails use bulrush plant material for nest building and cover, but nests are still associated with tidal channels, as in pickleweed-dominated marshes. This type of habitat occurs along the larger creeks in the South Bay. The historical distribution of the California clapper rail was restricted to the tidal marshland of coastal California from Humboldt Bay in the north to Morro Bay in the south.

Numerous human-related factors, including commercial and sport hunting during the late 1800s, have led to rail population declines over the last 150 years. The Migratory Bird Treaty Act (16 U.S.C. § 703-712) is believed to have led to a recovery of populations in many remaining marshes. During the early to mid-1900s, commercial and urban development destroyed over 85% of the primary tidal marshes in San Francisco Bay, resulting in severe rail population declines, range contraction, and fragmented distribution.

The clapper rail population in San Francisco Bay has declined significantly since the 1970's. There was an estimated a population of 4,200-6,000 rails based on data from 1971-1975. By 1988, populations were estimated to have declined to 700 rails. One of the primary causes for this decline is predation caused by the introduction of the red fox**.** The most recent estimates indicate a population of 1,040-1,264 rails in San Francisco Bay. Increases in the South Bay population have been attributed to ongoing predator management that was initiated in 1991.

There are few records of breeding rails utilizing diked marshes or other non-tidal habitat, but one observer documented a successful breeding pair in a sewage oxidation pond, and Orton-Palmer and Takekawa (1992) documented use of the diked Crittenden Marsh by one individual and one breeding pair (Figure 7). Close proximity of tidal marshes supporting other breeding rails (e.g., Steven's Creek adjacent to Crittenden Marsh) are thought to contribute to the use of these non-tidal areas.

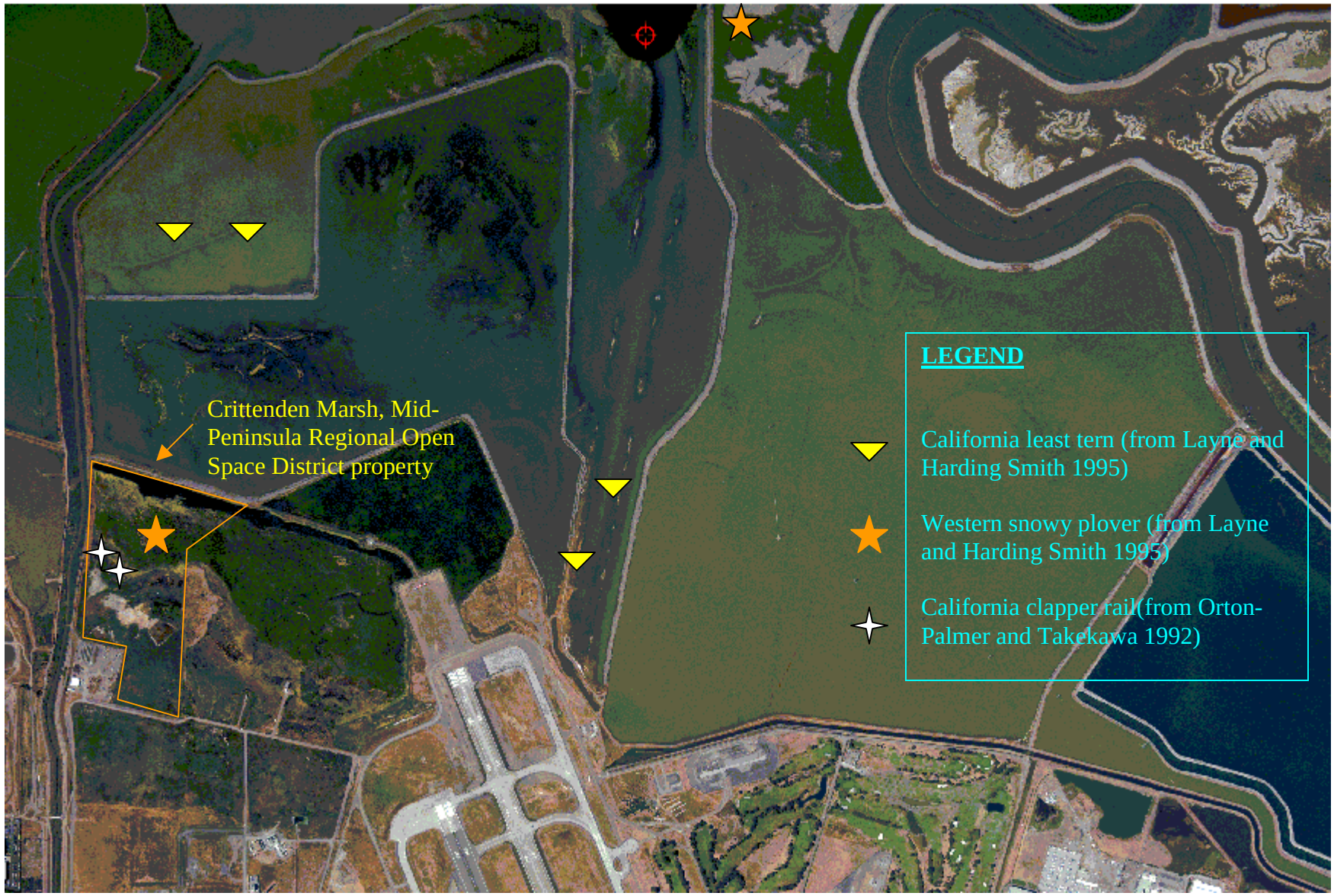


FIGURE 7:
Sightings of California clapper rail, California least tern and western snowy plover near Ames Research Center

Presently, California clapper rail populations are restricted to fragmented marshes in San Francisco Bay. Remaining marshes are geographically disjunct, and characterized by lack of significant transition zone to terrestrial habitat, relatively small size, a large edge to area ratio, and close proximity to urban and industrial development. Several factors have previously been identified as negatively affecting current rail populations, including predation and marsh conversion and degradation. Predation is likely their most immediate threat for survival.

At least ten native and three non-native predators are known to prey on California clapper rails and their eggs. Recent evidence suggests that the non-native red fox may pose the most serious threat to adult clapper rails. Red foxes are well adapted to urban environments, and thus their populations have rapidly expanded along the coast in such areas as San Francisco Bay. Free-roaming and feral cats (*Felis domesticus*) also prey on rails in marshes adjacent to housing and landfill areas.

Besides habitat fragmentation and increased predation, contaminants pose a threat to California clapper rails.

6.3 California least tern

The California least tern is one of three subspecies of least terns in the United States. This species was listed as an endangered species by the Federal government in 1970 and by the State of California in 1971.

Least terns typically arrive at California breeding areas in middle or late April. Courtship is observed from the time birds arrive. Nesting is reported in "two waves," the first from early May through early June, and the second from mid-June through early July. The species is a colonial nester, although single pairs are sometimes found.

Least terns require tracts of open sand or fine gravel substrate with sparse vegetation for nesting. Nests are simple depressions in the substrate, called scrapes. One to three eggs require about 21 days of incubation. Loss of natural habitat has caused these birds to become opportunistic, using areas such as newly filled or graded lands and airports for nesting. Nesting areas must be located near open water, usually along coastal beaches and estuaries, and they must host adequate numbers of small elongate fishes to sustain adults and growing young.

Least terns with adequate food resources fledge from about 17 to 21 days. Young, well-fledged, least terns eventually leave breeding sites and disperse to localized post-breeding foraging areas where fish are plentiful and waters are calm. These post-breeding foraging areas, which offer young birds opportunities to develop foraging skills and provide all terns the food to build reserves for migration, are considered by some to be as important to the survival of juvenile terns as the nesting areas. Several post-breeding sites in the Bay Area are located at South Bay intake salt ponds. Shallow tidal areas are also used, such as at the E. B. Roemer Bird Sanctuary in Alameda and at Roberts Landing in San Leandro. California least terns most often finish breeding activities by late August and are usually absent from California breeding and post-breeding areas by late September. It takes two to three years for least terns to mature.

California least terns forage by hovering over shallow to deep waters and diving or, less often, dipping onto the surface of the water to catch prey. Least terns also make short skimming approaches onto pools of water left on mudflats during low tide to catch trapped prey items. Although California least terns have been known to consume a wide variety of fish species, they appear partial to northern anchovy *(Engraulis mordax),* and silversides *(Atherinidae sp.)*. To a much lesser extent there is evidence that least terns may take small invertebrates such as the water borne larvae of drone flies (*Eristalis tenax).*

The California least tern is migratory. Winter distribution is largely unknown, although least terns banded as chicks in California have been found as far south as southern Colima and Guatemala. During the breeding season (spring and summer), California least terns are found nesting along the Pacific Coast as far north as Pittsburg, Contra Costa County, California and as far south as Bahia Magdalena. In the State of California, least terns nest annually at about 35 sites from San Diego County to Contra Costa County. The breeding locations shift somewhat due to annual conditions.

It was once thought by some that California least terns nested from the Mexican border north only as far as Monterey County. However, records show the bird's presence further north in Santa Cruz County from 1939 through 1954. Accounts of least tern numbers in California prior to 1970 are sketchy, however, colony numbers described as "abundant," in the "thousands," "good-sized," "1,000," "600 pairs," and "large numbers" were reported at numerous sites along California's coast at the turn of the century. By 1971, less than 300 pairs were reported over only 15 sites. In 1973, 624 pairs were located statewide. After state and federal listings, recovery efforts and sometimes intense management strategies were put into place. Recovery efforts succeeded. Surveys in recent years have indicated fluctuating numbers, but in 1995, approximately 2,536 pairs of least terns were estimated to have nested at about 35 California nesting locations.

Sightings in the San Francisco Bay Area date back to 1927. The earliest Bay Area sighting was in the city of Alameda, where the current largest northern California colony breeds, with over 200 pairs in 1996. Although least terns, including groups with over 50 birds and juveniles, had been sighted in the Bay Area for decades, it was not until 1963 that nesting was confirmed at the Oakland Airport and at another Alameda County location soon thereafter.

At the present time, Alameda's least tern colony and two to three least tern pairs nesting at the Pittsburg Power Plant are the only known Bay Area nesting sites producing fledglings. In 1995, one to six pairs nested at the Oakland Airport, but all failed due to predation. In the past, least terns were documented to nest on Bair Island, and on various salt pond levees. Layne and Harding-Smith (1995) observed 27 least terns (20 adults and 7 fledglings) in a salt evaporator north of ARC (Figure 7). Other terns were sighted on Don Edwards San Francisco Bay National Wildlife Refuge property adjacent to the runways at ARC.

Although the history of the least tern in the San Francisco Bay Area is not clear, the Bay Area birds are today considered a critical population - vital to the statewide species recovery effort. In 1995, California Department of Fish and Game preliminary numbers showed that the Alameda Colony was the State's fourth largest producer of fledglings.

Human development of least tern habitat, highway access to the coast, and summertime beach recreation have caused the destruction of breeding sites and resulted in least tern breeding failures. Although recovery efforts have brought about increased least tern numbers in California, some problems continue to challenge these efforts. It appears that for colonies to have guaranteed successes, they require intense management policies to protect nest sites, including regular monitoring of breeding activities, adequate barriers or supervision to restrict public access, persistent predator control, and vegetation management.

Predator management has become more difficult due to the recent introduction of red fox on California's coast. Feral cats and the establishment of cat feeding stations in the State have added to least tern reproductive failures. Public support for feral animals has created additional problems with predator management programs. In recent years, there has been concern over reduced fish availability at some sites, which may be related to "El Nino" weather patterns or other phenomena.

6.4 Western snowy plover

The western snowy plover is a small, light colored plover in the family Charadriidae. The species *Charadrius alexandrinus* is distributed worldwide; the subspecies *C. a. nivosus* is found in western North America. Snowy plovers are small, measuring approximately 16 centimeters; they have a thin dark bill, dark legs, an incomplete dark breast band and dark patches on the ears and forehead.

The snowy plover nests on coastal beaches, salt pond levees, and the margins of alkaline lakes in western North America. Salt ponds, their levees, and pond edges, which may mimic historic salt pan habitat in some essential way for the plover, provide almost all known snowy plover nesting habitat in San Francisco Bay today. They winter on the Pacific coast from Oregon to Baja California, and on the coasts of the Gulf of California and the Gulf of Mexico.

The breeding season extends from March through August. The nest is little more than a scrape or shallow depression in the ground, usually in barren areas but may be next to vegetation or an object. The female lays 2-3 eggs that are cryptically colored. Both sexes incubate, with the male shouldering the majority of the task. Incubation lasts 27 to 28 days. The female deserts the brood shortly after hatching and may mate again with another male. The young are raised primarily by the male and fledge approximately 31 days after hatching.

Loss of habitat has become a threat to the survival of the western snowy plover. In an effort to protect their breeding populations and breeding habitat, the Pacific coast population of the western snowy plover was listed as a threatened species under ESA in March 1993. Snowy plover are vulnerable to predation and disturbance from many sources, including birds (chiefly gulls and ravens), red foxes, and humans.

Habitat elements important to snowy plover include mudflats and sandflats for feeding; salt pan for nesting and feeding; and unvegetated levees, islets, and beaches for nesting, feeding, and roosting. The most likely habitats for western snowy plover in the vicinity of ARC include dry salt flat areas in Crittenden Marsh, the SWRP, and the levee system for the salt evaporators just north of ARC. Crittenden Marsh and the SWRP contain open ponded areas devoid of vegetation, which dry out in the late spring and early summer and could be used for nesting or foraging (Layne and Harding-Smith 1995).

No western snowy plovers were found at ARC during a 1994 study (Layne and Harding-Smith 1995). However, several individuals were reported near the study area in 1994 and early 1995

and one bird was seen in Crittenden Marsh in July 1994 (Figure 7). Most of the sightings were of birds on levees of the salt evaporators immediately north of ARC during the winter months, from November 1994 to February 1995. At least one historic record exists of snowy plover on ARC (Point Reyes Bird Observatory, unpubl. data). The exact location of this observation is not known. Nearby salt evaporators have hosted many snowy plover nests over the last decade. Recent data show that the salt evaporators near ARC are used as wintering as well as breeding areas. Sightings of snowy plovers in near ARC are shown in Figure 7.

6.5 California Brown Pelican

The brown pelican is one of the largest piscivorous birds of coastal and estuarine waters of North America. The species breeds colonially, constructing its stick nests on the ground or, more commonly, in trees or shrubs. Pelicans lay two eggs per nesting attempt.

In western North America, the brown pelican breeds on islands in marine waters on either side of Baja California, Mexico, north to the Channel Islands of southern California and to Florida. In the West, following the breeding season, many thousands move north to "winter" from central California north to the Columbia River. Peak numbers in central California, including the San Francisco Bay and surrounding area, occur from July through November. During years when pelicans do not breed, such as during El Nino years, large numbers (in the thousands) occur throughout the year in northern California, including San Francisco Bay. The highest counts in central and northern California occur during those warm-water periods. Wintering areas are chosen based on the availability of food and tradition.

There are no current or historical Bay-wide censuses of brown pelican. The number of birds found over the waters of San Francisco Bay in a given year varies according to the well being of this species at its breeding grounds and the numbers in coastal waters of central California. In years of high breeding productivity or years of non-breeding, more pelicans can be found here. The fall peak in brown pelican numbers in central California has ranged from about 7,000 in 1987 to 21,000 in 1981. Currently, on average, several hundred occur within the Bay each summer and fall. As the species recovers from breeding productivity effects resulting from 1950s and 1960s DDT use, numbers seen in the Bay Area have slowly increased. The USFWS observed brown pelicans at ARC in 1992.

In San Francisco Bay, brown pelicans frequent all the deeper waters, including some salt evaporation ponds and the mouths of the larger creeks (e.g., Corte Madera Creek, Marin County). Significant numbers are not found much farther inland than San Pablo Bay. They roost in numbers on small islands (e.g., Red Rocks) and breakwaters (e.g., Alameda Naval Air Station). Brown pelicans feed on schooling fish. In waters of the San Francisco Bay, their diet includes such species as anchovies *(Engraulis mordax)* and smelt. Their technique of feeding-plunging beak first from altitude into the water to grasp fish up to a meter or so deep requires deep water.

Except on nesting grounds, brown pelicans are not intimidated by the presence of humans. The species occurs in close proximity to humans and forages very close to human fishers. As long as forage fish are available, the population of brown pelicans will do well. When forage fish are not available, brown pelicans scavenge fish offal discarded by humans. Because this species is a higher order consumer, populations suffered considerably due to the effects of DDT on breeding productivity in the 1950s and 1960s. Currently, the California population of this species is listed as endangered on the Federal Endangered Species List, but may be down-listed or delisted soon.

7 BASELINE CONDITIONS

'Baseline conditions' rather than existing environment are discussed here because if the NADP were not to be adopted and implemented, other already approved projects would still occur. Therefore, the baseline level of development assumed at ARC in this BA consists of existing conditions plus new development already approved under two other environmental documents:

- The 1997 Final Master Plan Short Range Projects Environmental Assessment for the California Air National Guard 129th Rescue Wing (CANG EA). The CANG EA provided environmental clearance for the consolidation of CANG facilities at Ames Research Center into the southeastern portion of the Eastside/Airfield area. The CANG EA includes the construction of approximately 6,200 square meters (66,500 square feet) and the demolition of approximately 465 square meters (5,000 square feet) of space in two non-historic buildings to provide space for new construction.

- The 1994 Comprehensive Use Plan (CUP) and its Environmental Assessment (CUP EA). This was NASA's first plan for Moffett Field when it was acquired from the Navy. Under the CUP EA, NASA is proposing to construct an advanced space research lab, related office and research development space, and a temporary museum facility. Approximately 32,000 square meters (340,000 square feet) of non-historic buildings would be demolished to make way for new buildings under the CUP EA. In total, this baseline development includes a total of 540,000 square meters (5.8 million square feet) of existing and new buildings, which does not include CANG, as summarized in Table 3 and Figure 8.

FIGURE 8:


BASELINE LAND USE PLAN
LEGEND:
Lab Project
Historic District Renovation
ARC Daycare
ATCC Renovation
Computer Museum
UCSC Offices
Supporting Retail
CANG
TRW Vehicle Storage
Open Space
Wetlands
Relocated Fence
Existing Fence
Ames Campus
NASA Research Park
Eastside / Airfield
DMJM
EDAW
N
NASA AMES RESEARCH CENTER
NASA AMES DEVELOPMENT PLAN DRAFT EIS

Table 3: Alternative 1 (Baseline) - Land Use Summary

Parcel		Land Use		Parcel Area	Parcel Area (AC)	FAR	Developable Area	Developable Area (SF)
Ames Campu	E	ARC Facilities		93.53	*230.92*	0.29	267,343	*2,877,658*
	1	ARC Daycare	*	1.25	*3.08*	0.09	1,115	*12,000*
		Sub Total		**94.8**	*234.0*		**268,458**	*2,889,658*
NASA Research Park	E	NRP Facilities		73.47	*181.5*	0.14	103,862	*1,117,962*
	1	Lab Project	*	3.36	*8.31*	N/A	11,148	*120,000*
	2	Lab Project	*	7.90	*19.53*	0.71	55,742	*600,000*
	3	CMHC Temp. Buildi	*	1.46	*3.61*	0.29	4,181	*45,000*
	4	Historic Dist Reno	*	N/A	*N/A*	N/A	8,268	*89,000*
	5	ATCC Building Renc	*	N/A	*N/A*	N/A	1,765	*19,000*
	6	UCSC Building Renc	*	N/A	*N/A*	N/A	465	*5,000*
	7	Research / Girvan	*	N/A	*N/A*	N/A	836	*9,000*
		Sub Total		**86.2**	*213.0*		**186,267**	*2,004,962*
Eastside / Airfield	E	ESAF Facilities		384.86	*951.00*	0.02	79,863	*859,636*
	1	TRW Vehicle	*	0.40	*1.00*	N/A	0	*0*
		Sub Total		**385.3**	*952.0*		**79,863**	*859,636*
	A	CANG	**					
Bay View	E	Bay View		38.24	*94.50*	N/A	0	*0*
		Sub Total		**38.2**	*94.5*		**0**	*0*
Total							**534,588**	########
	A	CANG	**	44.52	*110.00*	N/A	6,020	*64,800*
		Existing CANG		N/A	N/A	N/A	20,717	*223,000*

* *"Preapproved pursuant to the 1994 NASA/MFA Environmental Assessment - Comprehensive Use Plan"*

** *"Preapproved pursuant to the CANG EA Master Plan - Square footage not included in totals*

Under this baseline, the NRP area would have a total build out of approximately 186,000 square meters (2 million square feet), the Eastside/Airfield area would have a total of approximately 85,000 square meters (920,000 square feet), the Ames Campus area would have a total of approximately 270,000 square meters (2.9 million square feet) and there would be no development in the Bay View area. The baseline level of development for the entire Ames Research Center would thus be approximately 540,000 square meters (5.8 million square feet).

The following sections discuss the baseline storm drainage system at ARC and the biological resources in the ARC study area. The storm drainage system is discussed here in detail due to its influence on the Center's habitats, particularly wetlands. Sections related to ARC's biological resources are organized geographically. The first three sections discuss resources in the NRP and Ames Campus planning areas, the Bay View planning area, and the East Side Airfield planning area, respectively. A fourth section summarizes resources immediately north, but outside of, the Bay View planning area. This area is referred to herein as the North of Bay View Area.

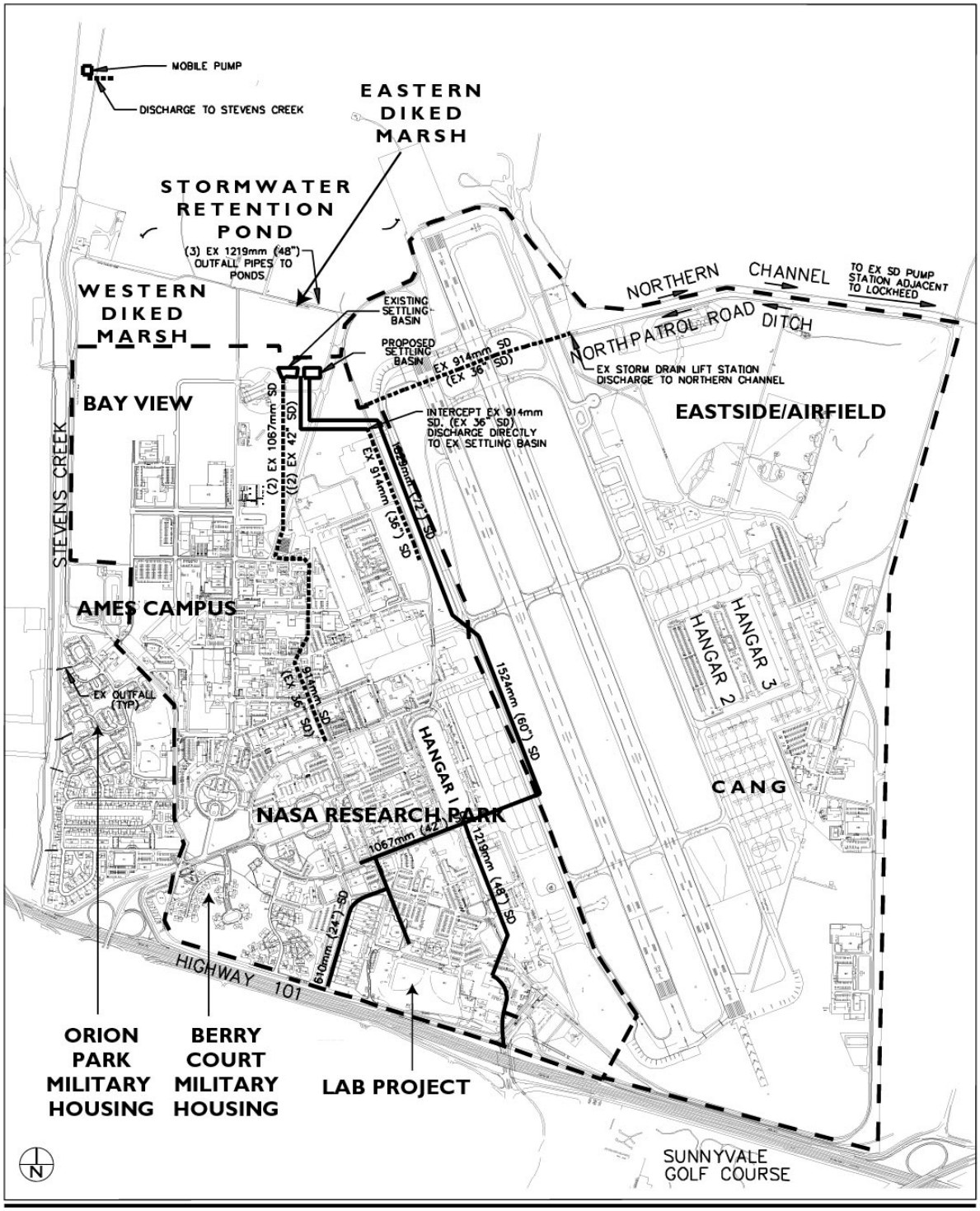
7.1 Storm Drainage System

This section describes the existing storm drainage system in the two drainage areas within Ames Research Center, as shown in Figure 9.

7.1.2 Overview of the Existing System

The ARC watershed consists of about 680 hectares (1,690 acres) and is divided into two drainage areas. The first drainage area, referred to as the western drainage system, encompasses approximately 275 hectares (680 acres). This drainage system services the NRP area, most of the Ames Campus, Berry Court Military Housing, and the Bay View area.

The western drainage system discharges into the SWRP in the North of the Bay View Area. The SWRP has no outfall during most of the year. Water is removed by evaporation only. During the wet season of some years, when flow into the pond exceeds the storage capacity, temporary pumps are moved onto the levee on the western edge of the pond where water is pumped directly into Stevens Creek.



Source: BKF

Existing Storm Drain ----------

Baseline Storm Drain ——————

Drainage Area Boundary — — —

FIGURE 9:

BASELINE CONDITIONS STORM DRAIN SYSTEM

The second drainage area, referred to as the eastern drainage system, encompasses approximately 410 hectares (1,010 acres). The drainage system in this area services the southeast portion of the NRP area, Ames Campus facilities next to the runway, the Eastside/Airfield, and the California Air National Guard. There is no direct connection between this area and the SWRP.

7.1.3 Western Drainage System

The western drainage system begins in the Berry Court Military Housing and NRP area. Stormwater flows north, through Berry Court Military Housing, the NRP area and Shenandoah Plaza, toward the main junction, which is located on the boundary between Shenandoah Plaza and the Ames Campus at the intersection of McCord Avenue and Bushnell Road. Stormwater from a small portion of Orion Park Military Housing flows east toward the same junction. This line passes through Orion Park Military Housing, the Main Gate area and the Ames Campus area.

At the McCord/Bushnell junction, all lines discharge into a 910 mm (36-inch) main trunk line. Stormwater then flows north through the Ames Campus area. Several other storm drain lines, located in the Ames Campus area, discharge into this main line as it flows north.

At the border of the Ames Campus area and the Bay View area, the 910 mm (36-inch) main line discharges into two 1,0 70 mm (42-inch) pipes. These pipes flow north, through the Bay View area, toward a settling basin located in the northeastern portion of Bay View. From the settling basin, stormwater is discharged into the Eastern Diked Marsh (EDM), located just north of Bay View. The stormwater is drained by three 1,220 mm (48-inch) culverts under North Perimeter Road. These culverts convey flows from the EDM to the SWRP located northwest of the airfield.

The water in the pond has no outlet except evaporation. Therefore, when inflow into the pond exceeds storage capacity, mobile pumps are used to discharge excess water into Stevens Creek, which flows from south to north along the western edge of ARC. The pumps are not automated and are brought out to the pond during flooding or when conditions are favorable for flooding. During the wet season, once the storage capacity of the pond is fully utilized, any runoff discharging into the pond that exceeds the rate at which the mobile pumps can remove water from the pond will result in water backing up into the drainage system so additional runoff cannot enter the system. This causes inundation of the wetlands in northern ARC and localized

flooding in Bay View and in the upper reaches of the drainage system to the south. The capacity of the mobile pumps is less than 0.30 cubic meters per second (10 cfs), which is much less than the peak runoff from the 2-year storm for the 275-hectare (680-acre) area that currently discharges into the SWRP.

The eastern and western portions of the SWRP are separated by a levee. A 20-meter section of the levee has been eroded, so there is hydrologic connectivity between these bodies when the water reaches sufficient depth. The areal extent of the pelagic system is highly dependent on seasonal fluctuations in precipitation and evaporation.

The settling basin was constructed in the early 1990's to remove contaminated sediments from stormwater prior to its discharge in to the SWRP. It now receives most of the runoff produced in the NRP and Ames Campus. Before its construction, stormwater was directed along the western side of the airfield, through the northwest corner of the EDM, thence to the SWRP.

Since 1998, discharges from a US Navy groundwater treatment system at ARC have increased freshwater flows to the EDM and the SWRP. When operating, this system discharges approximately 80 gallons per minute or about 5,620,000 ft^3 (129 acre-feet) per year of freshwater to the settling basin, the EDM, and eventually the SWRP.

7.1.4 Eastern Drainage System

The eastern drainage system begins in the southern portion of ARC and the southern portion of the CANG area. Storm water from the airfield and the CANG travels north through several storm drain lines and via random overland flow. Overland flow from the golf course is collected by a small concrete-lined channel that flows west toward the Moffett Field storm drain lift station, which is located at the northeast corner of the airfield. This channel is commonly referred to as North Patrol Road Ditch. It is separated from the Northern Channel, which flows east, by a levee. The Northern Channel flows east off of the site and runs along the northern boundary of the adjacent Lockheed Martin property. The Northern Channel connects to the easternmost Lockheed pond, adjacent to the Moffett Channel through a culvert. A pump station with three pumps lifts the water into the Moffett Channel where it flows by gravity into the Guadalupe Slough and thence to the San Francisco Bay.

The southeastern portion of the NRP also contributes to the eastern drainage system via a main line that flows north, near the western most portion of the airfield. As this line continues north along Zook Road, it picks up several smaller lines from the eastern portion of the Ames Campus.

7.2 Biological Resources

7.2.1 NRP and Ames Campus Areas

The NRP and Ames Campus Areas are both highly urbanized areas of ARC. The bulk of development has occurred in these two areas, and as a result what little habitat remains is disturbed and fragmented. Existing resources within the NRP and Ames Campus areas are very similar and are therefore addressed together.

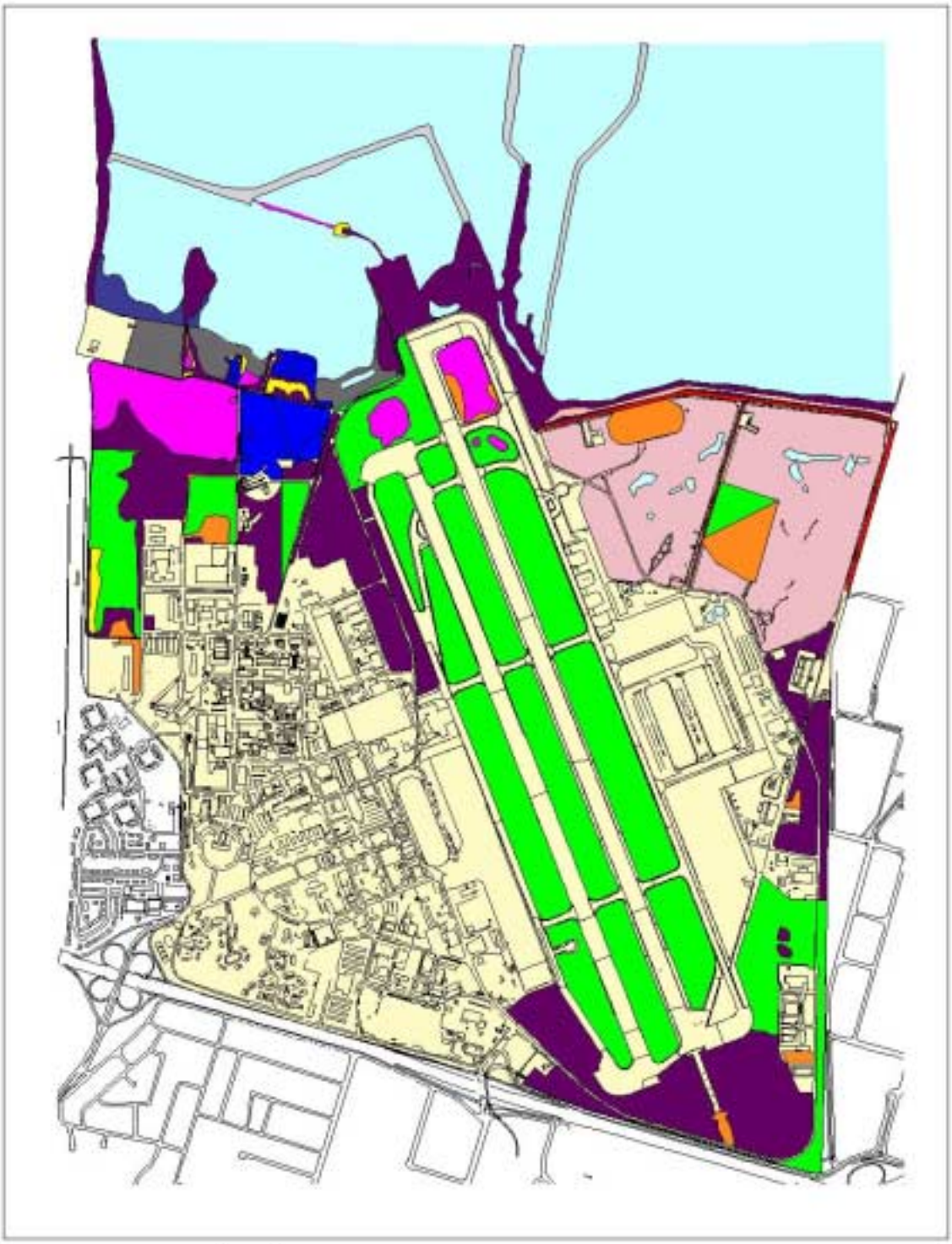
7.2.1.1 Habitats

Habitat types in the NRP and Ames Campus planning areas include weed-dominated areas, disturbed areas, and urban landscaped areas. Figure 10 shows the distribution of these habitat types.

7.2.1.1.1 Weed-Dominated Areas

Weed-dominated habitat occurs along roadsides and in undeveloped infill parcels in the NRP and Ames Campus areas. Extensive development has contributed to the establishment of weedy species; in many cases weed-dominated areas are mowed or exhibit the effects of other past disturbance.

This habitat type is generally dominated by non-native annual herbs, primarily bristly ox-tongue (*Picris echiodes*), scattered geranium (*Geranium dissectum*), and non-native



Legend

- Levee
- Open Water
- Estuarine Channel
- Coastal Salt Marsh
- Coyote Brush Scrub
- Disturbed
- Developed
- Fresh and Brackish Water Marsh
- Non-native Grassland
- Seasonal Salt Marsh and Transition
- Weed Dominated Area
- Golf Course
- Ditches

Moffett Field
Mapped Vegetation

FIGURE 10

900 0 900 1800
Feet

annual grasses (*Avena* spp., *Polypogon monspeliensis*, *Hordeum* spp., *Vulpia* spp.). These sites may also support invasive exotic weeds that crowd out native species and create a monoculture habitat with little value to wildlife. The dominant species in this habitat may alternate between non-native grasses and weedy herbs, depending on the season, amount of rainfall, and maintenance activities (e.g., mowing).

7.2.1.1.2 Disturbed Areas

Disturbed areas are common in the undeveloped regions between buildings and along roadsides in NRP and Ames Campus areas. Disturbed areas may exhibit altered topography resulting from past or present fill or excavation and are commonly covered with debris. These areas are significantly altered from their original habitat type; in many cases, they are almost bare or are dominated by ruderal species. Weedy species that may be found in this habitat type include the invasive exotic perennial pepperweed (*Lepidium latifolium*).

7.2.1.1.3 Developed Areas

Developed areas include buildings and urban landscaping. Urban landscaping consists of ornamental trees, shrubs, and turf grasses that were intentionally planted around the buildings in the NRP area and in other parts of Ames Research Center. Most species are non-native and require irrigation and regular maintenance. Species planted in these areas include lawn grasses, juniper (*Juniperus* spp.), and cypress (*Cypressus* spp.).

7.2.1.2 Federally Threatened or Endangered Plants

No plants that are currently listed, or proposed for listing under the federal ESA, are known or expected to occur in the NRP and Ames Campus planning areas because of their highly urbanized nature.

7.2.1.3 Federally Threatened or Endangered Animals

No animals that are currently listed, or proposed for listing under the federal ESA, are known or expected to occur in the NRP and Ames Campus planning areas because of their highly urbanized nature.

7.2.2 Bay View Area

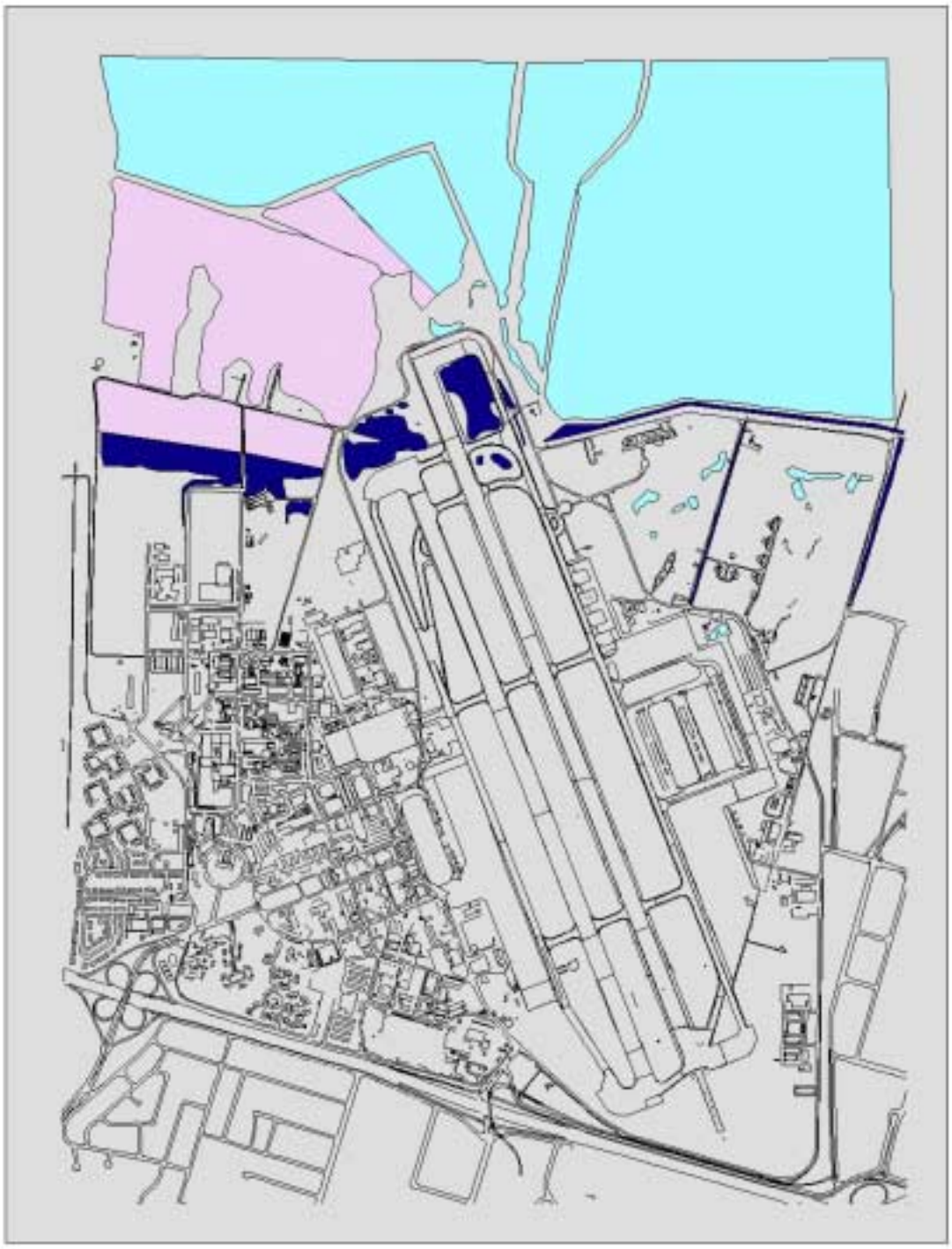
The Bay View area is less developed than other parts of ARC and as a result it supports more native habitat types. However, despite its more natural appearance, the Bay View area has been subject to disturbance, resulting in the development of non-native grasslands and weed dominated areas. For example, areas that now support coyote brush scrub and non-native grassland habitats were previously under dryland cultivation and were affected by farming practices, including disking and plowing, until the 1980's. In addition, hydrologic alterations such as the construction of salt ponds, a stormwater retention pond, and levees and dikes, also caused permanent disturbance to this area.

7.2.2.1 Habitats

Habitats in the Bay View area include: seasonal salt marsh and transition, coyote brush scrub, non-native grassland, weed-dominated areas, disturbed areas, and developed areas. Figure 10 shows the distribution of these habitat types.

7.2.2.1.1 Seasonal Salt Marsh and Transition

Seasonal salt marsh is found in the wetlands in the North of the Bay View area, which is outside of the four planning areas and will not be developed under the NADP, and along the border between these wetlands and the Bay View area (Figures 10-12). Only a very small extent of seasonal salt marsh and transitional habitat is actually within the Bay View area (approximately 2.1 hectares [5.3 acres]). The Bay View boundary was redrawn after verification of the wetlands delineation to remove these areas from Bay View. Seasonal salt marsh occurs on the uppermost edges of coastal salt marsh habitats and includes vegetation that is transitional between the salt marsh and adjacent uplands or structural elements (e.g., roads, levees, dikes). At lower elevations, seasonal salt marsh is dominated by pickleweed (*Salicornia virginica*), alkali heath (*Frankenia salina*), and salt grass (*Distichlis*



Legend

Wetlands and Waters of the U.S., verified by COE 1989

Potential Wetlands and Waters of the U.S., (unverified).

Wetlands and Waters of the U.S., verified by COE 2001

Wetlands and Waters of the U.S. at Moffett Field

FIGURE 11

900 0 900 1800

Feet

FIGURE 12:
Bay View and North of Bay View wetland habitats and adjacent areas

spicata). Black mustard (*Brassica nigra*) and Australian saltbush (*Atriplex semibaccata*) are present along berms and in other elevated areas. In some areas, perennial pepperweed may exceed 50 percent cover. Its presence indicates the displacement of native plant species and reduction in habitat value for wildlife.

7.2.2.1.2 Coyote Brush Scrub

At Ames Research Center, areas of coyote brush scrub include regions that have been disturbed in the past or have been subjected to repeated disturbances over time. In the Bay View area, this habitat type occurs on the western boundary of the Center, along West Perimeter Road.

In coastal areas, coyote brush (*Baccharis pilularis*) is often one of the first native shrub species to colonize disturbed upland areas and sometimes forms dense stands. Dense stands of coyote brush are categorized as coyote brush scrub. The overstory of coyote brush scrub is dominated by coyote brush. The species composition of the herbaceous plants in the understory is similar to that of adjacent habitats (non-native grassland or weed-dominated areas). At Ames Research Center, other shrub and tree species were also observed in some stands of coyote brush scrub, including the native elderberry (*Sambucus mexicana*) and non-native ornamental olive (*Olea* spp.) and acacia (*Acacia* spp.).

7.2.2.1.3 Non-Native Grassland

A large portion of the Bay View area along the west boundary of ARC (West Perimeter Road) is non-native grassland habitat. Areas classified as non-native grasslands are dominated by non-native grasses, including annual Mediterranean grasses such as Mediterranean rye (*Lolium multiflorum*), wild oats (*Avena* spp.), bromes (*Bromus* spp.), and rattail fescue (*Vulpia myuros*). Another common species, creeping red fescue (*Festuca rubra*), is a non-native perennial grass. Non-native herbaceous species contribute less than 20 percent of vegetation cover in non-native grasslands; they include bristly ox-tongue, birdsfoot trefoil (*Lotus corniculatus*), field bindweed (*Convolvulus arvensis*), and milk thistle (*Silybum marianum*).

7.2.2.1.4 Weed-Dominated Areas

The Bay View area supports weedy habitats similar to those in the NRP and Ames Campus planning areas. Weed-dominated habitats in the Bay View area occur along roadsides and in

open spaces between development, and may also occur as patches enclosed by other habitat types. Some weed-dominated habitats in the Bay View area include areas where moist soil supports an increased diversity of non-native weedy species. In some locations, large stands of invasive exotic species such as kikuyu grass (*Pennisetum clandestinum*), periwinkle (*Vinca major*), and perennial pepperweed are present. Kikuyu grass is abundant on berms and roadsides adjacent to coastal salt marsh and freshwater and brackish marsh habitats. The presence of these species is notable because they are all highly invasive and have the potential to displace more desirable vegetation. If not controlled, these invasive species will continue to spread into surrounding habitats.

7.2.2.2 Other Habitat Types

Other habitat types are sparsely represented in the Bay View area. Because there has been little development in the area, currently disturbed areas are limited to a few empty lots between buildings. However, there is urban landscaping around the buildings in this area.

7.2.2.3 Federally Threatened or Endangered Plants

No plants that are currently listed, or proposed for listing under the federal ESA, are known or expected to occur in the Bay View planning area because of is highly disturbed nature.

7.2.2.4 Federally Threatened or Endangered Animals

Within the Bay View planning area, seasonal salt marsh and transition is the only habitat type that could support animals that are listed or proposed for listing under ESA. Surveys have concluded that the following special-status species do not occur in the Bay View area.

California Red-Legged Frog: The California red-legged frog is federally listed as threatened and is a State species of special concern. The species requires permanent or semi-permanent aquatic habitats with emergent and submergent vegetation. A red-legged frog survey was conducted in 2001 (Scott and Alderete, 2001). The areas surveyed in Bay View were the small portions of wetland in this planning area and the settling basin. No adult frogs or metamorphs were observed.

Scott and Alderete (2001) concluded that the presence of treefrog tadpoles in the settling basin indicates that it could provide potential breeding habitat for red-legged frogs. However, yearly maintenance activities such as draining the basin for sediment removal and an abundance of predators in and around the basin (i.e., mallards (*Anas platyrhynchos*) and cinnamon teal (*Anas cyanoptera*) preclude this species from occurring there. Moreover, the isolation of ARC and the highly developed areas that surround the site have most likely caused the extirpation of the red-legged frog from this area some time ago. Scott and Alderete (2001) further surmised that red-legged frogs would not be able to successfully breed in the marshes because they dry each year before the frogs would be able to complete metaphorphosis.

California Tiger Salamander: The California tiger salamander is a candidate for federal listing and is a State species of special concern. Tiger salamanders are terrestrial and spend most of their time underground in small mammal burrows, emerging only for brief periods to breed. Breeding is known to occur in temporary pools and may also occur in more permanent bodies of water. California tiger salamander surveys were conducted concurrently with California red-legged frog surveys in 2001 (Scott and Alderete, 2001). No California tiger salamander adults or larvae were found in the Bay View area.

The habitat requirements for the California tiger salamander are not present in the settling basin or wetlands in this Bay View area. In addition, the presence of predators and a relatively low density of ground squirrel burrows in the Bay View area preclude this species from occurring there.

For the five species considered in this BA, a habitat assessment of seasonal salt marsh and transition areas was conducted. Since only a very small amount of this habitat is present in Bay View, the results of the habitat assessment are provided in the description of the North of Bay View planning area (Section 9.4), where most of this habitat occurs.

7.2.3 Eastside/Airfield

The majority of the Eastside/Airfield area is occupied by the airfield and its accompanying hangars and support buildings. Other land uses in the area include office buildings and the golf course.

7.2.3.1 Habitats

Habitats in the Eastside/Airfield area include: estuarine channel, ditches, non-native grassland, golf course, weed-dominated areas, and disturbed areas.

7.2.3.1.1 Estuarine Channel

The Northern Channel is a storm drain channel that contains shallow water habitats that exhibit estuarine characteristics. The channel runs along the northern boundary of the Eastside/Airfield area, and is separated from the North Patrol Road by an armored chain link fence. The Northern Channel's saltwater influx is likely contributed by the Cargill salt ponds, and becomes seasonally diluted by freshwater runoff that enters the channel. The channel's shore supports emergent hydrophytic vegetation that provides habitat for a variety of waterbirds, including salt marsh yellowthroat and common moorhen. The channel also supports several fish and invertebrate species, including bay shrimp, crabs, mosquitofish, and longjaw mudsuckers. Freshwater gastropod shells have been found in the channel, suggesting that the winter influx of fresh water supports populations of snails (U.S. Navy 1997).

7.2.3.1.2 Ditches

In the Eastside/Airfield area, wetland habitats are found in ditches that run parallel to roads in and around the golf course. The habitats associated with wetlands vary by location. The

Marriage Road ditch is seasonally wet and supports freshwater species, while the North and East Patrol Road ditches are more saline and support species more typical of a salt marsh.

The Marriage Road ditch is low in elevation and located near salt water, so the water that seasonally ponds there may be somewhat brackish or alkaline. Vegetation in this habitat type is a mosaic of patches of baltic rush (*Juncus balticus*), creeping wild rye (*Leymus triticoides*), and cattails (*Typha* spp.) Other species include spearscale (*Atriplex triangularis*), salt grass, clustered field sedge (*Carex praegracilis*), and non-native perennial pepperweed.

The ditches located along East Patrol Road and North Patrol Road represent a unique habitat because of their steep banks and the long-term availability of water. Their structure supports the development of several narrow, linear vegetation zones adjacent to one another. The ditch along North Patrol Road has steep banks and wetland vegetation is limited to the lower portions of the banks, immediately above the water line. The dominant plant species in the wetland portions of the North Patrol Road ditch include pickleweed, salt grass, and prairie bulrush (*Scirpus maritimus*). Adjacent uplands support the non-native herbaceous species birdsfoot trefoil and yellow sweet clover (*Melilotus inducus*) and the non-native grasses rattail fescue and Mediterranean canary grass (*Phalaris minor*). Cattails and bulrushes (*Scirpus* spp.) form patches of emergent vegetation.

The ditch along the East Patrol Road is slightly wider and has more gently sloping banks than the North Patrol Road ditch. During the field surveys in August and September 2000, surface water was present only in a ponded area at the northern end of the ditch. The East Patrol Road ditch supports much less vegetation than the North Patrol Road ditch, and is dominated by non-native dallis grass (*Paspalum dilatum*) and litter, with a few stands of prairie bulrush.

7.2.3.1.3 Other Habitat Types

Non-native grasslands, weed-dominated areas, and disturbed areas are also present in the Eastside/Airfield area. They occur between developed parcels, along roads, and in open fields.

7.2.3.1.4 Golf Course

The golf course provides irrigated, grassy, open habitat for small mammals and the predators that prey on them. Both California ground squirrels and burrowing owls are abundant. The golf

course also encompasses permanent ponds and stormwater runoff ditches that are supplied with brackish water.

7.2.4 North of Bay View Area

Immediately north of the Bay View area is a tract of high-quality wetland habitat that is rich in vegetation and wildlife. This region, referred to as the North of Bay View area, is within ARC jurisdiction but has been excluded from the proposed action area because of the special-status species it supports or may support, and because of the presence of jurisdictional wetlands. It is discussed here because of its proximity to the Bay View area and the potential that it may be indirectly impacted by nearby activities related to the proposed action.

The North of Bay View wetland area contains the most diverse and least disturbed habitats at Ames Research Center, including: freshwater and brackish marshes, seasonal open water and salt flat, coastal salt marsh, seasonal salt marsh and transition, coyote brush scrub, and disturbed areas.

7.2.4.1 Habitats

7.2.4.1.1 Freshwater and Brackish Marshes

Fresh and brackish water marsh habitat comprises the Eastern Diked Marsh (EDM) and a small area along the southern edge of the Stormwater Retention Pond (SWRP), which receives drainage from the EDM. The vegetation in this habitat is influenced by freshwater input from the upstream settling basin that receives stormwater input from the Center. These areas support a mosaic of large patches of Baltic rush, creeping wild rye *(Leymustriticoides)*, and cattails *(Typha spp.)*. Other species including spearscale, salt grass, clustered field sedge *(Carex praegraclis)* and non-native perennial pepperweed are present. The mosaic pattern of the distribution of plant species in this area is likely influenced by the moisture pattern, corresponding to slight changes in topography and the hydrology of the site. Native and non-native species that typically occur in the mesic habitats are also present. Patches dominated by plant species that are typically found in more saline sites are present in isolated patches at the northern edge of the EDM. Stands or individuals of willows are present in this habitat type. Cover by native species is very high, over 85%, and cover by non-native species is less than 15%. SAIC (1999) noted that patches of cattails greatly increased in size between their field investigations in 1999 and the vegetation mapped in this area by Layne and Harding-Smith

(1995). This is likely the result of an increase in area inundated by freshwater flows to the EDM since 1990, when the settling basin was constructed. Additional freshwater flows from the US Navy's groundwater treatment system since 1998 have also likely contributed to the increased abundance of freshwater species in the EDM.

7.2.4.1.2 Seasonal Open Water and Salt Flat

The SWRP consists of seasonal open water and salt flat habitat surrounded by diked salt-marsh and some upland areas. Low areas within the retention pond are submerged for several months and no vegetation grows there, even when the water evaporates. Algal mats are present on the soil surface, especially in the channels and low areas and along the edges of the open water. These mats retard evaporation and the soils underneath the mats remain saturated for extended periods evens after the open water has receded. Green algae is abundant in the open-water and ditch grass is present along portions of the shoreline with deeper waters.

Salinity in the SWRP is highly variable in time and space. This variability is largely controlled by hydrologic fluxes. Temporal variability occurs on both seasonal and annual timescales. Individual storm events may change the salinity on shorter timescales (e.g., days or hours) by introducing large quantities of freshwater in a short period of time. These events can suddenly and drastically reduce salinity in localized areas until sufficient mixing has occurred or additional salts are flushed from underlying soils.

The channel leading into the SWRP receives most of its flow from the settling basin and the EDM and the salinity is therefore low. For example, salinity in this channel was observed to range from 0.6-1.1 part per thousand (ppt) between April and June 2001 (USGS 2001) and was 2 ppt in July 1993 (US Navy 1993). Salinity in regions of the SWRP immediately downstream of this discharge has been observed in the 4.5-5 ppt range. In the main body of the western section of the SWRP, salinity was 11-35 ppt between April and July 2001 (USGS 2001) and ranged from 10 ppt to 24 ppt in July 1993 (US Navy 1993). Between April and June 2001, salinities in the eastern body of the SWRP ranged between 10 ppt and 30 ppt (USGS 2001). All of the water in this part of the pond had evaporated by July 2001.

During and in the months immediately following the wet season, the eastern and western bodies of the SWRP are hydrologically connected. Thus, the observed salinities in the eastern and western bodies are similar during this time of year. As inflow decreases and evaporation increases during

the dry season, water levels in the SWRP decrease and hydrologic connectivity between the eastern and western sections of the SWRP ceases. Because volume of the eastern body is smaller than the western section, during the dry season the water level decreases and salinity increases more quickly in this part of the SWRP. In July 1993, for instance, salinity measurements in the eastern section ranged from 20-28 ppt, compared to 10-24 ppt in the western body (US Navy 1993).

7.2.4.1.3 Coastal Salt Marsh

The coastal salt marsh in the North of Bay View area primarily occurs along the edges of the non-tidal, seasonally flooded SWRP. This habitat also occurs in Crittenden Marsh located immediately adjacent to ARC property and owned by the Midpeninsula Regional Open Space District. Dense, monotypic stands of pickleweed occur on the edges of the ponds and occupy a significant portion of the SWRP in some locations where the topography is sufficiently elevated to support vascular plants. Species other than pickleweed are common on slightly higher ground. Nearly all vegetation classified as coastal salt marsh is dominated by pickleweed, ranging from 25%-80% cover in transects conducted in 1999 (SAIC 1999). Salt grass is a common component of the coastal salt marsh that can be found mixed with pickleweed at scattered locations but is more typically found in the slightly elevated areas in the salt marsh and on lower portions of the berms. Other plant species present in the coastal salt marsh habitats include alkali heath *(Frankenia salina)*, Baltic rush *(Juncus balticus)*, and prairie bulrush *(Scirpus martimus).* Bare areas with salt encrusted soil surfaces and channels occasionally interrupt the pickleweed canopy.

The dominant plants on the berms and roadsides adjacent to the coastal salt marsh habitats at ARC are a mix of species commonly found at higher elevations of the coastal salt marsh, such as alkali heath *(Baccharis douglasii)*, species common in the seasonal salt marsh habitat, such as salt heliotrope *(Heliotropium curassavicum)*, and spearscale *(Atriplex triangularis)*, and non-native species common in the weed dominated areas such as bristly ox-tongue *(Picris echioides)* and milk thistle *(Silybum marianum).*

Over 85% of the dominant plant species surveyed in the coastal salt marsh habitats are native herbaceous species. Non-native coastal species in coastal salt marsh habitat generally occur at the edges of the marshes in areas that were recently disturbed or areas of slightly higher elevations, such as road edges or berms.

7.2.4.1.4 Seasonal Salt Marsh and Transition

A description of seasonal salt marsh and transition is provided in Section 7.2.2.1.1. This habitat comprises a large portion of the Western Diked Marsh (WDM, Figures 4 and 10).

7.2.4.1.5 Coyote Brush Scrub

A description of Coyote Brush Scrub is provided in 7.2.2.1.2. In the North of Bay View planning area, this habitat is found in the southern portions of the WDM and upland areas surrounding the SWRP.

7.2.4.1.6 Disturbed Areas

A description of disturbed areas is provided in 7.2.1.1.2. In the North of Bay View planning area, this habitat is found primarily along levees.

7.2.4.2 Federally Threatened or Endangered Plants

No plants that are currently listed, or proposed for listing under the federal ESA, are known or expected to occur in the North of Bay View planning area. Surveys have been conducted for delta tule pea (*Lathyrus jepsonii* var. *jepsonii*), hairless popcornflower (*Plagiobothrys glaber*), Point Reyes bird's beak (*Cordylanthus maritimus* ssp. *palustris*), and California sea-blite (*Suaeda californica*). To date, none of these species have been observed. Habitat suitable for federally endangered California sea-blite (*Suaeda californica*) may exist in the North of Bay View planning area, but this plant species is thought to have been extirpated from the Mountain View, California Quadrangle and it was not observed a recent survey (Engels and Zippin 1997).

7.2.4.3 Federally Threatened or Endangered Animals

Surveys and incidental sightings in the North of Bay View area and surrounding lands have documented the presence of several federally threatened and endangered animals, including: salt marsh harvest mouse, California clapper rail, California least tern, western snowy plover, and California brown pelican.

Surveys were also conducted for California red-legged frog and California tiger salamander (Layne and Harding-Smith 1995, Scott and Alderete 2001). To date, these two species have not been observed. High water salinities, seasonal drying, and the presence of predators preclude the existence of red-legged frogs and tiger salamanders in the North of Bay View area.

Qualitative assessments of habitat value were conducted for those areas in the North of Bay View area that could potentially provide habitat for any of the five species considered in this BA. These habitats include freshwater and brackish marshes, seasonal open water and salt flat, coastal salt marsh, and seasonal salt marsh and transition. Each habitat was ranked as unsuitable or as low, medium, or high quality. Results are presented in Tables 4-7.

Table 4. Habitat assessment of freshwater and brackish marshes in the North of Bay View area for selected species

	Salt marsh harvest mouse	*California clapper rail*	*California least tern*	*Western snowy plover*	*California brown pelican*
Nesting	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Foraging	Unsuitable	Low	Unsuitable	Unsuitable	Unsuitable
Roosting	N/A	Low	Unsuitable	Unsuitable	Unsuitable

Table 5. Habitat assessment of seasonal open water and salt flat in the North of Bay View area for selected species

	Salt marsh harvest mouse	*California clapper rail*	*California least tern*	*Western snowy plover*	*California brown pelican*
Nesting	Unsuitable	Unsuitable	Medium	Medium	Unsuitable
Foraging	Unsuitable	Unsuitable	Medium	Medium	Low
Roosting	N/A	Unsuitable	Low	Medium	Medium

Table 6. Habitat assessment of coastal salt marsh area in the North of Bay View area for selected species

	Salt marsh harvest mouse	*California clapper rail*	*California least tern*	*Western snowy plover*	*California brown pelican*
Nesting	Medium	Low	Unsuitable	Unsuitable	Unsuitable
Foraging	Medium	Low	Unsuitable	Low	Unsuitable
Roosting	N/A	Low	Unsuitable	Unsuitable	Unsuitable

Table 7. Habitat assessment of seasonal salt marsh and transition areas in the Bay View and North of Bay View planning area for selected species

	Salt marsh harvest mouse	*California clapper rail*	*California least tern*	*Western snowy plover*	*California brown pelican*
Nesting	Low	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Foraging	Low	Low	Unsuitable	Unsuitable	Unsuitable
Roosting	N/A	Low	Unsuitable	Unsuitable	Unsuitable

8 EFFECTS

This section describes existing impacts to the species considered in this BA and their habitats and addresses all direct and indirect impacts expected to result from the proposed action.

8.1 Existing Impacts on Threatened and Endangered Species

The most significant potential impacts to federally threatened or endangered animals in the North of Bay View that currently exist are an altered vegetation community in the EDM and predation from non-native animals and native animals that thrive in highly fragmented, urban environments. Other existing impacts include human disturbance and noise.

8.1.1 Altered Vegetation Community

In the early 1990s, a sedimentation basin was installed upstream of the EDM to remove contaminants from stormwater before it enters the SWRP. Prior to this, much of the stormwater that now flows through the sedimentation basin and the EDM was discharged through the northwest corner of the EMD and thence to the SWRP. In addition to the stormwater discharges, in 1998 the U.S. Navy began discharging treated groundwater to the sedimentation basin and the EDM. Comparisons of aerial photographs from the early 1990s and vegetation maps from 1995 (Layne and Harding-Smith) and 1999 (SAIC) indicate that these additional freshwater flows to the EDM have substantially altered the vegetation community. SAIC noted that patches of freshwater cattails greatly increased in size between when the vegetation was mapped in this area by Layne and Harding-Smith and their field investigations..

These changes in the EDM may have increased its habitat value for some species, but it offers substantially less value for salt marsh harvest mice and California clapper rail.

8.1.2 Predation

Predation is an existing impact on ARC biota. Known or expected predators of salt marsh harvest mice, California clapper rail, California least tern, and western snowy plover are present at ARC, including red foxes *(Vulpes vulpes),* domestic cats (*Felis domesticas*), raccoons

(*Procyon lotor*), and skunks (*Mephitis mephitis*). Preliminary results from investigations by USGS (unpub data 2000) indicate that predation rates of shorebirds and waterfowl are substantially higher at ARC than on adjacent lands (70% vs. 37%). There are no documented cases of predation on threatened or endangered animals at ARC, but given the high rates of predation, the potential for such occurrences cannot be discounted.

In recent years, ARC has worked with the USFWS and the United States Department of Agriculture, Wildlife Services Division to control predators of endangered species. While this program is expected to have reduced predation pressure at ARC, high predation rates persist.

Feeding stations for feral cats, operated by ARC employees, have been present at ARC for more than five years. Besides attracting cats, large numbers of other mammalian predators are attracted to these stations. Because these feeding stations artificially concentrate predators of endangered species, in November 2000, the USFWS informed ARC that immediate steps must be taken to eliminate this activity. ARC has since taken steps to comply with this directive.

Besides eliminating feeding stations, ARC plans to reduce predation impacts by increasing the intensity of future predator control efforts. Moreover, ARC has funded a two-year study with the US Geological Survey and the University of California, Davis to better quantify the rates of predation at ARC compared to adjacent lands and to assess which species are the most prolific predators of ground nesting birds. Results from this investigation will inform future control efforts, and increase the efficacy of the ARC predator control program.

8.1.3 Human Disturbance

People frequently walk on the roads surrounding the fresh and brackish marsh and seasonal salt marsh and transition habitats in the North of Bay View area. This activity may create a slight disturbance for some threatened and endangered species that occupy this habitat. However, this use has been ongoing for many years and wildlife may have grown accustomed to this minimal disturbance.

8.1.4 Noise

NASA periodically conducts aerodynamic testing at the OARF in the Bay View area. This facility is in close proximity to the wetlands and wildlife habitat in the North of Bay View area. The environmental impacts of the extreme noise generated by these tests were evaluated in the NASA Ames Aerodynamics Testing Program EIS, which concluded that California brown pelicans, California least terns, and western snowy plovers were unlikely to experience significant noise-related impacts as a result of testing activities (NASA 1998). In addition, the area exposed to potentially significant noise levels as a result of testing activities does not contain suitable habitat for California clapper rails or salt marsh harvest mice (USFWS 2000).

8.2 Impacts of the Proposed Action

Alternative 5 proposes development in the NRP, Ames Campus, Bay View, and Eastside/Airfield areas. Under Alternative 5, new development and renovation would consist of approximately 140,000 square meters (1.5 million square feet) in the NRP area, 93,000 square meters (1 million square feet) in the Bay View area, and 1,115 square meters (12,000 square feet) in the Eastside/Airfield area. Finally, in the Ames Campus area, Alternative 5 includes the demolition of approximately 37,000 square meters (400,000 square feet) of existing buildings to make way for 46,000 square meters (500,000 square feet) of high-density office and research and development space. Total build out under Alternative 5 would be approximately 780,000 square meters (8.4 million square feet).

Most of the parcels identified for development in the Bay View planning area under Alternative 5 are west of the OARF and are set back from the wetlands in the Bay View and North of Bay

View areas. They are separated from wetland areas by a strip of open space approximately 30 meters (100 feet) wide (Bay View Parcel 11) that would serve as a buffer between developed areas and nearby wetland habitat. There would be no direct impacts to habitat or potential habitat for any threatened or endangered species.

Alternative 5 provides for an 11-hectare (27-acre) burrowing owl preserve in the Bay View area, surrounded by 11 hectares (27 acres) of open space. The preserve was designed as part of NASA's Burrowing Owl Management Plan (Trulio 2001), which also includes a 9-hectare (22-acre) area in the NRP area, a 3-hectare (8-acre) site in the Ames Campus area, and a 10-hectare (24-acre) area in the Eastside/Airfield area. In addition to protecting burrowing owl nesting habitat and foraging habitat, the Bay View preserve and open space would also minimize potential impacts on threatened and endangered species in the North of Bay View area. Moreover, these areas would buffer threatened and endangered species habitat from the impacts of development.

The following sections address impacts expected to result from implementation of Alternative 5. Construction-related impacts (finite duration) are addressed separately from operations-related impacts (ongoing).

8.2.1 Construction-Related Impacts

The following sections describe potential impacts from the construction activities proposed under Alternative5.

8.2.1.1 Construction-Related Noise

Noise generated under Alternative 5 by construction equipment in the Bay View area is not expected to have an adverse impact on the North of Bay View area. California clapper rails have been reported in Stevens Creek and in Crittenden Marsh, approximately 1.3 kilometers (0.8 mile) and 0.9 km (0.6 mile) north of the Bay View area, respectively (CDFG 2001 and Orton-Palmer and Takekawa 1992). This is far enough away that construction noise generated in the Bay View area would not be expected to substantially disturb these clapper rails or their habitat, especially given that noise would be temporary and of much lower volume than the noise from testing at the OARF.

8.2.1.2 Construction-Related Mortality of Salt Marsh Harvest Mice

Under Alternative 5, approximately 17,000 truck trips would be required to fill low lying areas in Bay View. Additional construction traffic would also occur. These construction vehicles would have the potential to inadvertently injure or kill salt marsh harvest mice. Occurrence of salt marsh harvest mice has been confirmed in the coastal salt marsh in the North of Bay View area (Layne and Harding-Smith 1995, Pomeroy 1991). However, coastal salt marsh habitat is not adjacent to the portions of Bay View planning area that are proposed for development. Because of this distance between development and salt marsh harvest mouse habitat, and because construction vehicles are unlikely to need to drive on the roads surrounding coastal salt marsh, the potential for take of salt marsh harvest mice is considered extremely low. With this low probability and the mitigation measures described below, construction traffic is not expected to have a substantial impact on salt marsh harvest mice or any other threatened or endangered species considered in this BA.

Mitigation Measure 1: To minimize the potential for injury or death caused by construction vehicles to salt marsh harvest mice in the Bay View area:

- Construction traffic would be routed on roads farthest from areas where these special-status species occur.

- Occupied or potential habitat for these species near established routes would be marked as off-limits to construction vehicles.

- If construction vehicles must travel on roads within approximately 30 meters (100 feet) of occupied or potential salt marsh harvest mouse habitat, drift fencing would be erected to prevent mice from crossing these roads. The drift fencing would be placed so that harvest mice retain access to adjacent upland habitats for use as refugia during high water events.

- All drivers of construction vehicle drivers would be informed of the established vehicle routes and made aware of the importance of avoiding occupied and potential habitat for salt marsh harvest mice.

8.2.1.3 Impacts on Wetland Habitats from Construction Runoff

Alternative 5 proposes construction within the Bay View area, which is adjacent to wetland habitats (Figure 11). Runoff from these sites may contain sediment, oils and grease, and other pollutants. If contaminated runoff were discharged to these wetlands, it could decrease water quality in these habitats. Thus implementation of Alternative 5 could result in indirect adverse impacts on adjacent wetlands. The habitat that would most likely be affected is seasonal salt marsh and transition in the Western Diked Marsh and fresh and brackish water marsh habitat in the Eastern Diked Marsh. As shown in Table 7, both of these habitats are considered unsuitable or of low value to the species considered in this BA. Consequently, construction runoff is expected to have minimal impact on the threatened or endangered species considered in this BA. Nonetheless, the following mitigation measures are proposed to further minimize potential impacts.

Mitigation Measure 2: To minimize impacts on wetlands, construction would be avoided in the jurisdictional wetlands along the northern boundary of the Bay View area and within 30 meters (100 feet) of these wetlands. All construction near or adjacent to wetlands would implement standard Best Management Practices to minimize runoff into these sensitive areas. Implementing grading and construction during the driest months of the year (July–October) would reduce the potential for siltation and runoff into surrounding habitats.

8.2.1.4 Impacts From Invasive Plant Populations Caused by Construction and Operations of the Proposed Action

Invasive non-native plant species have already substantially degraded some native habitats at ARC, including wetlands that support threatened and endangered species. Species such as perennial pepperweed, periwinkle, yellow star-thistle, bristly ox-tongue, ripgut brome, and wild oats now dominate some habitats once dominated by native species, and these invasive non-native species have the potential to continue to spread. Further development at ARC, especially in the Bay View area, could increase the risk of introductions of new invasive non-native species or increase the rate of spread of existing species as a result of improper selection or handling of landscaping or erosion-control materials. For example, hay bales used for erosion control might contain seeds of invasive weedy species. Construction equipment could also introduce weed seeds in dirt and debris carried from other areas. In addition, more people using the trails surrounding native habitats could inadvertently spread invasive weed seeds on their clothes or shoes.

With the mitigation measures proposed below, additional invasions of non-native plant species are unlikely. Consequently, invasive plants are expected to have minimal impact on any of the threatened or endangered species considered in this BA.

Mitigation Measure 3: Except for lawn areas, landscaping would be designed with native species. Invasive plants would not be used in any landscaping. Any imported soil used for landscaping would be certified as weed-free. Similarly, any erosion-control structures that contain hay or other dried plant material (e.g., hay bales) would be certified as weed-free. Any construction equipment operating within 76 meters (250 feet) of jurisdictional wetlands or other sensitive habitats in the Bay View area would be washed with reclaimed water prior to use in this area to remove potential weed seeds. The construction zone would be surveyed periodically by a qualified botanist, so that any infestations of invasive species that establish within the construction zone of the Bay View area could be eradicated before the plants can flower and set seed.

8.2.2 Operations-Related Impacts

The following sections describe potential impacts from the continuing operations of new development proposed under Alternative 5.

8.2.2.1 Increased Predation

New development at ARC would increase the number of personnel on-site by approximately 200%. This in turn would increase the chances that people would establish unauthorized feeding stations for feral cats. These stations artificially support cats and other non-native predators, as well as native predators that thrive in urbanized environments (e.g. skunks). Consequently, the populations of these predators could increase, and with them possible predation on salt marsh harvest mice, California clapper rails, California least terns, and western snowy plovers. This indirect impact would likely be particularly pronounced in the Bay View area because of the proximity of proposed development in this area to native habitats. Without mitigation, increased predation could significantly impact these species. With the following mitigations, however, substantial increases in predation are unlikely. Consequently, minimal impacts to the threatened or endangered species considered in this BA are expected.

Mitigation Measure 4a: Employees would be prohibited from feeding wildlife, including cats.

Mitigation Measure 4b: An education program for students, researchers, office workers and residents about the impacts caused by non-native predators and the need to refrain from feeding feral cats and other wildlife would be developed and implemented.

Mitigation Measure 4c: A strictly enforced no pets policy would be developed and implemented in new housing in Bay View.

Mitigation Measure 4d: Trash containers that cannot be opened by predator species would be used.

Mitigation Measure 4e: The existing non-native predator control program, which includes humane trapping and removal of feral cats and other non-native predators, would be augmented.

8.2.2.2 Increased predation resulting from increased production of refuse

An increase in the population at ARC would increase the amount of refuse disposed of in and around buildings. Wildlife, especially feral cats and non-native predatory species, often forage in trash receptacles where food waste is disposed. This may result in an increase of these species in and around ARC, which would increase predation on native species.

Increased non-native predator populations caused by increased refuse are not expected to have a substantial impact on any of the threatened or endangered species considered in this BA. Nonetheless, the following mitigation measures are proposed to further minimize potential adverse effects.

Mitigation Measure 5: Trash receptors that are animal resistant would be used, and a regular garbage disposal schedule would be maintained.

8.2.2.3 Effects of Increased Stormwater Runoff from Impermeable Surfaces on Sensitive Habitats

Construction of new buildings, roads, and parking lots within the Bay View area under Alternative 5 would increase the extent of impermeable surfaces in this planning area, potentially increasing stormwater runoff into adjacent habitats. Runoff from constructed impermeable surfaces might contain oil, grease, pesticides, fertilizers used on landscaping, and other pollutants typically found in urban areas. If contaminated runoff entered the sensitive and high-quality wetland habitats in the North of Bay View area, the pollutants it contained could impact these habitats and the listed species that may reside there.

Development in the Bay View area would increase the amount of freshwater runoff generated in this part of the Center. If this runoff were to substantially increase freshwater inputs to the EDM, WDM, or SWRP, salinity in these remnant, diked salt marshes would decrease. In turn, this could alter the plant and animal species composition in these marshes. In particular, altered salinity could reduce the abundance of pickleweed in these marshes, potentially affecting salt marsh harvest mice and California clapper rails. Large increases in stormwater flows could also alter inundation patterns in the SWRP, and thus flood potential nesting sites for California least tern and snowy plover. However, as described below, none of these impacts are expected.

ARC plans to direct this stormwater flow from the Bay View area to Steven's Creek during low flow periods in the creek. During periods of higher flows, most of the stormwater flows would be discharged to the EDM and subsequently to the SWRP. Because discharges to the WDM would not be substantially increased or decreased over baseline conditions, no significant impacts to this wetland are expected. Impacts to the EDM are not expected either, because this marsh has already been substantially altered; it is now a freshwater/brackish system. Marginal changes in the amount of freshwater runoff entering this wetland are unlikely to result in additional vegetation changes.

To assess the potential for altered vegetation or increased flooding of habitats in the SWRP, the rational runoff method (Dunne and Leopold 1979) was used to obtain rough estimates of annual stormwater discharge to this area under pre-project and post-project conditions. Amount of impervious surface was assumed to stay the same in all areas except the Bay View, where approximately 25 acres will be paved. This is a conservative approach because impervious in the NRP area is expected to decrease from baseline conditions.

The rational method uses the following simple relationship to compute runoff: Q = CiA; where "Q" is the runoff rate (acre-feet/year), "C" is the rational runoff coefficient (dimensionless), "i" is the rainfall intensity (inches/year), and "A" is the drainage area (acres). As shown in Table 8, stormwater runoff under pre-project conditions is approximately 545 acre-feet/year, assuming an average annual rainfall of 13.5 inches. Under post-project conditions, approximately 566 acre-feet of stormwater runoff is expected during an "average" year[2].

This 4% increase in annual stormwater runoff is small and well within the range expected from natural variability in rainfall. Moreover, since the SWRP is on the order of 175 acres, marginal increases in flow to the SWRP are not expected to result in significant changes in inundation patterns. Consequently, increased stormwater runoff is not expected to result in significant impacts to the species considered in this BA. Additional factors make such impacts even less likely. Specifically, while an increase in impervious surfaces would occur in Bay View, the amount of impervious in the NRP area would decrease. Moreover, within the next year, the US Navy plans to cease discharging approximately 129 acre-feet/year treated groundwater to the EDM and SWRP.

2 Neither the pre-project or post-project computations consider contributions from groundwater discharge to these wetlands. Whether groundwater discharges to these wetlands has not been determined. If such discharges do occur, however, they would not be altered by the proposed action.

Table 8: Estimated Stormwater Runoff for Pre-Project and Post-Project Conditions

Pre-Project (Existing Conditions)

Q = ciA	**Paved Surfaces**	**Lawns and Grasslands**
c =	0.9	0.15
i =	13.5inches/year	13.5inches/year
A =	510.0acres	170.0Acres
Q =	6196.5acre-inches/year	344.3acre-inches/year
Q =	516.4acre-feet/year	28.7acre-feet/year
Total runoff =	**545acre-feet/year**	

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Post-Project

Q = ciA	**Paved Surfaces**	**Lawns and Grasslands**
c =	0.9	0.15
i =	13.5inches/year	13.5inches/year
A =	535.0acres	145.0acres
Q =	6500.3acre-inches/year	293.6acre-inches/year
Q =	541.7acre-feet/year	24.5acre-feet/year
Total runoff =	**566acre-feet/year**	

Mitigation Measure 6a: Potentially contaminated runoff would be managed using stormwater Best Management Practices. Swales would be constructed adjacent to wetlands in upland areas to intercept and filter any runoff before it reaches the wetland. Construction of swales would be permitted within the 30 meters (100-foot) buffer zone around wetlands, but not within the wetlands themselves.

Mitigation Measure 6b: When feasible, the use of pesticides on landscaping near native habitats would be prohibited.

Mitigation Measure 6c: In the Bay View area, minimal irrigation (e.g., drip systems) would be used to minimize runoff into surrounding habitats.

8.2.2.4 Impacts on Nocturnal Species Caused by Increased Lighting

Salt marsh harvest mice are largely nocturnal. Lighting along roads and buildings in the proposed development areas might impact this species by disrupting their behavior such as dispersal or breeding. Habitat that is currently suitable for this species might be less suitable if it were artificially lit at night. The impact of increased lighting resulting from proposed development in the NRP and Eastside/Airfield areas would not be considered significant because they are far from salt marsh harvest mouse habitat and extensive development and lighting already exist in those areas. The impact of increased lighting in the Bay View area would not result in significant impacts to salt marsh harvest mice because there is a substantial buffer between this area and the North of Bay View coastal salt marsh, which provides the highest quality harvest mouse habitats at and adjacent to ARC. Nonetheless, the following mitigation measures are proposed to further minimize the potential for adverse effects.

Mitigation Measure 7: When feasible, nighttime lighting would be excluded in new development adjacent to high-quality wildlife habitat in the North of Bay View area. The impacts of necessary lighting would be minimized by using low-glare light sources (e.g., low pressure sodium lighting) mounted on short poles and directed away from native habitats.

8.2.2.5 Additional Mitigation Measures Identified by US Fish & Wildlife Service

US Fish & Wildlife Service identified additional mitigation measures to further reduce the potential impacts that could be caused from the housing in the Bay View area. Housing in the Bay View area could result in increased nighttime light in the wetland north of Bay View housing, and in the open space east of Bay View housing. Housing could also result in increased numbers of animals that would prey on endangered species. The following mitigation measures would further minimize the potential for adverse effects.

Mitigation Measure 8: There would be no net increase in lighting north or east of Bay View housing. A lighting study would be conducted to determine baseline light levels. Light amplification to nearby sensitive wildlife areas would be eliminated by use of directional lighting with baffles, non-reflective tinting on windows, and other mechanisms.

Mitigation Measure 9: An ongoing predator management program would be implemented to trap and remove predators, including, but not limited to, red fox, skunks, raccoons, rats, feral cats and dogs.

Mitigation Measure 10: North and east fences bordering Bay View housing would be designed to eliminate movement of potential predators from the housing area to sensitive wildlife areas. The bottom portion of the fence would be buried at least 18 inches below ground level. The fencing grid size would be small enough to prevent rats from passing through. Roll wire would be placed along the top of the fencing to eliminate the possibility of predators climbing over the fence and to deter avian predators from perching.

Mitigation Measure 11: Predator perches would be eliminated along and within the boundaries of the western diked marsh, eastern diked marsh, and storm water retention pond to compensate for any increase in predation caused by predators in the Bay View housing. Roll wire would be placed atop all fencing surrounding the eastern and western diked marshes and the storm water retention pond. Anti-perching devises would be placed on and surrounding the Plant Engineering facilities at the northwest corner of the ARC property. If feasible, all landscape features that provide perches for avian predators would be removed.

Mitigation Measure 12: Landscaping in the Bay View housing area would utilize California native trees from the US Fish & Wildlife Service's approved list.

Mitigation Measure 13: If possible, rip rap would not be used on slope resulting from the fill of the Bay View housing area. If rip rap must be used, it would be small diameter materials that

will not create habitat for rodents. Rip rap would not be placed on existing marsh vegetation. Instead of rip rap, a more gradual slope (4-H: 1V) would be created and native vegetation planted on newly graded area to provide transitional habitat.

9 ANALYSIS OF ALTERNATE ACTIONS

9.1 Description of Alternate Actions

ARC is evaluating five development alternatives. Alternative 5, described in detail in Section 6, is NASA's preferred alternative under NEPA and is thus considered the proposed action in this BA. Four other alternate actions, referred to as Alternatives 1-4 are being evaluated and are described below. Figures 8, 13, 14 and 15 show the proposed development for these alternatives. Tables 9-11 provide detailed information related to development under these alternatives and Table 12 provides a summary comparison.

9.1.1 Alternative 1: The No Project Alternative

Under the No Project Alternative, no new development would be proposed for Ames Research Center under the NADP. However, NASA would implement several projects already approved under previous environmental documents. Therefore, this alternative is considered the 'baseline' condition (Figure 8, Table 3).

9.1.2 Alternative 2

Alternative 2 proposes to develop approximately 360,000 square meters (3.9 million square feet) of new space in the NRP, Bay View, and Eastside/Airfield areas. Within the NRP area, there would be approximately 190,000 square meters (2 million square feet) of new educational, office, research and development, museum, conference center, housing and retail development, approximately 52,000 square meters (560,000 square feet) of existing non-historic structures would be demolished, and approximately 46,000 square meters (500,000 square feet) of existing space would be renovated. Alternative 2 proposes approximately 121,000 square meters (1.3 million square feet) of new educational and housing development in the Bay View area, and approximately 51,000 square meters (550,000 square feet) of new low-density research and development and light industrial space, in addition to the renovation of Hangars 2 and 3, in the Eastside/Airfield area. Total build out under this alternative would be approximately 845,000 square meters (9.1 million square feet). Figure 13 is the proposed land-use plan for this alternative and Table 9 provides details related to specific parcels.

Figure 13

PROPOSED LAND USE PLAN
ALTERNATIVE TWO

LEGEND:

- Partner Parcel
- Community Support
- University Reserve
- NASA Reserved
- Recreation
- Adaptive Reuse (Hangars)
- Relocated AC Control Tower
- Training/Conference Center
- California Air and Space Center
- Historic District Infill
- Historic District Renovation
- Historic Buildings
- Computer Museum
- Supporting Retail
- Light Rail
- Preserve (Burrowing Owl)
- Open Space
- Wetlands
- Fence Line
- Bay Trail Extension

Denotes Parcel Number as Noted in Table 2-1

- Ames Campus
- NASA Research Park
- Eastside / Airfield
- Bay View

DMJM

EDAW

N

NASA AMES RESEARCH CENTER
NASA AMES DEVELOPMENT PLAN DRAFT EIS

Table 9: Alternative 2 Land Use Summary

Parcel		Land Use		Parcel Area	Parcel Area (AC)	FAR	Developable Area	Developable Area (SF)
Ames Campu	1	ARC Facilities		91.60	*226.35*	0.29	268,458	*2,889,658*
	2	Preserve		3.15	*7.78*	N/A	N/A	*N/A*
		Sub Total		**94.8**	*234.1*		**268,458**	*2,889,658*
NASA Research Park	1	Lab Project	*	3.36	*8.31*	0.33	11,148	*120,000*
	2	Lab Project	*	7.90	*19.53*	0.71	55,742	*600,000*
	3	University Reserve		1.03	*2.53*	0.59	6,039	*65,000*
	4	Partner Parcel		1.50	*3.70*	0.53	7,897	*85,000*
	5	University Reserve		11.58	*28.60*	0.66	76,180	*820,000*
	6	University Reserve		2.88	*7.11*	1.16	33,445	*360,000*
	7	Computer Museum		1.26	*3.11*	0.52	6,503	*70,000*
	8	University Reserve		1.02	*2.52*	0.64	6,503	*70,000*
	9	Gateway Parcel		0.26	*0.65*	0.42	1,116	*12,010*
	10	Partner Parcel		1.90	*4.70*	0.68	13,006	*140,000*
	11	Partner Parcel		1.36	*3.35*	0.75	10,219	*110,000*
	12	Historic District	*	7.91	*19.55*	N/A	8,268	*89,000*
	12a	Historic District					1,486	*16,000*
	13	Historic District Infill		2.31	*5.70*	0.40	9,290	*100,000*
	14	Historic District Infill		1.72	*4.26*	0.67	11,613	*125,000*
	15	Historic District Infill		1.06	*2.62*	0.66	6,968	*75,000*
	16	Partner Parcel		1.85	*4.56*	0.70	13,006	*140,000*
	17	Historic Dist Reno		1.72	*4.26*	N/A	4,181	*45,000*
	18	C.Air & Space Cntr.		5.70	*14.09*	0.64	36,232	*390,000*
	19	Preserve		8.83	*21.82*	N/A	N/A	*N/A*
	X	No Change		N/A	*N/A*	N/A	6,316	*67,990*
		Sub Total		**65.1**	*161.0*		**325,161**	*3,500,000*
Eastside / Airfield	1	Adaptive Re-Use Hangar 2 (46)		6.17	*15.24*	0.52	32,226	*346,875*
	2	Adaptive Re-Use Hangar 3 (47)		6.48	*16.02*	0.62	40,296	*433,738*
	3	Training/Conf. Cntr.		1.86	*4.60*	0.40	7,432	*80,000*
	4	Partner Parcel		10.46	*25.84*	0.32	33,445	*360,000*
	5	Partner Parcel		3.99	*9.86*	0.23	9,104	*98,000*
	6	A/C Control Tower		0.19	*0.46*	0.60	1,115	*12,000*
	7	Preserve		9.82	*24.26*	N/A	N/A	*N/A*
	8	Open Space		61.28	*151.43*	N/A	N/A	*N/A*
	X	No Change		N/A	*N/A*	N/A	7,341	*79,023*
		Sub Total		**100.2**	*247.7*		**130,959**	*1,409,636*
	A	CANG Master Plan	**					
Bay View	1	Partner Housing		4.17	*10.30*	0.67	27,871	*300,000*
	2	Education Reserve		5.11	*12.62*	0.91	46,452	*500,000*
	3	NASA Reserve		2.04	*5.03*	N/A	N/A	*N/A*
	4	Recreation		1.63	*4.02*	N/A	N/A	*N/A*
	5	Recreation		2.98	*7.37*	N/A	N/A	*N/A*
	6	Preserve		6.31	*15.60*	N/A	N/A	*N/A*
	7	Preserve		4.81	*11.89*	N/A	N/A	*N/A*
	8	Open Space		2.57	*6.35*	N/A	N/A	*N/A*
	9	Open Space		1.02	*2.52*	N/A	N/A	*N/A*
	10	Partner Parcel		4.52	*11.17*	1.03	46,452	*500,000*
	11	Open Space		3.03	*7.49*	N/A	N/A	*N/A*
		Sub Total		**38.2**	*94.4*		**120,774**	*1,300,000*
Total							**845,352**	########
	A	CANG Master	**	44.52	*110.00*	N/A	6,020	*64,800*
		Existing CANG		N/A	N/A	N/A	20,717	*223,000*

* *"Preapproved pursuant to the 1994 NASA/MFA Environmental Assessment - Comprehensive Use Plan"*

** *"Preapproved pursuant to the CANG EA Master Plan - Square footage not included in totals*

Figure 14

PROPOSED LAND USE PLAN
ALTERNATIVE THREE

LEGEND:
- Partner Parcel
- University Reserve
- NASA Reserved
- Adaptive Reuse (Hangars)
- California Air and Space Center
- Historic District Infill
- Historic District Renovation
- Historic Buildings
- Computer Museum
- Supporting Retail
- Light Rail
- Preserve (Burrowing Owl)
- Open Space
- Wetlands
- Fence Line
- Bay Trail Extension

(Circled Parcel Numbers as Noted on Table 2-1)
- Ames Campus
- NASA Research Park
- Eastside / Airfield

DMJM EDAW

NASA AMES RESEARCH CENTER
NASA AMES DEVELOPMENT PLAN DRAFT EIS

Table 10: Alternative 3 Land Use Summary

Parcel		Land Use		Parcel Area	Parcel Area (AC)	FAR	Developable Area	Developable Area (SF)
Ames Campu	1	ARC Facilities		91.60	*226.35*	0.29	268,458	*2,889,658*
	2	Preserve		3.15	*7.78*	N/A	N/A	*N/A*
		Sub Total		**94.8**	*234.1*		**268,458**	*2,889,658*
NASA Research Park	1	Lab Project	*	3.36	*8.31*	0.33	11,148	*120,000*
	2	Lab Project	*	7.90	*19.53*	0.71	55,742	*600,000*
	3	University Reserve		1.03	*2.53*	0.59	6,039	*65,000*
	4	Partner Parcel		1.50	*3.70*	0.53	7,897	*85,000*
	5	University Reserve		5.89	*14.56*	1.32	78,039	*840,000*
	6	University Reserve		2.88	*7.11*	1.16	33,445	*360,000*
	7	Computer Museum		1.26	*3.11*	0.52	6,503	*70,000*
	8	University Reserve		1.02	*2.52*	0.68	6,968	*75,000*
	9	Gateway Parcel		0.26	*0.65*	0.42	1,116	*12,010*
	10	Partner Parcel		1.90	*4.70*	0.98	18,581	*200,000*
	11	Partner Parcel		1.36	*3.35*	1.03	13,935	*150,000*
	12	Historic District	*	7.91	*19.55*	N/A	8,268	*89,000*
	12a	Historic District					1,486	*16,000*
	13	Historic District Infill		2.31	*5.70*	N/A	10,684	*115,000*
	14	Historic District Infill		1.72	*4.26*	0.86	14,864	*160,000*
	15	Historic District Infill		1.06	*2.62*	0.79	8,361	*90,000*
	16	Partner Parcel		1.85	*4.56*	1.01	18,581	*200,000*
	17	Historic Dist Reno		1.72	*4.26*	0.24	4,181	*45,000*
	18	C.Air & Space Cntr.		5.70	*14.09*	N/A	36,232	*390,000*
	19	Partner Parcel		5.68	*14.05*	1.23	69,677	*750,000*
	20	Preserve		7.66	*18.94*	N/A	N/A	*N/A*
	21	NASA Reserved		1.16	*2.87*	N/A	N/A	*N/A*
	X	No Change		N/A	*N/A*	N/A	6,316	*67,990*
		Sub Total		**65.1**	*161.0*		**418,064**	*4,500,000*
Eastside / Airfield	1	Adaptive Re-Use Hangar 2 (46)		6.35	*15.69*	0.51	32,226	*346,875*
	2	Adaptive Re-Use Hangar 3 (47)		6.48	*16.02*	0.62	40,296	*433,738*
	3	Preserve		9.82	*24.26*	N/A	N/A	*N/A*
	4	Open Space		59.53	*147.11*	N/A	N/A	*N/A*
	X	No Change		N/A	*N/A*	N/A	7,341	*79,023*
		Sub Total		**82.2**	*203.1*		**79,863**	*859,636*
	A	CANG Master Plan (	**					
Tota							**766,385**	#######
	A	CANG Master	**	44.52	*110.00*	N/A	6,020	*64,800*
		Existing CANG		N/A	N/A	N/A	20,717	*223,000*

* *"Preapproved pursuant to the 1994 NASA/MFA Environmental Assessment - Comprehensive Use Plan"*

** *"Preapproved pursuant to the CANG EA Master Plan - Square footage not included in totals*

FIGURE 15

PROPOSED LAND USE PLAN
ALTERNATIVE FOUR

LEGEND:

- Partner Parcel
- Community Support
- University Reserve
- NASA Reserved
- Recreation
- Adaptive Reuse (Hangars)
- Relocated AC Control Tower
- Training/Conference Center
- California Air and Space Center
- Historic District Infill
- Historic District Renovation
- Historic Buildings
- Computer Museum
- Supporting Retail
- Light Rail
- Preserve (Burrowing Owl)
- Open Space
- Wetlands
- Fence Line
- Bay Trail Extension

Denotes Parcel Number as Noted on Table 2-3

- Ames Campus
- NASA Research Park
- Eastside / Airfield
- Bay View

DMJM

EDAW

NASA AMES RESEARCH CENTER

NASA AMES DEVELOPMENT PLAN DRAFT EIS

Table 11: Alternative 4 Land Use Summary

Parcel		Land Use		Parcel Area	Parcel Area (AC)	FAR	Developable Area	Developable Area (SF)
Ames Campu	1	ARC Facilities		91.32	*225.67*	0.29	268,458	*2,889,658*
	2	Preserve		3.15	*7.78*	N/A	N/A	*N/A*
		Sub Total		**94.5**	*233.4*		**268,458**	*2,889,658*
NASA Research Park	1	Lab Project	*	3.36	*8.31*	0.33	11,148	*120,000*
	2	Lab Project	*	7.90	*19.53*	0.71	55,742	*600,000*
	3	University Reserve		1.03	*2.53*	0.59	6,039	*65,000*
	4	Partner Parcel		1.50	*3.70*	0.31	4,645	*50,000*
	5	University Reserve		11.58	*28.60*	0.61	71,071	*765,000*
	6	University Reserve		2.88	*7.11*	0.86	24,619	*265,000*
	7	Computer Museum		1.26	*3.11*	0.52	6,503	*70,000*
	8	University Reserve		1.02	*2.52*	0.64	6,503	*70,000*
	9	Gateway Parcel		0.26	*0.65*	0.07	187	*2,010*
	10	Partner Parcel		1.90	*4.70*	0.27	5,110	*55,000*
	11	Partner Parcel		1.36	*3.35*	0.27	3,716	*40,000*
	12	Historic District	*	7.91	*19.55*	N/A	8,268	*89,000*
	12a	Historic District					1,486	*16,000*
	13	Historic District Infill		2.31	*5.70*	0.20	4,645	*50,000*
	14	Historic District Infill		1.72	*4.26*	0.65	11,148	*120,000*
	15	Historic District Infill		1.06	*2.62*	0.57	6,039	*65,000*
	16	Partner Parcel		1.85	*4.56*	0.28	5,110	*55,000*
	17	Historic District Infill		1.72	*4.26*	N/A	4,181	*45,000*
	18	C.Air & Space Cntr.		5.70	*14.09*	0.64	36,232	*390,000*
	19	Preserve		8.83	*21.82*	N/A	N/A	*N/A*
	X	No Change		N/A	*N/A*	N/A	6,316	*67,990*
		Sub Total		**65.1**	*161.0*		**278,709**	*3,000,000*
Eastside / Airfield	1	Adaptive Re-Use Hangar 2 (46)		6.17	*15.24*	0.52	32,226	*346,875*
	2	Adaptive Re-Use Hangar 3 (47)		6.48	*16.02*	0.62	40,296	*433,738*
	3	Training/Conf. Cntr.		1.86	*4.60*	0.40	7,432	*80,000*
	4	Partner Parcel		10.46	*25.84*	0.43	44,593	*480,000*
	5	Partner Parcel		3.99	*9.86*	0.23	9,104	*98,000*
	6	A/C Control Tower		0.19	*0.46*	0.60	1,115	*12,000*
	7	Preserve		9.82	*24.26*	N/A	N/A	*N/A*
	8	Open Space		61.28	*151.43*	N/A	N/A	*N/A*
	X	No Change		N/A	*N/A*	N/A	7,341	*79,023*
		Sub Total		**100.2**	*247.7*		**142,108**	*1,529,636*
	A	CANG Master Plan	**					
Bay View	1	Partner Housing		7.47	*18.45*	0.82	61,316	*660,000*
	2	Education Reserve		3.13	*7.74*	0.89	27,871	*300,000*
	3	NASA Reserve		2.04	*5.03*	N/A	N/A	*N/A*
	4	Recreation		2.98	*7.37*	N/A	N/A	*N/A*
	5	Partner Parcel		4.52	*11.17*	0.97	44,032	*473,956*
	6	Partner Parcel		6.29	*15.54*	0.93	58,309	*627,628*
	7	Partner Parcel		6.45	*15.93*	0.92	59,311	*638,416*
	8	Open Space		4.08	*10.09*	N/A	N/A	*N/A*
	9	Open Space		0.93	*2.31*	N/A	N/A	*N/A*
		Sub Total		**37.9**	*93.6*		**250,838**	*2,700,000*
Tota							**940,113**	#######
	A	CANG Master	**	44.52	*110.00*	N/A	6,020	*64,800*
		Existing CANG		N/A	N/A	N/A	20,717	*223,000*

* *"Preapproved pursuant to the 1994 NASA/MFA Environmental Assessment - Comprehensive Use Plan"*

** *"Preapproved pursuant to the CANG EA Master Plan - Square footage not included in totals*

Table 12: Baseline and Proposed Alternative Analysis Breakdown

Alternative One

	Site		Existing Facilities		Current Baseline Projects under the CUP and CANG EAs (FONSI)						Baseline Facilities		Proposed Projects under the EIS						Totals	Totals		
	Hectares	Acres	Existing (MS)	Existing (SF)	Demo (MS)	Demo (SF)	Reno (MS)	Reno (SF)	New (MS)	New (SF)	Existing (MS)	Existing (SF)	Demo (MS)	Demo (SF)	Reno (MS)	Reno (SF)	New (MS)	New (SF)	Total (MS)	Total (SF)	Net Change (MS)	Net Change (SF)
NASA Research Park	86.20	213.00	146,533	1,577,269	31,801	342,307	11,334	122,000	71,071	765,000	185,803	1,999,962	-	-	-	-	-	-	185,803	1,999,962	-	-
Eastside / Airfield	385.26	952.00	79,863	859,636	-	-	-	-	-	-	79,863	859,636	-	-	-	-	-	-	79,863	859,636	-	-
Bay View Site	38.24	94.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ames Campus	94.70	234.00	268,458	2,889,658	1,115	12,000	-	-	1,115	12,000	268,458	2,889,658	-	-	-	-	-	-	268,458	2,889,658	-	
	604.40	1,493.50	494,854	5,326,563	32,916	354,307	11,334	122,000	72,186	777,000	534,123	5,749,256	-	-	-	-	-	-	534,123	5,749,256	-	-
CANG EA *	44.52	110.00	20,717	223,000	232	2,500	74	800	5,946	64,000	26,431	284,500	-	-	-	-	-	-	26,431	284,500	-	

Alternative Two

	Site		Existing Facilities		Current Baseline Projects under the CUP and CANG EAs (FONSI)						Baseline Facilities		Proposed Projects under the EIS						Totals	Totals		
	Hectares	Acres	Existing (MS)	Existing (SF)	Demo (MS)	Demo (SF)	Reno (MS)	Reno (SF)	New (MS)	New (SF)	Existing (MS)	Existing (SF)	Demo (MS)	Demo (SF)	Reno (MS)	Reno (SF)	New (MS)	New (SF)	Total (MS)	Total (SF)	Net Change (MS)	Net Change (SF)
NASA Research Park	86.20	213.00	146,533	1,577,269	31,801	342,307	11,334	122,000	71,071	765,000	185,803	1,999,962	52,209	561,972	46,452	500,000	191,567	2,062,010	325,161	3,500,000	139,358	1,500,038
Eastside / Airfield	385.26	952.00	79,863	859,636	-	-	-	-	-	-	79,863	859,636	-	-	72,521	780,613	51,097	550,000	130,959	1,409,636	51,097	550,000
Bay View Site	38.24	94.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120,774	1,300,000	120,774	1,300,000	120,774	1,300,000
Ames Campus	94.70	234.00	268,458	2,889,658	1,115	12,000	-	-	1,115	12,000	268,458	2,889,658	-	-	46,452	500,000	-	-	268,458	2,889,658	-	-
	604.40	1,493.50	494,854	5,326,563	32,916	354,307	11,334	122,000	72,186	777,000	534,123	5,749,256	52,209	561,972	165,424	1,780,613	363,438	3,912,010	845,352	9,099,294	311,229	3,350,038
CANG EA *	44.52	110.00	20,717	223,000	232	2,500	74	800	5,946	64,000	26,431	284,500	-	-	-	-	-	-	26,431	284,500	-	

Alternative Three

	Site		Existing Facilities		Current Baseline Projects under the CUP and CANG EAs (FONSI)						Baseline Facilities		Proposed Projects under the EIS						Totals	Totals		
	Hectares	Acres	Existing (MS)	Existing (SF)	Demo (MS)	Demo (SF)	Reno (MS)	Reno (SF)	New (MS)	New (SF)	Existing (MS)	Existing (SF)	Demo (MS)	Demo (SF)	Reno (MS)	Reno (SF)	New (MS)	New (SF)	Total (MS)	Total (SF)	Net Change (MS)	Net Change (SF)
NASA Research Park	86.20	213.00	146,533	1,577,269	31,801	342,307	11,334	122,000	71,071	765,000	185,803	1,999,962	52,209	561,972	46,452	500,000	284,470	3,062,010	418,064	4,500,000	232,261	2,500,038
Eastside / Airfield	385.26	952.00	79,863	859,636	-	-	-	-	-	-	79,863	859,636	-	-	72,521	780,613	-	-	79,863	859,636	-	-
Bay View Site	38.24	94.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ames Campus	94.70	234.00	268,458	2,889,658	1,115	12,000	-	-	1,115	12,000	268,458	2,889,658	-	-	46,452	500,000	-	-	268,458	2,889,658	-	-
	604.40	1,493.50	494,854	5,326,563	32,916	354,307	11,334	122,000	72,186	777,000	534,123	5,749,256	52,209	561,972	165,424	1,780,613	284,470	3,062,010	766,385	8,249,294	232,261	2,500,038
CANG EA *	44.52	110.00	20,717	223,000	232	2,500	74	800	5,946	64,000	26,431	284,500	-	-	-	-	-	-	26,431	284,500	-	

Alternative Four

	Site		Existing Facilities		Current Baseline Projects under the CUP and CANG EAs (FONSI)						Baseline Facilities		Proposed Projects under the EIS						Totals	Totals		
	Hectares	Acres	Existing (MS)	Existing (SF)	Demo (MS)	Demo (SF)	Reno (MS)	Reno (SF)	New (MS)	New (SF)	Existing (MS)	Existing (SF)	Demo (MS)	Demo (SF)	Reno (MS)	Reno (SF)	New (MS)	New (SF)	Total (MS)	Total (SF)	Net Change (MS)	Net Change (SF)
NASA Research Park	86.20	213.00	146,533	1,577,269	31,801	342,307	11,334	122,000	71,071	765,000	185,803	1,999,962	52,209	561,972	46,452	500,000	145,115	1,562,010	278,709	3,000,000	92,907	1,000,038
Eastside / Airfield	385.26	952.00	79,863	859,636	-	-	-	-	-	-	79,863	859,636	-	-	72,521	780,613	62,245	670,000	142,108	1,529,636	62,245	670,000
Bay View Site	38.24	94.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250,838	2,700,000	250,838	2,700,000	250,838	2,700,000
Ames Campus	94.70	234.00	268,458	2,889,658	1,115	12,000	-	-	1,115	12,000	268,458	2,889,658	-	-	139,355	1,500,000	-	-	268,458	2,889,658	-	-
	604.40	1,493.50	494,854	5,326,563	32,916	354,307	11,334	122,000	72,186	777,000	534,123	5,749,256	52,209	561,972	258,327	2,780,613	458,199	4,932,010	940,113	10,119,294	405,990	4,370,038
CANG EA *	44.52	110.00	20,717	223,000	232	2,500	74	800	5,946	64,000	26,431	284,500	-	-	-	-	-	-	26,431	284,500	-	

Alternative Five

	Site		Existing Facilities		Current Baseline Projects under the CUP and CANG EAs (FONSI)						Baseline Facilities		Proposed Projects under the EIS						Totals	Totals		
	Hectares	Acres	Existing (MS)	Existing (SF)	Demo (MS)	Demo (SF)	Reno (MS)	Reno (SF)	New (MS)	New (SF)	Existing (MS)	Existing (SF)	Demo (MS)	Demo (SF)	Reno (MS)	Reno (SF)	New (MS)	New (SF)	Total (MS)	Total (SF)	Net Change (MS)	Net Change (SF)
NASA Research Park	86.20	213.00	146,533	1,577,269	31,801	342,307	11,334	122,000	71,071	765,000	185,803	1,999,962	52,209	561,972	56,080	603,635	191,567	2,062,010	325,161	3,500,000	139,358	1,500,038
Eastside / Airfield	385.26	952.00	79,863	859,636	-	-	-	-	-	-	79,863	859,636	-	-	-		1,115	12,000	80,978	871,636	1,115	12,000
Bay View Site	38.24	94.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	92,903	1,000,000	92,903	1,000,000	92,903	1,000,000
Ames Campus	94.70	234.00	268,458	2,889,658	1,115	12,000	-	-	1,115	12,000	268,458	2,889,658	37,161	400,000	-	-	46,452	500,000	277,748	2,989,658	9,290	100,000
	604.40	1,493.50	494,854	5,326,563	32,916	354,307	11,334	122,000	72,186	777,000	534,123	5,749,256	89,370	961,972	56,080	603,635	332,036	3,574,010	776,790	8,361,294	242,666	2,612,038
CANG EA *	44.52	110.00	20,717	223,000	232	2,500	74	800	5,946	64,000	26,431	284,500	-	-	-	-	-	-	26,431	284,500	-	-

* Preapproved pursuant to the CANG EA Master Plan not included in totals

9.1.3 Alternative 3

Based on the ideas of Traditional Neighborhood Design, Alternative 3 would create a new mixed-use development within the NASA Research Park area. Alternative 3 proposes the addition of approximately 280,000 square meters (3 million square feet) of new educational, office, research and development, museum, conference center, housing and retail development, the demolition of approximately 52,000 square meters (560,000 square feet) of non-historic structures, and the renovation of approximately 46,000 square meters (500,000 square feet) of existing space. Alternative 3 does not propose any new construction in the Bay View or Eastside/Airfield areas, although Hangars 2 and 3 in the latter area would be renovated for low-intensity research and development or light industrial uses. The total build out under this alternative would be approximately 770,000 square meters (8.2 million square feet). Figure 14 is the proposed land-use plan for this alternative and Table 10 provides details related to specific parcels.

9.1.4 Alternative 4

Alternative 4 would concentrate more of the new development in the Bay View area than would the other alternatives, while creating less dense development in the NRP area. Alternative 4 proposes the addition of approximately 145,000 square meters (1.6 million square feet) of new educational, office, research and development, museum, conference center, housing and retail space in the NRP area, as well as the demolition of approximately 52,000 square meters (560,000 square feet) of non-historic structures and the renovation of approximately 46,000 square meters (500,000 square feet) of existing space. Alternative 4 also proposes approximately 251,000 square meters (2.7 million square feet) of new office, research and development, laboratory, educational, and student/faculty housing development in the Bay View area. In the Eastside/Airfield area, Alternative 4 proposes approximately 62,000 square meters (670,000 square feet) of new light industrial, research and development, office and educational facility development, as well as the renovation of the historic hangars. The total build out under Alternative 4 would be approximately 938,000 square meters (10.1 million square feet). Figure 15 is the proposed land-use plan for this alternative and Table 11 provides details related to specific parcels.

9.2 Discussion

In general, the types of impacts expected to occur under Alternatives 1-4 are similar to those identified for the proposed action, Alternative 5. They typically vary only in the level of impact. Consequently, the impacts for the alternate actions are only described qualitatively, in comparison to the impacts for the proposed action.

9.2.1 Alternative 1

Alternative 1 proposes no new development above baseline conditions. No additional impacts beyond those described in Section 9.1 would occur.

9.2.2. Alternative 2

Alternative 2 proposes development in the NRP, Eastside/Airfield, Ames Campus and Bay View areas. The impacts of Alternative 2 would be similar to those of the proposed action, Alternative 5. However, the severity of the impacts would be greater because Alternative 2 proposes more development in Bay View, providing less buffer for sensitive habitats and wetlands. Moreover, unlike Alternative 5, Alternative 2 could impact a small amount of wetlands (0.12 hectares, 0.3 acres) that occur in Bay View.

9.2.3 Alternative 3

Alternative 3 proposes new development in the NRP and Eastside/Airfield areas only. This alternative has the least potential to affect threatened or endangered species because all development would occur in the NRP and Eastside/Airfield areas, far from sensitive habitats in the North of Bay View area. Increased predation resulting from an increase in people at ARC could still occur. However, the population increase under this alternative is less than that proposed under Alternatives 2 and4, , so the intensity of this impact would also be less.

9.2.4 Alternative 4

Alternative 4 proposes development in the NRP, Eastside/Airfield, and Bay View areas. Impacts under this alternative would be similar to those of Alternative 5, but their intensity would be greater due to increased development in Bay View. Specifically, the burrowing owl preserve

proposed in Alternative 5 is not included in this alternative. Without this preserve, the wetlands in the North of Bay View area would not be buffered from the impacts of development, including light, glare, and runoff. In addition, with more people present in Bay View, the predation would likely be greatest under this alternative. Finally, Alternative 4 could impact a small amount of jurisdictional wetlands in the Bay View (0.73 hectares, 1.81 acres).

10 CONCLUSIONS AND DETERMINATION

Potential impacts to salt marsh harvest mouse, California clapper rail, California least tern, western snowy plover, and California brown pelican resulting from implementation of the NADP were evaluated in this BA. These include impacts from noise, construction vehicles, runoff during and after construction, invasive plant species, predation, and lighting.

Noise from construction is expected to be much lower than existing sources of noise and far enough away that impacts to threatened or endangered species, such as the California clapper rail, are not expected. Construction vehicle traffic poses some, albeit very low, risks to salt marsh harvest mice. With this low risk and implementation of the proposed mitigation measures, including vehicle routing, fencing, and driver education, construction traffic is not expected to have a substantial impact on salt marsh harvest mice or any other threatened or endangered species considered in this BA. Runoff from construction sites and impervious surfaces is not expected to result in significant impacts to threatened and endangered species, because a 100-foot buffer around sensitive habitats would be established and Best Management Practices implemented. Minimal impacts potentially resulting from increased presence of invasive plant species would be further reduced by use of native plant species and weed-free soil and by field surveys. Without mitigation, increased predation resulting from more feeding stations could impact all of the species considered in this BA, except California brown pelicans. However, augmentation of the existing predator control program, and implemention of strict “no feeding’ and “no pets” policies are expected to prevent this from occurring. Lighting is not expected to negatively influence threatened or endangered species considered in this BA.

In conclusion, based on the impact analysis and proposed mitigation measures presented herein, NASA has determined that implementation of the NADP is *not likely to adversely affect* any threatened or endangered species, including salt marsh harvest mouse, California clapper rail, California least tern, western snowy plover, and California brown pelican.

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12 LIST OF PREPARERS

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WETLAND DELINEATION

Delineation of Waters of the United States for Moffett Field, California

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Preliminary Delineation of Waters of the United States for Moffett Field, California

INTRODUCTION

This report presents the results of a delineation of waters of the United States, including wetlands, for Moffett Field, in Santa Clara County, California. The delineated features are subject to federal jurisdiction and regulation under Section 404 of the Clean Water Act. The results of this delineation are preliminary pending verification by the U.S. Army Corps of Engineers (Corps).

PROJECT LOCATION AND DESCRIPTION

Moffett Field is located on the southwest shoreline of San Francisco Bay in an unincorporated area of Santa Clara County (Figures 1 and 2). Moffett Field encompasses approximately 2,250 acres and is bordered by salt ponds and San Francisco Bay to the northeast. The city of Mountain View is on the western and southern boundaries of Moffett Field; the city of Sunnyvale is adjacent to the eastern and southern boundaries (Figure 3).

NASA Ames is proposing to construct office, laboratory, and educational facilities on Moffett Field and has established four planning areas within the site: Bay View, East Side Airfield, NASA Research Park, and ARC Facilities (Figure 4). The NASA Ames Development Plan is currently in preparation and should be finalized in 2001. It will prescribe the square footage of office, education, research and development, and laboratory space to be constructed or renovated in each planning area. Actual building footprints and plans will be developed based on the distribution of sensitive resources and receptors in each planning area, including wetland resources identified through the wetland delineation process. An environmental impact statement (EIS) evaluating the likely environmental effects of proposed development is slated for completion in 2001.

The northern limits of this delineation extend 300 feet north of the proposed Bay View development area and follow the northern boundary of the East Side Airfield planning area. Southern, eastern, and western limits of the delineation follow the outer boundaries of the ARC Facilities, NASA Research Park, and East Side Airfield planning areas. The golf course and Air National Guard Master Plan Area were not included in this survey (Figures 5 and 6).

Site Description

Topographic relief in the study area is approximately 35 feet; the study area appears generally flat and slopes slightly toward the Bay. Seasonal freshwater, brackish, and saltwater marshes occur near the northeastern boundary of the study area. Upland areas are dominated by non-native grasslands or invasive weeds, with one stand of coyote brush (*Baccharis pilularis*) along the western boundary of the study area.

Most of the land in the study area has been disturbed in the past. The site has been removed from tidal action because of diking and creation of salt evaporation ponds. Much of the area in and north of the Bay View planning area was previously disked, plowed, and planted with crops. This type of farming continued until the mid-1980s, after which the fields were left fallow (Alderete pers. comm.). In the East Side Airfield planning area, wetlands occur locally in the open space between runways. However, storm drains have been installed in some places to prevent flooding of the airfield. Where drains are present, they prevent the collection of standing water necessary for the formation of seasonal wetlands.

Habitats and Vegetation

Bay View Planning Area

The Bay View planning area is in the northwestern portion of Moffett Field. It is less developed than other parts of Moffett Field, and as a result it supports more native habitat types. However, although the habitats in the Bay View area appear more natural than those in other parts of the site, the area has been disturbed by farming practices and hydrologic alterations. The construction of salt ponds, stormwater retention ponds, and levees and dikes has caused permanent disturbance to this area.

Vegetation. Habitats in the Bay View planning area include: seasonal salt marsh and transition, coyote brush scrub, non-native grassland, weed-dominated areas, disturbed areas, and urban landscaped areas.

Seasonal Salt Marsh and Transition. Seasonal salt marsh is found in the wetlands north of the Bay View planning area and along the border between these wetlands and the Bay View area; only a very small extent of seasonal salt marsh and transitional habitat is actually within the Bay View planning area. Seasonal salt marsh occurs on the uppermost edges of coastal salt marsh habitats and includes vegetation that is transitional between the salt marsh and adjacent uplands or structural elements (e.g., roads, levees, dikes). At lower elevations, seasonal salt marsh is dominated by pickleweed (*Salicornia virginica*), alkali heath (*Frankenia salina*), and salt grass (*Distichlis spicata*) (Science Applications International Corporation 1999). Black mustard (*Brassica nigra*) and Australian saltbush (*Atriplex semibaccata*) are present along berms and in other elevated areas. In some areas, perennial pepperweed (*Lepidium latifolium*) may exceed 50% cover (Science

Applications International Corporation 1999). Its presence indicates the displacement of native plant species and reduction in habitat value for wildlife.

Coyote Brush Scrub. On Moffett Field, areas of coyote brush scrub include regions that have been disturbed in the past or have been subjected to repeated disturbances over time. In the Bay View area, this habitat type occurs on the western boundary of Moffett Field, along West Perimeter Road.

In coastal areas, coyote brush is often one of the first native shrub species to colonize disturbed upland areas and sometimes forms dense stands. Dense stands of coyote brush are categorized as coyote brush scrub. The overstory of coyote brush scrub is dominated by coyote brush. The species composition of the herbaceous plants in the understory is similar to that of adjacent habitats (non-native grassland or weed-dominated areas). On Moffett Field, other shrub and tree species were observed in some stands of coyote brush scrub, including the native elderberry (*Sambucus mexicana*), non-native ornamental olive (*Olea* spp.), and acacia (*Acacia* spp.).

Non-Native Grassland. A large portion of the Bay View area along the west boundary of Moffett Field (West Perimeter Road) is non-native grassland habitat. Areas classified as non-native grasslands are dominated by non-native grasses, including annual Mediterranean grasses such as Mediterranean rye (*Lolium multiflorum*), wild oats (*Avena* spp.), bromes (*Bromus* spp.), and rattail fescue (*Vulpia myuros*). Another common species, creeping red fescue (*Festuca rubra*), is a non-native perennial grass. Non-native herbaceous species contribute less than 20% of vegetation cover in non-native grasslands; they include bristly ox-tongue (*Picris echioides*), birdsfoot trefoil (*Lotus corniculatus*), field bindweed (*Convolvulus arvensis*), and milk thistle (*Silybum marianum*) (Science Applications International Corporation 1999).

Weed-Dominated Areas. Weed-dominated habitats of the Bay View area occur along roadsides and in open spaces between developed parcels and may occur as patches enclosed by other habitat types. Some weed-dominated habitats in the Bay View area include areas where moist soil supports a diversity of non-native weedy species. In some locations, large stands of invasive exotic species such as kikuyu grass (*Pennisetum clandestinum*), periwinkle (*Vinca major*), and are present. Kikuyu grass is abundant on berms and roadsides adjacent to coastal salt marsh and freshwater and brackish marsh habitats. The presence of these species is notable because they are all highly invasive and have the potential to displace more desirable vegetation. If not controlled, these invasive species will continue to spread into surrounding habitats.

Disturbed Areas. Disturbed areas are limited to a few undeveloped regions between buildings and along roadsides in the Bay View planning area. Disturbed areas may exhibit altered topography resulting from past or present fill or excavation and are commonly covered with debris. These areas are significantly altered from their original habitat type; in many cases, they are almost bare or are dominated by ruderal species. Weedy species that may be found in this habitat type include the invasive exotic perennial pepperweed and purple loosestrife (*Lythrum salicaria*).

Other Habitat Types. Urban landscaping is planted around the buildings in this area, and includes hackberry tree (*Celtis sinensis*), Brazilian pepper tree (*Schinus terebinthifolius*), and English yew (*Taxus baccata*).

Areas of open water are intermittently present in the Bay View area. Depending on the amount of rainfall in a given year, the diked east and west marshes may fill with water. Only a very small portion of this habitat is within the Bay View planning area; the majority of the open water habitat is located in the wetlands north of the planning area.

East Side Airfield Planning Area

The majority of the East Side Airfield planning area is occupied by the airfield itself and by hangars and support buildings. Other land uses in the area include extensive office building development and the golf course.

Vegetation. Habitats in the East Side Airfield planning area include: seasonal wetland, seasonal salt marsh, non-native grassland, weed-dominated areas, and disturbed areas.

Seasonal Wetland. The seasonal wetlands in the East Side Airfield planning area are located on the airfield itself and in several ditches on and adjacent to the golf course. Because of their low elevation and proximity to salt water, these wetlands may be slightly brackish or alkaline. Vegetation in this habitat type is a mosaic of large patches of Baltic rush (*Juncus balticus*), creeping wild rye (*Leymus triticoides*), and cattails (*Typha* spp.) (Science Applications International Corporation 1999). Other species include spearscale (*Atriplex triangularis*), salt grass, clustered field sedge (*Carex praegracilis*), and non-native perennial pepperweed.

Seasonal Salt Marsh. In the East Side Airfield planning area, seasonal salt marsh habitats occur in ditches constructed along East Patrol Road and North Patrol Road adjacent to the golf course. The ditches represent a unique habitat because their steep banks and the long-term availability of water support the development of several narrow, linear vegetation zones adjacent to one another.

The ditch along North Patrol Road has steep banks, and wetland vegetation is limited to the lower portions of the banks, immediately above the water line. The dominant plant species in the wetland portions of the North Patrol Road ditch include pickleweed, salt grass, and prairie bulrush (*Scirpus maritimus*); adjacent uplands support the non-native herbaceous species birdsfoot trefoil and yellow sweet clover (*Melilotus inducus*) and the non-native grasses rattail fescue and Mediterranean canary grass (*Phalaris minor*). Cattails and bulrushes (*Scirpus* spp.) form patches of emergent vegetation.

The ditch along the East Patrol Road is slightly wider and has more gently sloping banks than the North Patrol Road ditch. The East Patrol Road ditch supports much less vegetation than the North Patrol Road ditch, and is dominated by non-native dallis grass (*Paspalum dilatatum*) and leaf litter, with a few stands of prairie bulrush (Science Applications International Corporation 1999).

Other Habitat Types. Non-native grasslands, weed-dominated areas, and disturbed areas are also present in the East Side Airfield planning area. They occur between developed parcels, along roads, and in open fields.

Wetland Habitats North of Bay View Planning Area (Outside the Planning Areas)

Immediately north of the Bay View planning area is a tract of high-quality wetland habitat that is rich in vegetation and wildlife. This region, referred to as the North of Bay View area, is within the larger Moffett Field study area but has been excluded from the proposed action area because of the special-status species it supports or may support.

The North of Bay View wetland area contains the most diverse and least disturbed habitats on Moffett Field, including: coastal salt marsh, seasonal salt marsh and transition, freshwater and brackish marshes, coyote brush scrub, unvegetated areas (including open water), and disturbed areas. Habitat suitable for many special-status plants and wildlife may occur in the North of Bay View area.

DELINEATION METHODS

The methods used to delineate wetlands and other waters of the United States in the study area are described below. Many terms used throughout this report have specific meanings related to the wetland delineation process. These terms are defined, based on the Corps' 1987 delineation manual (Environmental Laboratory 1987), in the glossary at the end of this report.

Pre-Field Investigation

Before conducting the field delineation survey, a Jones & Stokes wetland ecologist reviewed the soil survey of the Santa Clara County area (U.S. Soil Conservation Service 1958) to identify the soil types found in the project area as well as their drainage class. Five soil types were identified in the project area: Alviso clay, Sunnyvale silty clay (drained), Bayshore clay loam, Kitchen middens, and Pacheco loams (clay substrate) (Figures 7, 8; Appendix A). The Santa Clara County hydric soils list (U.S. Department of Agriculture 1992) was also reviewed to determine whether any mapping units on the sites are listed as hydric. Two of the mapping units were included on the County hydric soils list: Alviso clay (An) and Sunnyvale silty clay (drained) (Sv).

Jurisdictional Wetland Delineation

Wetlands that are potentially subject to Corps jurisdiction under Section 404 of the Clean Water Act were delineated using the U.S. Army Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987). The manual provides technical guidelines and methods for

determining the boundaries of jurisdictional wetlands. This manual requires that an area have positive indicators of hydrophytic vegetation, hydric soils, and wetland hydrology to be considered a wetland.

The site was visited on September 27 and 28, 2000, by Jones & Stokes botanists. Standard wetland determination forms were completed for wetland and adjacent upland data points at 15 sample sites (Appendix B) and are cross-referenced with their respective locations in Figures 5 and 6. The dominant and subdominant plant species were recorded at each sample site, and the wetland indicator status was determined for each species (Reed 1988). Soil pits were excavated, and the hydrology of the sample site was evaluated. Potential wetland areas were mapped on a color aerial photograph at a scale of approximately 1 inch to 315 feet. The approximate square footage within the study area for each feature was determined by pacing the length and width in the field and drawing the wetland shape or ordinary high-water mark onto the aerial photograph. The polygons were mapped digitally into ArcView 3.1, and acreages were calculated within this GIS software. Wetlands were categorized by type using the U.S. Fish and Wildlife Service (USFWS) system (U.S. Fish and Wildlife Service 1999).

METHODS USED TO EVALUATE VEGETATION, SOILS, AND HYDROLOGY

Delineation of Jurisdictional Wetlands

Hydrophytic Vegetation Evaluation

To determine whether a site is dominated by hydrophytic vegetation, dominant and subdominant plant species present at each sample site are recorded, and the wetland indicator status (Reed 1988) is designated for the dominant species.

Hydric Soil Evaluations

Soils at sample points are evaluated for their color, including hue, value, and chroma. The hue notation of a color indicates its relation to red, yellow, green, blue, and purple; the value notation indicates its lightness; and the chroma notation indicates its strength (or departure from a neutral of the same lightness) (Macbeth Division of Kollmorgen Instruments Corp 1994). The soils in the project area had almost uniformly low chroma colors, most likely because they historically have been within the tidal zone. Therefore, because color alone would not reliably distinguish the currently hydric soils from non-hydric soils, evaluation of this wetland indicator was de-emphasized in relation to the vegetation and hydrology indicators.

Wetland Hydrology Evaluations

Potential wetland sites are evaluated to determine whether the site is/was periodically inundated or saturated to the surface for a long duration (at least 14 days) during the growing season. In general, wetland hydrology is determined to be present if a site has one or more of the following characteristics:

- landscape position and surface topography conducive to ponding water (i.e., position within a surface depression lower than an upslope water source),
- residual evidence of ponding or flooding (i.e., scour marks or water fluctuation lines),
- algal mats and sediment deposits, or
- observed flooding during the growing season.

The soils in potential jurisdictional wetlands were also evaluated according to U.S. Soil Conservation Service criteria (U.S. Soil Conservation Service 1991). Criterion number 4 identifies hydric soils as those that flood frequently for long durations during the growing season. This criterion is also used in the Santa Clara County area hydric soil list to identify potential hydric soils where frequent flooding for long duration occurs (U.S. Soil Conservation Service 1958). Observations by the onsite resource ecologist were used to determine the typical period of inundation for areas at Moffett Field (Alderete pers. comm.).

Delineation of Other Waters of the United States

Boundaries of other waters of the United States were based on the limits of jurisdiction defined in federal regulations (33CFR 328), which include the ordinary high-water mark. Ordinary high-water marks for drainages correspond with the scour lines, which define the bed and bank portion of the channel that floods under normal conditions. Waters of the United States occurring on the sites that did not qualify as jurisdictional wetlands were delineated based on their ordinary high-water marks and mapped onto an aerial photograph (1 inch = 315 feet).

LIMITATIONS OF SURVEY METHODS

Following are summaries of limitations in the methods used in this survey.

(1) Limitations related to timing of the survey.

- Some of the species that could occur on this site may not be visible at the time the survey was performed (late September). Many plants flower in the spring and summer months; perennial plants usually maintain vegetation that is visible

throughout the year, but annuals senesce following seed production. Because it can be difficult to identify plants after diagnostic characteristics are dried and/or lost, it is possible that some annuals that occur on the project site were not identifiable at the time of this survey.

- At the time of the survey, most of the likely wetlands in the study area were dry. Because standing water and/or wet conditions were not present in most areas, it was necessary to infer wetland hydrology based on location and topography in relation to adjacent areas.

(2) Difficulty of identifying wetland boundaries and delineating wetlands in areas where hydrology has been altered by human intervention.

Some plant species that do not normally occur in a particular area may be represented in a bank of dormant seeds in the soil. Seeds of facultative or obligate wetland species can be transported from adjacent wetland habitats by wind or animals and may remain in the seed bank for years. In most years and under most conditions, these seeds will not germinate, or will germinate in low numbers. However, abnormally wet growing conditions may cause these wetland species to germinate.

In the Bay View planning area, abnormally wet growing conditions may result from activities such as pumping water from the settling basin into adjacent regions. The result is a "problem area" where wetlands do not always exhibit all of the criteria for the identification of jurisdictional wetlands, and wetland plant species may be found in locations that do not meet other criteria for the identification of jurisdictional wetlands. In addition, the temporary pumping of water from the settling basin into adjacent regions may have led to ponding in topographic depressions that do not normally exhibit wetland indicators; some areas exhibited wetland hydrology, but were found to support species that may be found in both wetland and upland areas. The similarity of the soil color throughout the site, in combination with the absence or alteration of wetland hydrology (see next paragraph), made determinations problematic in these areas.

(3) Changing conditions in the study area. In some cases, criteria used to identify a wetland may be present but may not reflect existing (present-day) conditions. Many of the areas examined at Moffett Field support wetland plant species or show indicators of wetland hydrology and/or hydric soils. However, in many cases, soil color and populations of wetland plant species were found to be the same between wetlands and non-wetlands sites. In addition, much of the soil at Moffett Field consists of historic Bay mud, which commonly exhibits a low chroma color when examined with standard soil color identification techniques. However, because of diking, farming, and other changes in land use at Moffett Field, many areas located on low-chroma Bay mud soils are no longer inundated for long enough periods to qualify as jurisdictional wetlands. This circumstance forced the delineators to give less weight to soil color when determining the boundaries of the wetlands.

DELINEATION RESULTS

Fieldwork was conducted on September 27 and 28, 2000. At that time, water from a settling basin located directly north of the Outdoor Aerodynamic Research Facility (OARF) was being pumped into adjacent areas, causing some flooding. The flooded areas were considered problem areas in this delineation because the ponded water and facultative hydrophytic plants may not be present under normal circumstances.

Sites qualifying as waters of the United States as defined in the 1987 Corps manual are described below, and include seasonal wetlands as well as other waters of the United

RATIONALE FOR BOUNDARY DETERMINATION

The jurisdictional boundaries of the seasonal wetlands were delineated based on the topography, prevalence of hydrophytic vegetation, and presence of wetland hydrologic indicators. Soils for both the Bay View and East Side Airfield planning areas were characterized, but because of the uniformity of color among the soils on site, this parameter was de-emphasized in determining the boundaries for wetlands (see *Limitations of Survey Methods* above). Wetland hydrology was inferred based on topographical relationships to adjacent areas and local knowledge of the on-site resource ecologist. Hydrophytic plant species were considered indicative of wet conditions. A site qualified as a wetland based on the presence of all three indicators: hydrophytic plants, wetland hydrology, and hydric soils. These seasonal wetlands qualify as jurisdictional wetlands and are subject to regulation under Section 404 of the Clean Water Act (CWA).

JURISDICTIONAL WETLANDS

The study area supports a total of approximately 42.4 acres of seasonal wetlands. Table 1 describes the features identified within the study area that are considered wetlands potentially regulated by the Corps.

The wetlands in the Bay View and north of Bay View areas are contiguous, but listed separately by acreage in this section. The planning area designation is important, because potential direct impacts to wetlands should be considered only for the areas delineated in the Bay View planning area. Indirect impacts from construction in the Bay View area should be considered for wetlands delineated in the North of Bay View area.

Table 1. Descriptions of Wetlands at Moffett Field

Planning Area	Wetlands
Bay View	Approximately 5.3 acres of seasonally inundated wetlands are located within the Bay View planning area in the northwest portion of Moffett Field (see data forms 1–13). Two types of wetlands occur in the Bay View planning area: PEMCh (Palustrine, emergent, seasonally flooded, diked) and PEMYKh (Palustrine, emergent, saturated/semipermanent; seasonal, artificially flooded, diked) (Figures 5 and 6) (classification of U.S. Fish and Wildlife Service 1999).
North of Bay View	Approximately 16.8 acres of seasonally inundated wetlands are located north of the Bay View planning area (see data forms 1–13). The same two types of wetlands that occur the Bay View planning area are also found in the area north of Bay View: PEMCh (Palustrine, emergent, seasonally flooded, diked) and PEMYKh (Palustrine, emergent, saturated/semipermanent; seasonal, artificially flooded, diked) (Figures 5 and 6) (classification of U.S. Fish and Wildlife Service 1999).
East Side Airfield	Approximately 20.3 acres of seasonal wetlands are located in the northern sections of the airfield (see data forms 14–15). Three types of wetlands occur in this area: PEMA (palustrine, emergent, temporarily flooded); PEMWr (Palustrine, emergent, intermittently flooded/temporary, artificial substrate) (classification of U.S. Fish and Wildlife Service 1999); and wetland mosaic (Smith pers. comm.). (*Wetland mosaic* describes a condition in which the distribution of wetland and upland habitat characteristics within a defined patch is too intricate to be mapped.)

Vegetation

Seasonal wetlands in the study area are characterized by a prevalence of hydrophytic vegetation. Vegetation in the Bay View planning area is dominated by herbaceous species,[1] including bristly ox-tongue (FACU), (FACW+), birdsfoot trefoil (FAC), and Mediterranean rye (*) with small inclusions dominated by curly dock (*Rumex crispus*) (FACW-), and Baltic rush (FACW+). More saline seasonal wetlands contained pickleweed (OBL), alkali heath (FACW+), salt grass (FACW), and/or salt heliotrope (*Heliotropum curassavicum*) (OBL).

[1] Plant Indicator Status Categories:

obligate (OBL)—almost always occurs in wetlands (99% probability);
facultative wetland (FACW)—usually occurs in wetlands (67–99% probability);
facultative (FAC)—equally likely to occur in wetlands or nonwetlands (34–66% probability of occurrence in wetlands);
facultative upland (FACU)—usually occurs in nonwetlands, but occasionally occurs in wetlands (1–33% probability);
obligate upland (UPL)—almost never occurs in wetlands (1% probability);
no indicator (NI)—no indicator status assigned because information is lacking;
+ or - associated with wetland indicator status specifies whether the plant is at the higher (+) or lower (-) range for that particular indicator; and
(*)—species is not listed in Reed (1988).

Vegetation in the East Side seasonal wetlands are dominated by salt grass, pickleweed, and alkali heath. Salt crusts and algae mats were prevalent in many of the scald areas within the seasonal wetlands.

Hydrology

Based on observed and inferred hydrologic indicators, seasonal wetlands in the Bay View and East Side Airfield planning areas would be flooded for a long duration during the growing season. Both areas occur within topographically low areas near San Francisco Bay and receive rainfall and runoff from adjacent upland areas. Wetland hydrology in the Bay View planning area was inferred based on topographic position and information from the on-site resource ecologist (Alderete pers. comm.). These wetlands normally hold water from rain events in the winter and spring months (December through April), with the lowest points of the depressions becoming dry in June or July.

Soils

Although five soil types occur at Moffett Field, the seasonal wetlands are located in only two, Alviso Clay, and Sunnyvale silty clay (drained). The presence of hydric soils was inferred based on U.S. Soil Conservation Service criterion number 4 (U.S. Soil Conservation Service 1991) and the Hydric Soils of Santa Clara County list (U.S. Department of Agriculture 1992) and are caused by frequent flooding for long durations during the growing season. Alviso Clay (An) and Sunnyvale silty clay (drained) (Sv) are both listed as hydric soils in Santa Clara County (U.S. Department of Agriculture 1992).

The seasonal wetland soil in both soil types had a low chroma matrix color (7.5 YR 3/1), which can be an indicator of hydric conditions.

OTHER WATERS OF THE UNITED STATES

Moffett Field supports approximately 8.6 acres of other waters of the United States, in the ditches along North and East Patrol Roads and on the golf course. These ditches are located as follows:

- between the golf course at Moffett Field and the salt marshes and ponds to the north (**Northern Channel** and **North Patrol Road ditch**),

- along the road that runs along the east boundary of Moffett Field (**East Patrol Road ditch**), and

- along a road that bisects the golf course (**Marriage Road ditch**).

The Northern Channel is 25 feet wide for most of its length along the north boundary of the study area. The North Patrol Road ditch, located immediately south of the Northern channel, is about 6 feet wide for its entire length along North Patrol Road. The East Patrol Road ditch tapers from 20 feet wide to 8 feet wide along its path down the eastern boundary of Moffett Field. The Marriage Road ditch is much narrower (approximately 5 feet wide for its entire length). All of the ditches are culverted under roadways (Figure 2).

All of these ditches normally contain water year-round. They have a normal high-water mark, and show linear gradations of vegetation from cattails (*Typha latifolia*) (OBL) and other emergent vegetation to upland non-native grasses and weeds. USFWS classification E1UBN (Estuarine, subtidal, unconsolidated bottom, regularly flooded) was used to describe the Northern Channel, and PEMJxr (Palustrine, emergent, intermittently flooded, excavated, artificial substrate) was used to describe the East Patrol Road, North Patrol Road, and Marriage Road ditches (U.S. Fish and Wildlife Service 1999).

CONCLUSION

A total of 51 acres of waters of the United States was delineated at the Moffett Field site, including 42.4 acres of seasonal wetland and 8.6 acres of other waters of the United States.

The above acreages are preliminary and subject to verification by the San Francisco District of the Corps.

Special Circumstances

After fieldwork, and during the preparation of the delineation report and figures, some fill was placed on the OARF by NASA maintenance staff. A previous delineation of waters of the United States verified by the Corps in 1986 did not identify any jurisdictional wetlands within the OARF area; NASA maintenance staff based their selection of the fill site on the 1986 delineation. However, this report has identified northern portions of the OARF as seasonal wetlands. The NASA resource ecologist knew that the jurisdictional status of this area was in question, and had the maintenance crew stop work immediately (Alderete pers. comm.). The area of potential seasonal wetlands affected by fill is approximately 150 square feet. NASA maintenance crews will remove the fill and allow the area to resume its seasonal wetland functions. No further restoration is recommended because the amount of disturbance is very small, the site is disturbed, and the dominant plant in the area, birdsfoot trefoil, should recolonize quickly.

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Glossary

The words and phrases below have specific meanings relating to the delineation of waters of the United States as required by Section 404 of the Clean Water Act (CWA).

Chroma. In soil science, chroma refers to the strength of a soils color (or its departure from a neutral of the same shade.

Dominant and Subdominant Plant Species. Dominance is a descriptor of vegetation that is related to the standing crop of a species in an area, usually measured by height, areal cover, or basal area (for tree). A dominant plant species exerts a controlling influence on or defines the character of a community. Measurements of percent areal cover are often used to determine a species' dominance (Environmental Laboratory 1987).

Frequently Flooded. A flooding class in which flooding is likely to occur often under normal weather conditions (i.e., more than 50% chance of flooding in any year or more than 50 times in 100 years) (Environmental Laboratory 1987).

Growing Season. Growing season is the portion of the year when soil temperatures at 19.7 inches below the soil surface are above biological zero (5ºC or 41º F). For ease of determination, this period can be determined by estimating the number of frost-free days in a year (Environmental Laboratory 1987).

Hue. In soil science, hue indicates a soil color's relation to red, yellow, or green, blue, or purple.

Hydric Soil. Hydric soil is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, July 13, 1994; Environmental Laboratory 1987; U.S. Department of Agriculture, Natural Resources Conservation Service, Wetland Science Institute and Soils Division December 1998).

Long Duration. Long duration is the period of inundation for a single event ranging from 7 days to 1 month (Environmental Laboratory 1987). "An area has wetland hydrology if it is inundated or saturated to the surface continuously for at least 5% of the growing season in most years (50% probability of recurrence)" (Environmental Laboratory 1987). The presence of water for a week or more during the growing season typically creates anaerobic conditions in the soil, and these conditions affect the types of plants that can grow and the types of soils that develop (Wetland Training Institute 1995).

Normal Condition–Frequency (Inundation or Soil Saturation). The normal condition is the periodicity of coverage of an area by surface water or soil saturation. It is usually expressed as the number of years (e.g., 50 years) the soil is inundated or saturated at least once each year during part of the growing season per 100 years or as a 1-, 2-, 5-year, etc., inundation frequency (Environmental Laboratory 1987).

Ordinary High-Water Mark. The term *ordinary high water mark* (OHWM) means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area (33 CFR 328.3[e]).

Problem Area. A wetland that is difficult to identify because it may lack indicators of wetland hydrology and/or hydric soils, or its dominant plant species are more common in nonwetlands.

Redoximorphic Features. Redoximorphic features are soil properties formed by oxidation, translocation, and/or reduction of iron and manganese oxides. Redoximorphic features indicate past or present prolonged soil saturation and were formerly known as mottles, concretions, soft masses, and low-chroma colors (Vepraskas 1992).

Value. In soil science, the value of a soil's color is indicated by its lightness.

Waters of the United States. The term *waters of the United States* means: (1) all waters thich are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide; (2) all interstate waters including interstate wetlands; (3) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters…; (4) all impoundments of waters otherwise defined as waters of the United States under the definition; (5) tributaries of waters identified in paragraphs (a)(1)-(4) of this section; (6) the territorial seas; and (7) wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a)(1)-(6) of this section (33 CFR 328.3). Waters of the United States are areas under federal jurisdiction pursuant to Section 404 of the CWA. For the purpose of this delineation report, waters of the United States are divided into wetlands and other waters of the United States.

Wetlands. Wetlands are "areas that are inundated or saturated by surface or groundwater 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 CFR 328.3[b], 40 CFR 230.3). To be considered subject to federal jurisdiction, a wetland must support hydrophytic vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987).

Wetland Hydrology. An area has wetland hydrology if it is inundated or saturated to the surface continuously for at least 5% of the growing season in most years (50% probability of

recurrence) (Environmental Laboratory 1987). Primary indicators of wetland hydrology may include drainage patterns, drift lines, sediment deposition, watermarks, drainage patterns within wetlands, stream gage data and flood predictions, historic records, visual observation of saturated soils, and visual observation of inundation. Secondary indicators of wetland hydrology may include presence of oxidized rhizospheres associated with living plant roots in the upper 12 inches of the soil, presence of water-stained leaves, local soil survey hydrology data for identified soils, and the FAC-neutral test of the vegetation.

Wetland Indicator Status. Wetland indicator status denotes the probability that a particular plant species is found in habitats qualifying as wetlands. Indicator status categories were originally developed and defined by the USFWS National Wetlands Inventory and subsequently modified by the National Plant List Panel (Reed 1988); Environmental Laboratory (1987)

Plant Indicator Status Categories:

- obligate (OBL)—almost always occurs in wetlands (99% probability);
- facultative wetland (FACW)—usually occurs in wetlands (67–99% probability);
- facultative (FAC)—equally likely to occur in wetlands or nonwetlands (34–66% probability of occurrence in wetlands);
- facultative upland (FACU)—usually occurs in nonwetlands, but occasionally occurs in wetlands (1–33% probability);
- obligate upland (UPL)—almost never occurs in wetlands (1% probability);
- no indicator (NI)—no indicator status assigned because information is lacking;
- + or - associated with wetland indicator status specifies whether the plant is at the higher (+) or lower (-) range for that particular indicator; and
- (*)—species is not listed in Reed 1988.

Wetland Plant Association. Any grouping of plant species that recurs wherever certain wetland conditions occur (Environmental Laboratory 1987).

Figure 1. Regional Context Map

Source: DCE

FIGURE 1

REGIONAL CONTEXT MAP

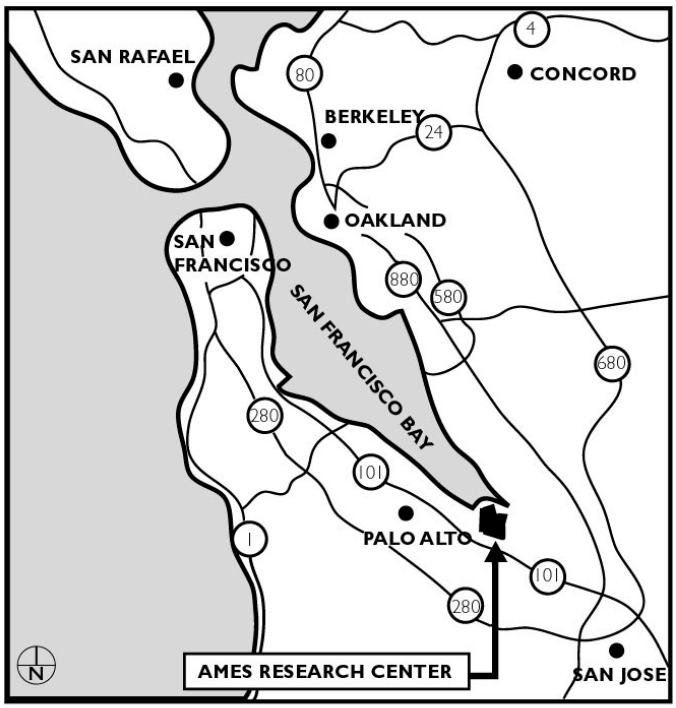


Figure 2. Portion of U.S. Geological Survey 7.5' Topographic Quadrangle Map for Moffett Field Study Area

ROAD CLASSIFICATION

Primary highway, hard surface ——— Light-duty road, hard or improved surface ———

Secondary highway, hard surface ——— Unimproved road ———

Interstate Route U. S. Route State Route

MOUNTAIN VIEW, CA

37122-D1-TF-024

1991

DMA 1558 I NE-SERIES V895

582 (85) (CUPERTINO) 1558 I SE 1 550 000 FEET 2' 30" 585

SCALE 1:24 000

0 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

Figure 3. Context Map

Source: DCE

LOCAL CONTEXT MAP

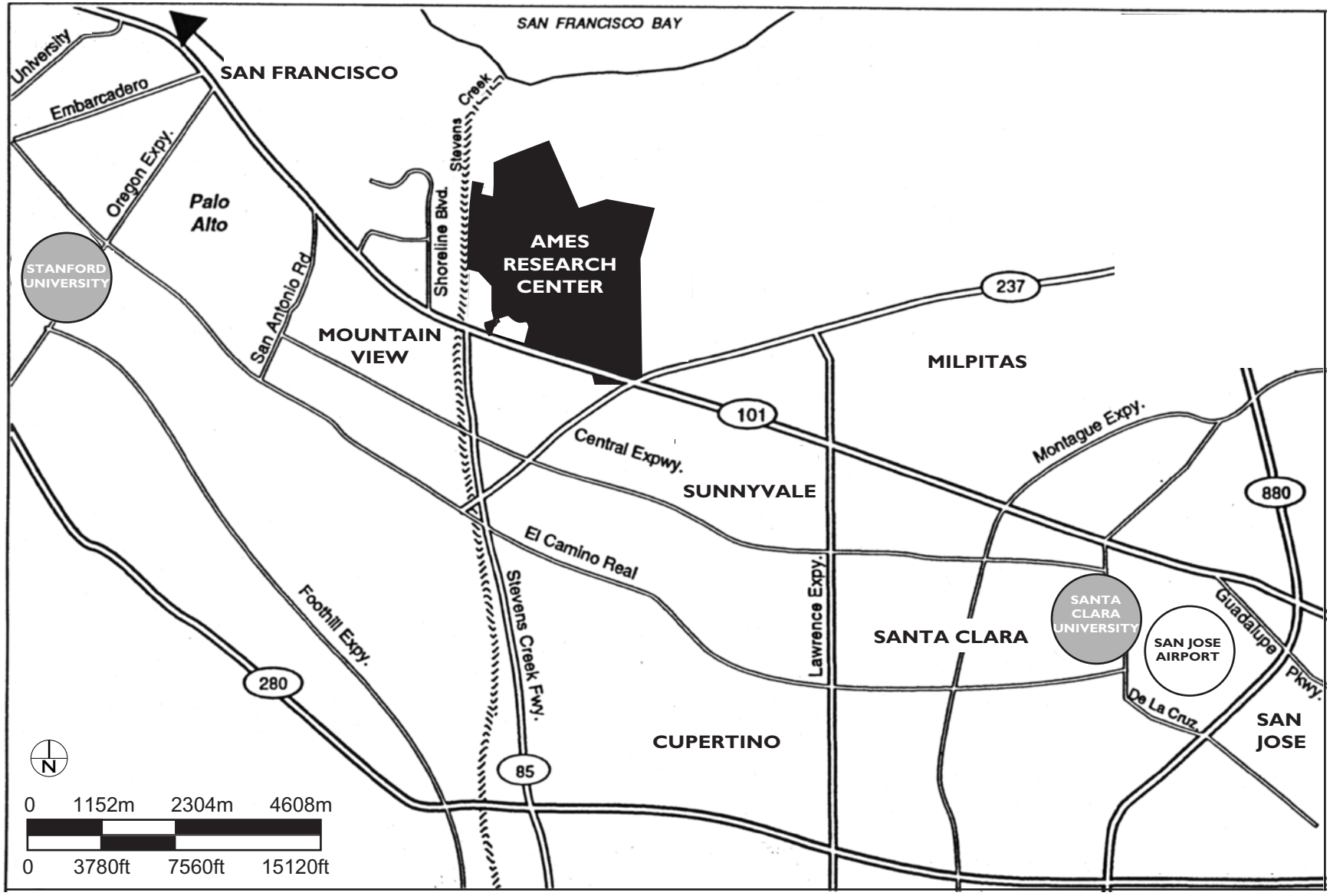
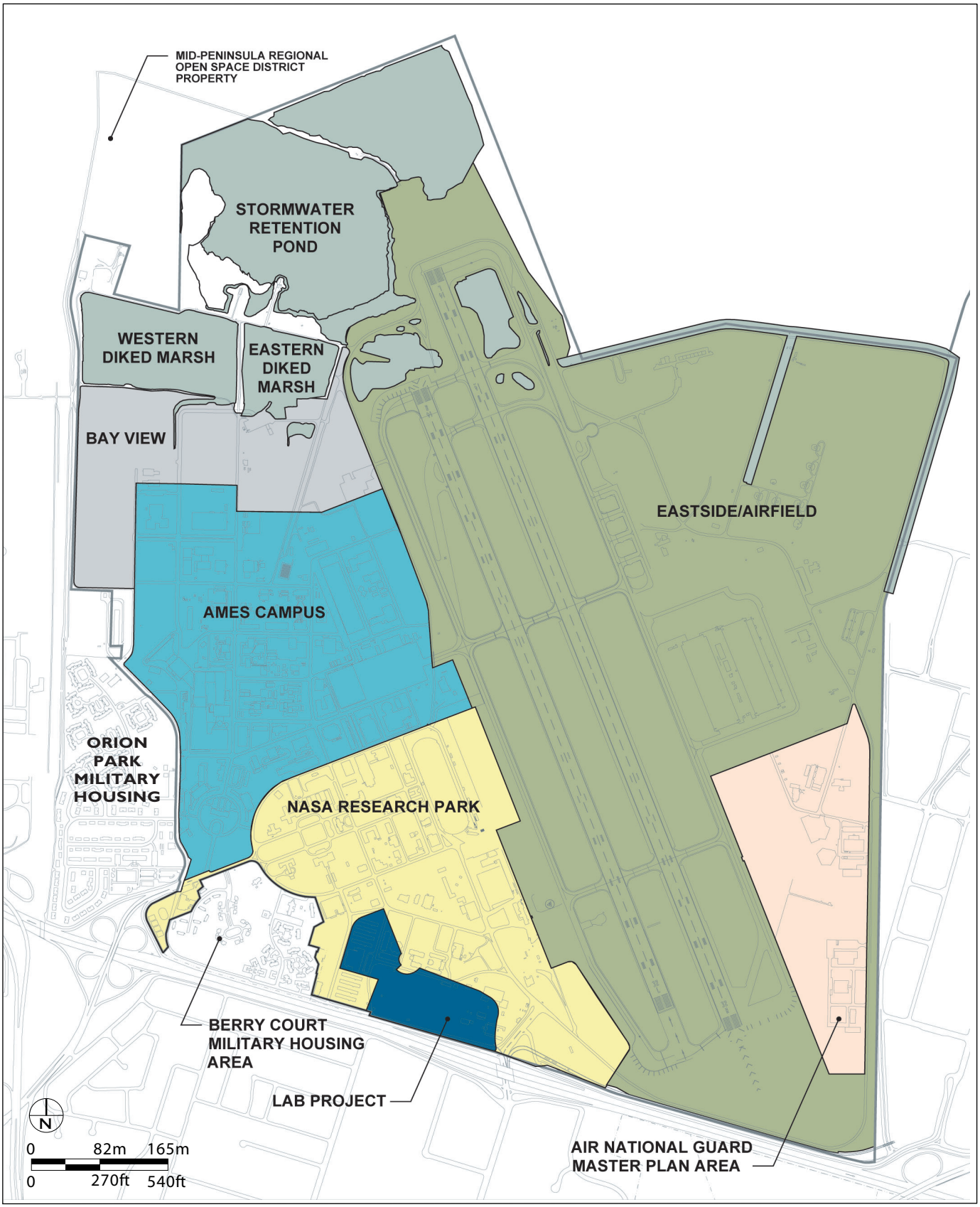


Figure 4. Proposed Development Areas

Source: DCE



This figure shows the Development Areas as of July 2002. Please see Figure 4A for an illustration of the Proposed Development Areas as submitted to the Corps in May 2001.

Figure 4

DEVELOPMENT AREAS

NASA AMES RESEARCH CENTER

NASA AMES DEVELOPMENT PLAN FINAL EIS

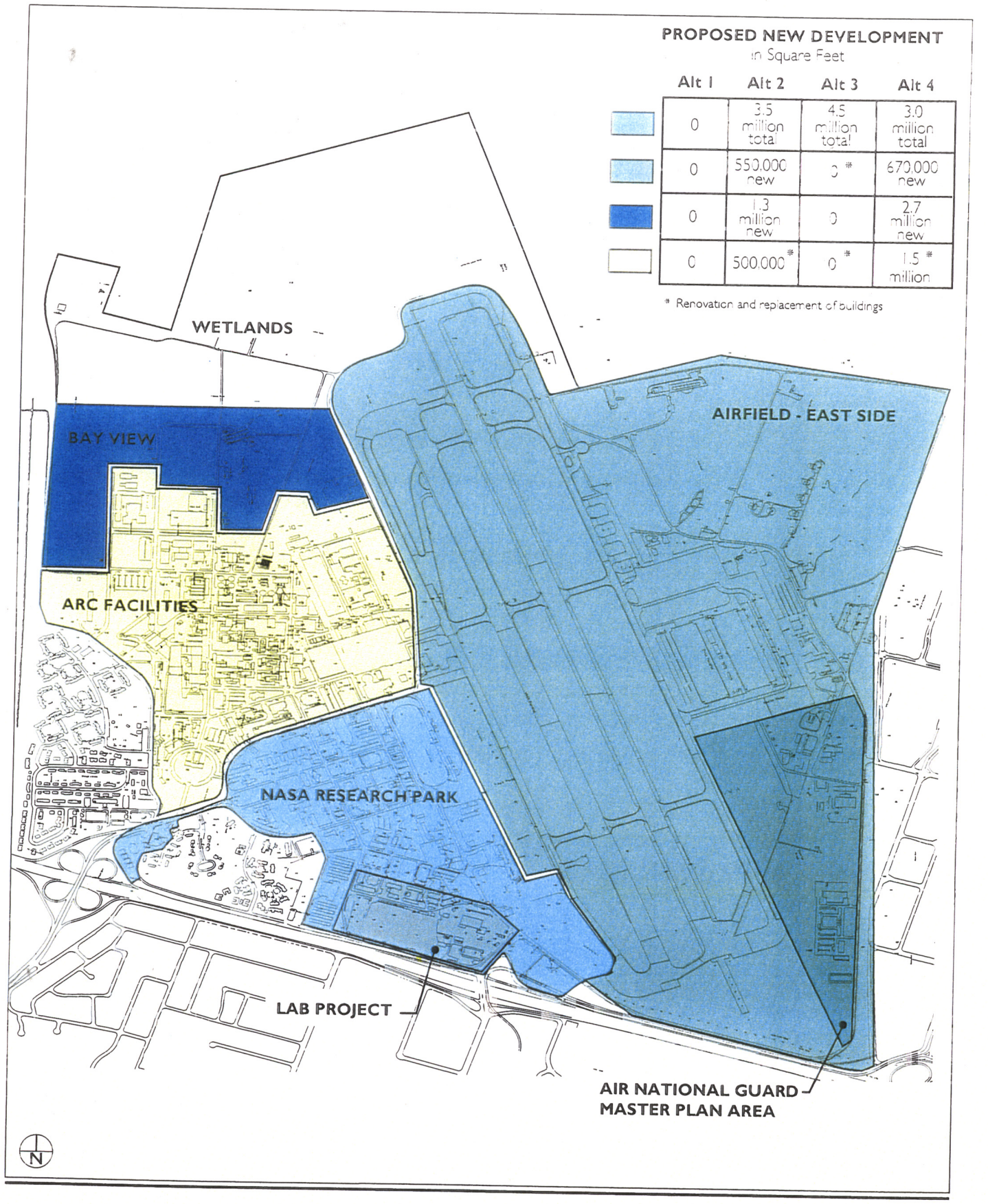


Figure 4A

PROPOSED DEVELOPMENT AREAS

Figures 5 and 6. Aerial Photographs


North Perimeter Road
West Perimeter Road
PEMCh
PEMYKh
Settling Tank
PEMA
PEMWr
PEMWr
PEMWr
PEMA
PEMA
WETLAND MOSAIC
Northern Channel, E1UBN
25'
6'
East Side Airfield
Planning Area
Bay View Planning Area
Arc Facilities
Planning Area
NASA Moffett Field Jurisdictional Delineation,
Moffett Field, Santa Clara County, California
U.S. Army Corps
of Engineers
San Francisco District
Regulatory Branch
Figure 5.
Mapped Wetlands for Moffett Field
Legend
Pumping Station
Storm Drain
Upland
Waters of the U.S.
Wetland
Culvert
Ditch
Sample Points
Not included in survey
Survey area boundary
Bay View planning area
Arc Facilities planning area
East Side Airfield planning area
Planning area boundaries are approximate
USFWS Wetland Classifications
PEMCh Palustrine, emergent, seasonally flooded, diked
PEMYKh Palustrine, emergent, saturated/semipermanent/seasonal, artificially flooded, diked
PEMWr Palustrine, emergent, intermittently flooded/temporary, artificial substrate
PEMA Palustrine, emergent, temporarily flooded
E1UBN Estuarine, subtidal, unconsolidated bottom, regularly flooded
PEMJxr Estuarine, emergent, intermittently flooded, excavated
N
250 0 250 500 750 Feet
1" = 200'
FILE NO: 25926S
DATE: March 9, 2001

PEMWr
PEMWr
PEMA
PEMA
WETLAND MOSAIC
PEMWr
Northern Channel, E1UBN
E1UBN
25'
6'
North Patrol Road
6'
25'
North Patrol Road Ditch, PEMJxr
Marriage Road
East Side Airfield
Planning Area
East Side Airfield
Planning Area
East Patrol Road Ditch, PEMJxr
East Patrol Road
Marriage Road Ditch, PEMJxr
6'
6'
15'
8'
20'

U.S. Army Corps of Engineers
San Francisco District
Regulatory Branch

NASA Moffett Field Jurisdictional Delineation, Moffett Field, Santa Clara County, California

Figure 6.

Mapped Wetlands for Moffett Field

Legend

- Pumping Station
- Storm Drain
- Upland
- Waters of the U.S.
- Wetland
- Culvert
- Ditch
- Sample Points
- Not included in survey
- Survey area boundary
- Bay View planning area
- Arc Facilities planning area
- East Side Airfield planning area

Planning area boundaries are approximate

USFWS Wetland Classifications

PEMCh	Palustrine, emergent, seasonally flooded, diked
PEMYKh	Palustrine, emergent, saturated/semipermanent/seasonal, artificially flooded, diked
PEMWr	Palustrine, emergent, intermittently flooded/temporary, artificial substrate
PEMA	Palustrine, emergent, temporarily flooded
E1UBN	Estuarine, subtidal, unconsolidated bottom, regularly flooded
PEMJxr	Estuarine, emergent, intermittently flooded, excavated

N

250 0 250 500 750 Feet

1" = 200'

FILE NO: 259268

DATE: March 9, 2001

Figures 7 and 8. Soil Maps for Study Area

Modified from: Soil Conservation Service (1958)

GUIDE TO MAPPING UNITS

Page numbers refer to descriptions of soil mapping units in Appendix A.

(Soil Conservation Service 1958)

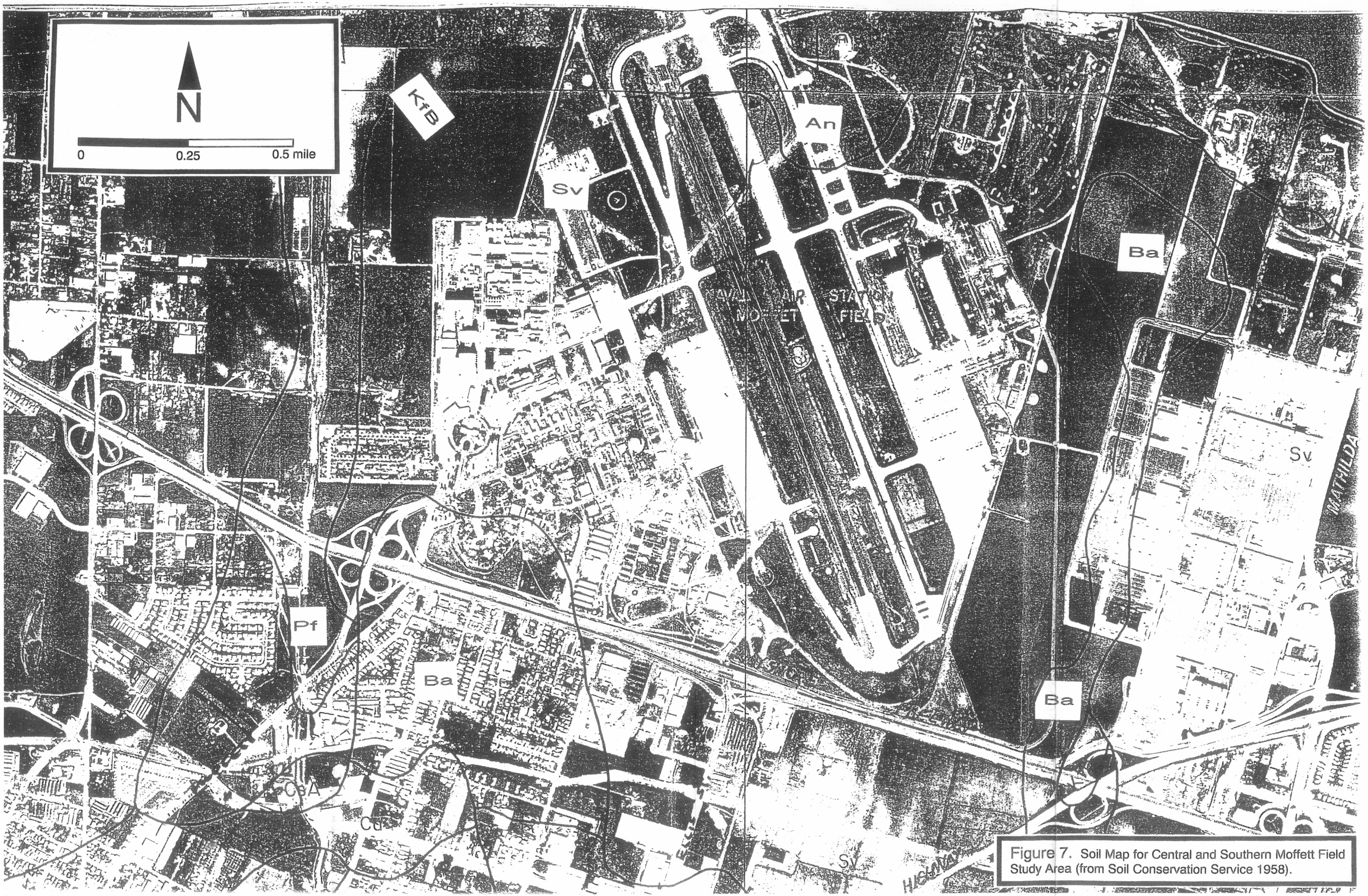


Figure 7. Soil Map for Central and Southern Moffett Field Study Area (from Soil Conservation Service 1958).

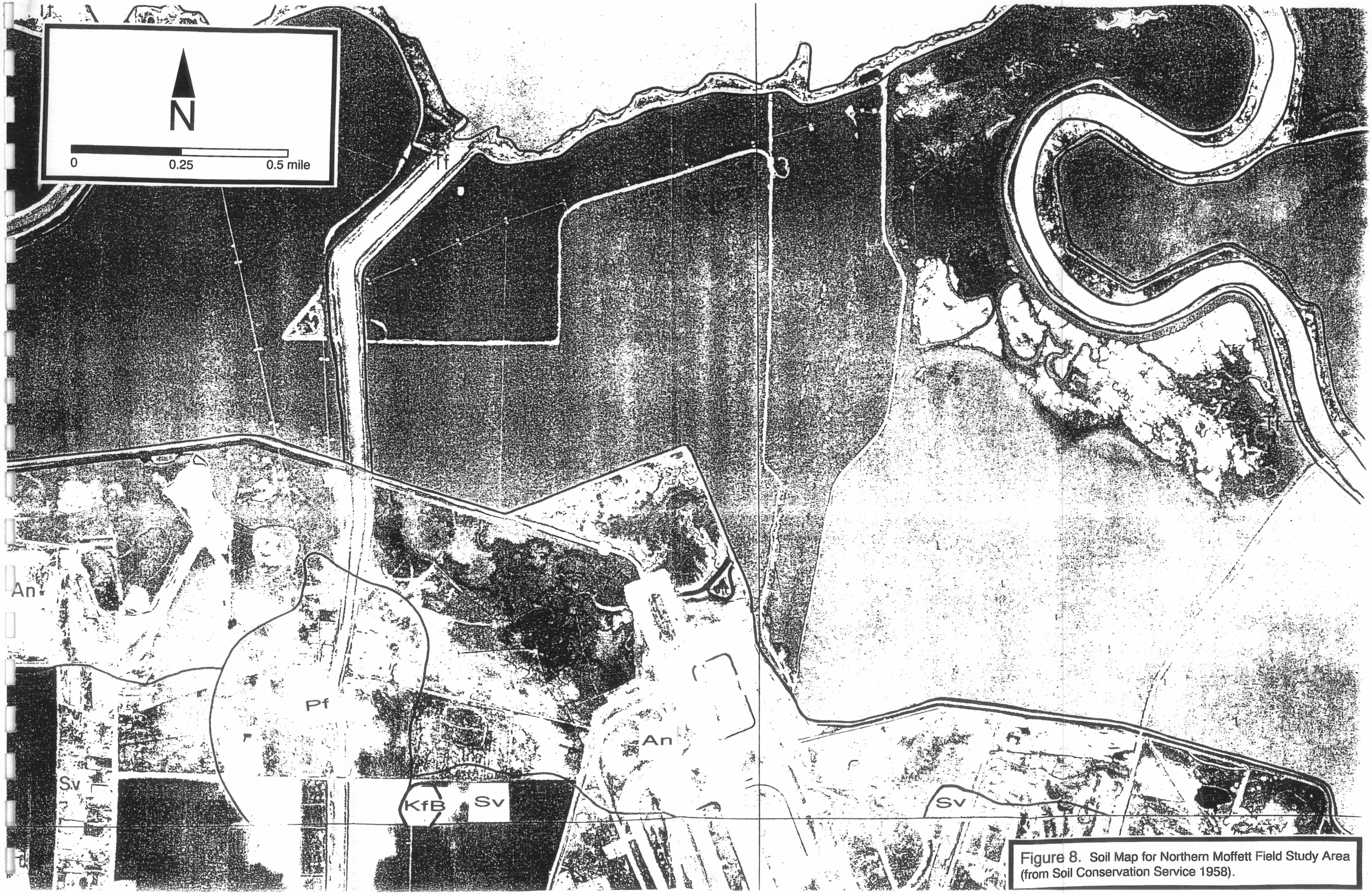


Figure 8. Soil Map for Northern Moffett Field Study Area (from Soil Conservation Service 1958).

Appendix A. Excerpts from Santa Clara County Soils Report

Source: Soil Conservation Service (1958)

Altamont clay 50 to 75 percent slopes, eroded (AcG2). This soil occurs as very steep areas with slopes of about 55 percent, associated with moderately steep areas of other Altamont soils. Because of moderate sheet erosion, depth to bedrock is 25 to 35 inches, and occasionally rock outcrops are present. This soil holds about 5 to 6 inches of water plants can use. Erosion hazard is very high, surface runoff is very rapid. Otherwise, this soil is similar to Altamont clay, 30 to 50 percent slopes. Included in mapping are San Benito clay loam, 10 percent, and landslips, and areas where the subsoils and underlying materials are exposed.

This soil is used for range. Capability unit VIIe5 (15).Pasture and range site Clayey very steep phase.

ALVISO SERIES

Alviso series consists of very poorly drained, fine textured soils, underlain by sedimentary alluvium. The soils formed on tidal flats. Vegetation is water-loving plants, saltgrasses and forbs. Elevations range from sea level to 10 feet. Mean annual rainfall is 15 to 16 inches; mean annual air temperature is 58 to 60° F. The growing season is 300 to 325 days. Sunnyvale and Castro are the principal associated soils.

The surface soil averages from 6 to 10 inches in thickness and is a dark gray clay. The subsoil is a gray silty clay ranging in thickness from 30 to 40 inches. The substratum is gray silty clay over layered basin sediments.

Alviso soils are used for pasture, wildlife, recreation and salt ponds. The soils are affected by high concentrations of both neutral and alkaline salts.

Alviso clay (An). This soil occupies level tidal flat positions.

Representative profile: 9/10 of a mile north on Morse Avenue, from Alviso Highway and 50 yards west into field along the levee; Santa Clara County, California.

Alg — 0 to 8 inches, dark gray (N 4/) clay, very dark gray (N 3/) moist; few faint gray (N 6/) dry mottles; moderate medium angular blocky structure; hard, firm, sticky and plastic; abundant very fine and fine roots; few very fine interstitial, common very fine and few fine tubular pores; slightly calcareous, moderately alkaline (pH 8.0); clear smooth boundary. (6 to 10 inches thick).

C1g — 8 to 38 inches, mixed gray and light gray (N5, N7); silty clay, dark gray (5Y 4/1) moist with common medium distinct olive (5Y 5/3) dry mottles; massive; very hard, friable, sticky and plastic; plentiful very fine roots; few very fine and fine tubular pores; slightly calcareous, moderately alkaline; clear smooth boundary. (30 to 40 inches thick).

IIIC2g 38 to 60 inches, gray (N-6) silty clay, dark gray (N 4/) moist; massive; very hard, firm, sticky and plastic; slightly calcareous, moderately alkaline (pH 8.0).

Surface soil color is gray or dark gray. Areas of the surface soil may be slightly calcareous and reaction may be neutral to moderately alkaline. Texture is clay, silty clay or silty clay loam. The surface soil is usually moist because of the presence of a water table at depths of 1 to 3 feet. A thin discontinuous organic layer, one inch or less in thickness may occur on the surface. Color of the subsoil is gray or light gray with brown and olive brown mottles. It is usually salty, calcareous and moderately alkaline. Texture will average a silty clay, but is stratified with silty clay loam, organic matter and sandy loam.

Included in mapping this soil are areas of similar soils, strongly acid in reaction 10 percent; and 5 percent Tidal marsh land.

This very poorly drained soil has a water holding capacity of 4 to 8 inches. Fertility is very low, because of high concentrations of both neutral and alkaline salts. Ponding occurs and the soils are subject to flooding at high tides where not protected by levees. Permeability of the subsoil is slow. The salty subsoil and water table restrict rooting depths at 1 to 3 feet.

This soil is used for pasture and range, wildlife, recreation and salt ponds. Capability unit IVw6 (14).

ARBUCKLE SERIES

The Arbuckle series consists of somewhat excessively drained, medium textured soils, underlain by sedimentary alluvium. These soils formed on nearly level to moderately sloping old fans and terraces. Vegetation is chiefly annual grasses and forbs, with a few scattered large oaks. Elevations range from 200 to 800 feet. Mean annual rainfall is 15 to 20 inches; mean annual temperature is 58 to 60° F. The growing season is 250 to 300 days. Pleasanton and San Ysidro are the principal associated soils.

The surface soil averages from 8 to 13 inches in thickness and is brown, slightly acid gravelly loam. The subsoil is a brown, slightly acid gravelly loam, ranging in thickness from 26 to 34 inches. The substratum consists of stratified very gravelly, cobbly alluvium.

Arbuckle soils are used for irrigated row crops, orchards, dryland grain hay, pasture and range.

Arbuckle gravelly loam, 0 to 2 percent slopes (ArA). This soil is nearly level with less than 2 percent average slope.

Representative profile: 1 and 3/4 miles east on Dunn Avenue from Southern Pacific railroad crossing and 200 yards north into field, in the N. W. 1/4 of the S. E. 1/4 of Sec. 22, T. 9 S., 3 E., Santa Clara County, California.

Most of this soil is moderately eroded having lost about 2 to 6 inches of surface soil. This soil holds about 4 to 6 inches of water plants can use. Surface runoff is medium; erosion hazard is moderate. Otherwise, it is similar to Azule clay loam 30 to 75 percent slopes.Included in mapping this soil are 15 percent Hillgate silt loam; areas of gravelly texture; areas of severe sheet and rill erosion, and areas of Gullied land.

This soil is used for growing dryland prunes, grapes, grain hay and pasture. Capability unit IVe5 (15); pasture and range site Fine Loamy.

BAYSHORE SERIES

The Bayshore series consists of poorly drained, moderately fine textured soils, underlain by gleyed sedimentary alluvium. They are formed on low level positions of the alluvial plains. Vegetation is water-loving plants, annual grasses, and forbs. Elevations range from 30 to 100 feet. Mean annual rainfall is 16 to 20 inches; mean annual air temperature ranges from 58 to 60° F. The growing season is 250 to 300 days. Sunnyvale and Castro are the principal associated soils.

The surface soil averages 11 to 16 inches in thickness and is dark gray calcareous clay loam. The subsoil is a light gray and white, strongly calcareous clay loam, ranging in thickness from 21 to 37 inches. The substratum is light gray gravelly loams.

Bayshore soils are used for irrigated row crops, fruit orchards and pasture. Large areas are also used for commercial and housing developments.

Bayshore clay loam (Ba). This nearly level soil occurs in low positions of the alluvial plains.

Representative profile: 200 feet west of Lawrence Station Road, 50 feet north of drainage channel, across from Jefferson Union School; in the S. W. 1/4 of N. E. 1/4, Sec. 32, T. 6 S., R. 1 W; Santa Clara County, California.

Ap — 0 to 8 inches, dark gray (N 4/) clay loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, very friable, sticky and plastic; few very fine roots; common very fine interstitial pores; moderately alkaline (pH 8.0); violently effervescent with disseminated lime; clear smooth boundary. (6 to 9 inches thick).

A12 — 8 to 16 inches, dark gray (N 4/) light clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure; slightly hard, very friable, sticky and plastic; few very fine roots; many very fine interstitial, common very fine and medium tubular pores; moderately alkaline (pH 8.0); violently effervescent with disseminated lime; clear

smooth boundary. (5 to 7 inches thick.)

C1 16 to 29 inches, light gray (N 7/) light clay loam, gray (5Y 5/1) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; many very fine interstitial and many very fine and few medium tubular pores; moderately alkaline (pH 8.0); violently effervescent disseminated lime; clear wavy boundary. (6 to 14 inches thick).

C2ca 29 to 48 inches, white (N 8/) light clay loam, light gray (2.5Y 7/2) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; many very fine interstitial and very fine tubular pores; moderately alkaline (pH 8.0); violently effervescent disseminated and common hard lime concentrations 1/4 to 2 inches long; clear smooth boundary. (15 to 23 inches thick).

IIC3 48 to 60 inches, light gray (2.5Y 7/2) gravelly loam, light olive brown (2.5Y 5/4) moist; with common fine and medium distinct mottles (2.5Y 7/4d 10YR 4/4m); weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine interstitial and common very fine tubular pores; moderately alkaline (pH 8.0); violently effervescent, few small hard lime concretions; clear smooth boundary.

Surface soil color is gray or dark gray. Reaction is moderately alkaline and it contains slight to moderate amounts of disseminated lime. Texture is clay loam or silty clay loam, containing 5 to 8 percent medium and fine gravels. Subsoil color is light gray or gray but will range to white or grayish brown and is strongly calcareous.

Included in mapping this soil are areas of 3 to 5 percent slopes; areas of dark grayish brown calcareous soils; 10 percent Sunnyvale silty clay and 5 percent Campbell silty clay loam.

Natural drainage is poor but now moderately good because of the general lowering of ground water levels in the valley. Runoff is very slow and subsoil permeability is moderately slow. The average water holding capacity is about 8 to 10 inches. Fertility is high and rooting zone depth is very deep; however, plant roots are somewhat limited by the strongly calcareous subsoil.

This soil is used for irrigated row crops, prune orchards and pasture. Large areas are also used for commercial and housing developments. Capability unit IIs5 (14).

BEN LOMOND SERIES

The Ben Lomond series consists of well drained, moderately coarse textured soils, underlain by soft, strongly acid sandstone at depths of 3 to 5 feet, on very steep uplands. Vegetation is

This soil is used for irrigated prunes, walnuts and pasture. A few areas are used for dryland pasture or dry farmed grain hay. Capability unit IIIs3 (14).

KITCHEN MIDDENS (KfB).

This miscellaneous land type consists of soil areas that were once used as campsites by Indians. The soil material is dark gray, friable, calcareous loam or clay loam. It is mixed with ashes, charcoal, shell fragments, stones and a few bones. The soil occurs on nearly level to gently sloping alluvial fans and plains, usually slightly higher than the associated Yolo and Campbell series. In most places, normal soil from which the campsite was made, is at depths of 1 to 2 feet.

This well drained land type holds about 8 to 10 inches of water plants can use. Fertility is moderate. Runoff is medium and erosion is not usually a hazard. Depth of rooting zone is very deep.

This land type is used for irrigated row crops, prunes, apricots, walnuts and pasture. Capability unit IIe1 (14).

LANDSLIDES (LaF).

This miscellaneous land type consists of soil areas that have moved down slope, and have uneven or broken surfaces resulting from the movement. Soil material is generally fine textured, ranging from clay loam to clay. Soil mantle and water regime has been disturbed so that soil characteristics are unpredictable. The areas are on steep slopes, associated with Altamont, Diablo, Azule and Climara soils.

This well drained land type is of moderate fertility and holds 5 to 8 inches of water plants can use. Runoff is medium to rapid and erosion hazard is high.

This land type is used for dryland pasture and range. Capability unit VIIe5 (15); pasture and range site Clayey, steep phase.

LOS GATOS SERIES

The Los Gatos series consists of well drained soils, having moderately fine textured subsoils, underlain at depths of 25 to 50 inches by sedimentary and metasedimentary bedrock. They formed on moderately steep to very steep uplands. Vegetation is hardwoods, consisting mainly of oaks, with an understory of brush, grass and forbs. Elevations range from 500 to 4,000 feet. Mean annual rainfall is about 25 to 40 inches; mean annual air temperature is about 55 to 56° F. The growing season is 200 to 250 days. Gilroy, Maymen and Gaviota are the principal associated soils.

Orestimba clay loam (Of). This soil is similar to Orestimba silty clay loam, except surface texture is clay loam, and concentration of salts is only slight. Natural drainage is now moderately well because of the general lowering of ground water level in the valley. Average water holding capacity is 9 to 10 inches and fertility is moderate. Most of this soil occupies small level basins east and southeast of San Jose. Included in mapping are areas of Sunnyvale silty clay 10 percent; 5 percent Clear Lake clay; also, a few small areas of moderate to strong concentrations of both neutral and alkaline salts.

This soil is used for irrigated row crops, prunes, pears, dryland hay and pasture. A few areas have been used for housing developments. Capability unit IIIw5 (14).

PACHECO SERIES

The Pacheco series consists of poorly drained, medium textured soils, underlain by sedimentary alluvium. These soils formed on low level alluvial plains. Vegetation is annual grasses and forbs. Elevations range from 150 to 300 feet. Mean annual rainfall is 16 to 20 inches; mean annual air temperature is 58 to 60° F. The growing season is 250 to 300 days. Clear Lake, Yolo, and Willows are the principal associated series.

The surface soil averages 14 to 18 inches in thickness and is a moderately alkaline, grayish brown fine sandy loam, loam, silt loam and clay loam. The subsoil is a mottled light gray, moderately alkaline loam averaging 18 to 25 inches in thickness. The substratum is light gray mottled calcareous, medium textured alluvium.

Pacheco soils are used for irrigated sugar beets, row crops, orchards, pasture and hay.

Pacheco clay loam (Pd). This soil occurs on level low positions of the alluvial plains.

Representative profile: In a field 1/10 of a mile west of pump number 1 on Taix Company ranch; Santa Clara County, California.

Ap — 0 to 7 inches, grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate, fine granular structure; hard, friable, sticky and plastic; many fine interstitial and fine tubular pores; moderately alkaline (pH 8.0); clear smooth boundary. (6 to 8 inches thick).

A12 — 7 to 16 inches, grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate, medium subangular blocky structure; hard, friable, sticky and plastic; many fine interstitial and tubular pores; moderately alkaline (pH 8.0); clear smooth boundary. (8 to 10 inches thick).

clay loam. Rooting depth is over 60 inches because of a generally lowering of the water table that existed during soil development. It has been flooded in the past about once every 25 years. Included in mapping are 10 percent areas of Yolo loam; and 5 percent areas of gravelly texture.

This soil is used for irrigated row crops, sugar beets, cherries, prunes, walnuts, hay and pasture. Capability unit I-1 (14).

Pacheco clay loam, gravelly substratum (Pe). This soil occurs as gravelly stringers, geographically intermixed with the Pacheco and Campbell soils. Surface soil color is grayish brown or dark gray. Texture may be a loam, clay loam or gravelly clay loam. In general, water tables are below 5 feet, but a few areas have seasonal water tables within 3 feet of the surface that will somewhat restrict rooting depth. The substratum, at an average depth of 36 to 40 inches is sand and gravel. Average water holding capacity is 6 to 8 inches; subsoil permeability is moderately rapid. Otherwise, it is similar to Pacheco clay loam. Included in mapping are areas of sand and gravel, within 20 inches of the surface; and a few areas of pale brown loam 10 to 15 inches in thickness over the normal grayish brown loams.

This soil is used for irrigated row crops, sugar beets, prunes, walnuts and pasture. Capability unit IIs4 (14).

Pacheco loams, clay substratum (Pf). This soil is intermixed with Mocho, Pacheco and Campbell soils. Texture may be a loam, fine sandy loam or clay loam. Generally, water tables are below 4 feet, but a few areas have seasonal water tables within 2 feet of the surface that will somewhat restrict rooting depth. The substratum is a clay that occurs at a depth of 36 to 40 inches. Average water holding capacity is about 4 to 8 inches. Subsoil permeability is slow. Otherwise, it is similar to Pacheco clay loam. Included in mapping are areas of soils that are calcareous on the surface, about 10 percent; and areas where it is only 20 inches to the clay substratum.

This soil is used for irrigated row crops, prunes and pears. Capability unit IIIw5 (14).

PARRISH SERIES

The Parrish series consists of well drained soils, having gravelly fine textured, strongly acid subsoils, underlain at depths of 2 to 3 feet by hard shales. They formed on strongly sloping to very steep uplands. Vegetation is grasses and forbs, oak trees and a few scattered stands of Ponderosa pine. Elevations range from 1,000 to 3,000 feet. Mean annual rainfall is 20 to 30 inches; mean annual air temperature is about 54 to 56° F. The growing season is about 200 to 250 days. Gaviota and Los Gatos are the principal associated soils.

The surface soil ranges in thickness from 4 to 10 inches and is

used as a source of sand and gravel. Capability unit VIIel (15); pasture and range site Loamy, steep phase.

SUNNYVALE SERIES

The Sunnyvale series consists of poorly drained, fine textured soils, underlain by gleyed sedimentary alluvium. They formed on low level positions of the alluvial plains. Vegetation is water-loving plants, annual grasses and forbs. Elevations range from 100 to 300 feet. Mean annual rainfall is 16 to 20 inches; mean annual air temperature is 58 to 60° F. The growing season is 250 to 325 days. Clear Lake and Campbell are the principal associated soils.

The surface soil averages 11 to 18 inches in thickness and is a dark gray, calcareous silty clay. The subsoil is a light gray and gray, strongly calcareous silty clay, ranging in thickness from 26 to 32 inches. The substratum is light gray mottled, slightly calcareous silty clay alluvium.

Sunnyvale soils are used for irrigated row crops, sugar beets, orchards and hay. Large areas are used for housing and commercial developments.

Sunnyvale silty clay, drained (Sv). This level soil occurs in low positions of the alluvial plains.

Representative profile: 100 feet west of the intersection of Santa Teresa and Laguna Road, 2 tree rows north in a prune orchard; Santa Clara County, California.

Apca — 0 to 6 inches, dark gray (N4/) silty clay, very dark gray (N3/) moist; strong fine granular structure; hard, very friable, sticky and plastic; plentiful very fine roots or fine roots; many very fine interstitial pores; slightly calcareous with disseminated lime; moderately alkaline (pH 8.0); clear smooth boundary. (5 to 8 inches thick).

A12ca — 6 to 14 inches, dark gray (N4/) silty clay, very dark gray (N3/) strong fine subangular blocky structure; hard, friable, sticky and plastic; few fine roots; many very fine interstitial and tubular pores few fine tubular pores; calcareous with lime disseminated and in soft medium irregular masses, moderately alkaline (pH 8.0); gradual wavy boundary. (6 to 10 inches thick).

C1ca — 14 to 34 inches, light gray (N7/) silty clay, dark gray (N4/) moist; strong medium subangular blocky structure; very hard, friable, sticky and plastic; few fine roots; many very fine interstitial and tubular pores; very strongly calcareous, with lime disseminated, also, many large irregularly shaped soft masses and a few hard lime concretions; moderately alkaline (pH 8.0); gradual

wavy boundary. (18 to 22 inches thick).

C2ca 34 to 42 inches, gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist, with mottles many fine distinct light yellowish brown (2.5Y 6/4) dry, and light olive brown (2.5Y 5/4) moist; strong medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; many very fine interstitial and tubular pores; strongly calcareous, with lime disseminated, also many large irregularly shaped soft masses, moderately alkaline (pH 8.0); clear smooth boundary (8 to 10 inches thick).

C3g 42 to 60 inches, light gray (5Y 7/1) silty clay, gray (5Y 5/1) moist; with mottles, many fine distinct light yellowish brown (2.5Y 6/4) dry, and light olive brown (2.5Y 5/4) moist; massive; hard, friable, sticky and plastic; many very fine interstitial and tubular pores; weakly calcareous with disseminated lime moderately alkaline (pH 8.0).

Surface soil color is typically dark gray and the texture is silty clay. Reaction is moderately alkaline and calcareous with slight to moderate concentrations of disseminated lime. The subsoil color is typically gray or may be white. The strongly calcareous subsoil occurs at an average depth of 14 inches. Lime is disseminated, but there are many large soft irregularly shaped lime masses and a few hard lime concretions. Texture is a silty clay or silty clay loam.

Included in mapping this soil are 15 percent areas of Clear Lake clay; and a few small areas strongly calcareous on the surface.

Drainage is poor, but now improved because of the general lowering of ground water levels in the valley. Water may become ponded during winter months and the subsoil permeability is slow. Fertility is high. Average water holding capacity is about 9 to 10 inches. Rooting depth is very deep, but is somewhat limited by the highly calcareous subsoils.

This soil is used for irrigated row crops, sugar beets, prunes, and pears. About 50 percent is used for housing and commercial developments. Where orchard crops are grown, definite symptoms of chlorosis are present. Capability unit IIs5 (14).

Sunnyvale silty clay (Su). This nearly level soil is similar to Sunnyvale silty clay, drained, except for having a seasonal water table at depths of 30 to 60 inches; texture may be silty clay or silty clay loam. Near Tulare Hill, flooding may occur about twice in 10 years. Average water holding capacity is 6 to 8 inches and fertility is moderate. Included in mapping are a few spots that are highly calcareous; a few that are salty on the surface; about 5 acres just south of Tulare Hill of Pacheco silt loam. and a few acres of Willows clay. About 20 acres of

this soil has black clay buried surface horizons at an average depth of 2 to 3 feet.

This soil is used for irrigated row crops and pasture. Drainage, irrigation management and flood control are the main management problems. Capability unit IIIw5 (14).

TERRACE ESCARPMENTS

Terrace escarpments (TeF). This miscellaneous land type consists of steep old terraces, usually with slopes of 30 to 50 percent. Keefers, Pleasanton and Hillgate are the principal associated soils. These areas have not developed distinct soil horizons but are generally gravelly loam or clay loam textured material. Runoff is rapid. Erosion hazard is high. Vegetation is mostly annual grasses, forbs and scattered oaks.

This land type is used for limited range, wildlife and watershed. Capability unit VIIe1 (15); pasture and range site Loamy, steep phase.

TIDAL MARSH

Tidal marsh (Tf). This miscellaneous land type consists of land that is periodically covered by ocean water. Vegetation is a rank growth of cordgrass and pickleweed. Numerous sloughs meander through out this land.

This land type is used for wildlife and recreation. Large areas have been ponded and used for evaporating sea water for the production of salt. Capability unit VIIIw6 (14).

VALLECITOS SERIES

The Vallecitos series consists of well drained soils having fine textured subsoils underlain by sedimentary and metasedimentary bedrock, at depths of about 19 inches. They formed on moderately steep to very steep uplands. Vegetation is annual grasses, forbs and oak trees. Elevations range from 300 to 3,500 feet. Mean annual rainfall is about 16 to 25 inches; mean annual air temperature is about 58 to 60° F. The growing season is about 200 to 250 days. Gaviota and Los Gatos are the principal associated soils.

The surface soil averages 5 to 10 inches in thickness and is a brown slightly and medium acid loam. The subsoil is dark brown and reddish brown, medium acid clay loam and clay, averaging 8 to 20 inches in thickness. The substratum is metamorphosed shale.

Vallecitos soils are used for dryland pasture, range, wildlife, recreation and watershed.

Appendix B. Wetland Delineation Data Sheets

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	Moffett Federal Airfield / Bay View site	Date:	9/27/00
Applicant/Owner:	NASA	County:	Santa Clara
Investigator(s):	Bane / Webber	State:	CA
		T/R/S	

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 below)

Community ID: PEMYKh
Transect ID:
Plot ID: 1

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Juncus balticus	H	50	FACW+				
Typha latifolia	H	45	OBL				

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 100%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☒ YES ☐ NO

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____
☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:
Primary Indicators:

- ☐ Inundated
- ☐ Saturated Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☒ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: Ø inches
Depth to Free Water in Pit: >12 inches
Depth to Saturated Soil: >12 inches

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 below)

Wetland Hydrology Present? ☑ YES ☐ NO

Remarks: Site is in a depression in low area.

(1)

SOILS

Map Unit Name: (series and phase) Aniso clay Drainage Class: _____

Taxonomy (subgroup): _____ Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-12		2.5/N	—	—	Clay

Hydric Soil Indicators: (check all that apply):

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☒ Gleyed or Low-Chroma (=1) matrix
- ☐ Matrix Chroma ≤2 with Mottles
- ☐ Mn or Fe Concretions
- ☐ High Organic Content in Surface Layer of Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on National/Local Hydric Soils List
- ☐ Other (explain below)

Hydric Soils Present? ☒ YES ☐ NO

Remarks:

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☒ YES ☐ NO

Wetland hydrology present? ☒ YES ☐ NO

Hydric soils present? ☒ YES ☐ NO

Is the sampling point within a wetland? ☑ YES ☐ NO

Remarks:

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	Moffett Federal Airfield / Bay View site	Date:	9/27/00
Applicant/Owner:	NASA	County:	Santa Clara
Investigator(s):	Bane / Webber	State:	CA
		T/R/S	

Do normal circumstances exist on the site?	☑ YES ☐ NO	Community ID:	Ruderal
Is the site significantly disturbed (atypical situation)?	☐ YES ☑ NO	Transect ID:	
Is the area a potential problem area? (If needed, explain below)	☐ YES ☑ NO	Plot ID:	2

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Vinca major		80	n/a				
Dipsacus sylvestris		15	[illegible] or FACW-	(Dipsacus fullonum			

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): ______

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☐ YES ☑ NO ?

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) ______
☐ Other (explain) ______

Typical length: ______ Days 5% = ______

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Field Observations:

- Depth of Surface Water: >12 inches
- Depth to Free Water in Pit: >12 inches
- Depth to Saturated Soil: >12 inches

Wetland Hydrology Indicators:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated 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 below)

Wetland Hydrology Present? ☐ YES ☑ NO

Remarks: [illegible] - no wetland [illegible]

SOILS

Map Unit Name: (series and phase) Ausdal Drainage Class:

Taxonomy (subgroup): Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-		10YR 2/1			Clay, ~ Stones (1-2" diam)

Hydric Soil Indicators: (check all that apply):

☐	Histosol	☐	Matrix Chroma ≤2 with Mottles
☐	Histic Epipedon	☐	Mn or Fe Concretions
☐	Sulfidic Odor	☐	High Organic Content in Surface Layer of Sandy Soils
☐	Aquic Moisture Regime	☐	Organic Streaking in Sandy Soils
☐	Reducing Conditions	☐	Listed on National/Local Hydric Soils List
☑	Gleyed or Low-Chroma (=1) matrix	☐	Other (explain below)

Hydric Soils Present? ☑ YES ☐ NO

Remarks:

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☐ YES ☑ NO ?

Wetland hydrology present? ☐ YES ☑ NO

Hydric soils present? ☑ YES ☐ NO Is the sampling point within a wetland? ☐ YES ☑ NO ?

Remarks: This site is @ higher elevation than pit — on a berm - man-made fill.

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	Moffett Federal Airfield / Bay View site	Date:	9/27/00
Applicant/Owner:	NASA	County:	Santa Clara
Investigator(s):	Bane / Webber	State:	CA
		T/R/S	

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 below)

Community ID: non-native grassland
Transect ID: J
Plot ID: 2

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Lolium multiflorum		40	n/a				
Festuca spp.		40	FAC				
Picris echioides		5	FAC				
Vinca major		10	n/a				
Malva nicaeensis		5	n/a				

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 40%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☐ YES ☒ NO

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____
☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:
Primary Indicators:

- ☐ Inundated
- ☐ Saturated Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: Ø inches
Depth to Free Water in Pit: >12 inches
Depth to Saturated Soil: >12 inches

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 below)

Wetland Hydrology Present? ☐ YES ☒ NO

Remarks: Site is level with Plot #2, upslope of Plot #1.

(3)

SOILS

Map Unit Name: (series and phase) Alviso clay — Drainage Class: ____

Taxonomy (subgroup): ____ — Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-6		10YR 2/2	—	—	clay
6-12		7.5YR 2/1	—	—	clay

Hydric Soil Indicators: (check all that apply):

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☒ Gleyed or Low-Chroma (=1) matrix
- ☐ Matrix Chroma ≤2 with Mottles
- ☐ Mn or Fe Concretions
- ☐ High Organic Content in Surface Layer of Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on National/Local Hydric Soils List
- ☐ Other (explain below)

Hydric Soils Present? ☒ YES ☐ NO

Remarks:

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☐ YES ☒ NO

Wetland hydrology present? ☐ YES ☒ NO

Hydric soils present? ☒ YES ☐ NO

Is the sampling point within a wetland? ☐ YES ☒ NO

Remarks:

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	Moffett Federal Airfield / Bay View site	Date:	9/27/00
Applicant/Owner:	NASA	County:	Santa Clara
Investigator(s):	Bane / Webber	State:	CA
		T/R/S	

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 below)

Community ID: PemyKh
Transect ID:
Plot ID: 4

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Lolium multiflorum		60	-	Picris echioides			fac
Rumex crispus		25	FACW-	Convolvulus arvensis			facu
Lotus corniculatus		10	FAC				

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 67%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☒ YES ☐ NO

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____
☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):
- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:
Primary Indicators:
- ☒ Inundated
- ☒ Saturated Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Field Observations:
- Depth of Surface Water: 1 inches
- Depth to Free Water in Pit: full inches
- Depth to Saturated Soil: 0 inches

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 below)

Wetland Hydrology Present? ☑ YES ☐ NO

Remarks: Area is flooded due to the [illegible] water from a storm water retention pond. Water was pumped into this low area on the opposite side of the road from the pond.

SOILS

Map Unit Name: (series and phase) Sunnyvale silty clay, drained Drainage Class: _____

Taxonomy (subgroup): _____ Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-12		10YR 2/1	—	—	clay - rocks present from 3-8"

Hydric Soil Indicators: (check all that apply):

☐	Histosol	☐	Matrix Chroma ≤2 with Mottles
☐	Histic Epipedon	☐	Mn or Fe Concretions
☐	Sulfidic Odor	☐	High Organic Content in Surface Layer of Sandy Soils
☐	Aquic Moisture Regime	☐	Organic Streaking in Sandy Soils
☐	Reducing Conditions	☐	Listed on National/Local Hydric Soils List
☒	Gleyed or Low-Chroma (=1) matrix	☐	Other (explain below)

Hydric Soils Present? ☒ YES ☐ NO

Remarks: Probably sampled a hydric inclusion w/in 5r

WETLAND DETERMINATION :

Hydrophytic vegetation present?	☑ YES	☐ NO	
Wetland hydrology present?	☑ YES	☐ NO	
Hydric soils present?	☑ YES	☐ NO	Is the sampling point within a wetland? ☑ YES ☐ NO

Remarks:

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	Moffett Federal Airfield / Bay View site	Date:	9/27/00
Applicant/Owner:	NASA	County:	Santa Clara
Investigator(s):	Bane / Webber	State:	CA
		T/R/S	

Do normal circumstances exist on the site?	☒ YES	☐ NO	Community ID: non-native grassland / weedy
Is the site significantly disturbed (atypical situation)?	☒ YES	☐ NO	Transect ID:
Is the area a potential problem area?	☒ YES	☐ NO	Plot ID: 5
(If needed, explain below)			

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Lotus corniculatus	H	50	FAC				
Lolium multiflorm	H	25	n/a				
Picris echioides	H	10	FAC				
Convolvulus arvensis	H	10	FACU+				

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 50%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☐ YES ☑ NO

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____
☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:

Primary Indicators:

- ☒ Inundated
- ☒ Saturated Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	inches
Depth to Free Water in Pit:	4	inches
Depth to Saturated Soil:	0	inches

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 below)

Wetland Hydrology Present? ☒ YES ☐ NO

Remarks: See explanation for Plot #4. This site is farther from the pipe outlet and is therefore, drier than Plot #4.

SOILS

Map Unit Name: (series and phase) Sunnyvale silty clay, 0 to 2 % slopes — Drainage Class: _____

Taxonomy (subgroup): _____ — Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-12		10YR 2/1	—	—	Clay

Hydric Soil Indicators: (check all that apply):

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma (=1) matrix
- ☐ Matrix Chroma ≤2 with Mottles
- ☐ Mn or Fe Concretions
- ☐ High Organic Content in Surface Layer of Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on National/Local Hydric Soils List
- ☐ Other (explain below)

Hydric Soils Present? ☑ YES ☐ NO

Remarks:

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☐ YES ☒ NO

Wetland hydrology present? ☑ YES ☐ NO

Hydric soils present? ☑ YES ☐ NO

Is the sampling point within a wetland? ☐ YES ☒ NO

Remarks:

Hydrology is artificially maintained and soils are assumed to be historic baylands

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	Moffett Federal Airfield / Bay View site	Date:	9/27/00
Applicant/Owner:	NASA	County:	Santa Clara
Investigator(s):	Bane / Webber	State:	CA
		T/R/S	

Do normal circumstances exist on the site?	☒ YES	☐ NO	Community ID: PEMY/Kh
Is the site significantly disturbed (atypical situation)?	☐ YES	☒ NO	Transect ID:
Is the area a potential problem area?	☒ YES	☐ NO	Plot ID: 6
(If needed, explain below)			

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Lotus corniculatus		90	FAC	Cyperus eragrostis			FACW
				Picris echioides			FAC

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 100%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☑ YES ☐ NO

Remarks: Site was mowed in August, 2000.

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____

☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☒ Drainage Patterns in Wetlands ?

Field Observations:

Depth of Surface Water:	0	inches
Depth to Free Water in Pit:	>12	inches
Depth to Saturated Soil:	>12	inches

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 below)

Wetland Hydrology Present? ☑ YES ☐ NO

Remarks: Site is in a topographic low area, where water ponds. C. alderete — said water ponds here >14 days in winter/spring barrier to diked marsh to the north

SOILS

Map Unit Name: (series and phase) Alviso clay — Drainage Class: _____

Taxonomy (subgroup): _____ Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-12		10YR 2/1	—	—	clay

Hydric Soil Indicators: (check all that apply):

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☒ Gleyed or Low-Chroma (=1) matrix
- ☐ Matrix Chroma ≤2 with Mottles
- ☐ Mn or Fe Concretions
- ☐ High Organic Content in Surface Layer of Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on National/Local Hydric Soils List
- ☐ Other (explain below)

Hydric Soils Present? ☒ YES ☐ NO

Remarks:

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☒ YES ☐ NO

Wetland hydrology present? ☒ YES ☐ NO

Hydric soils present? ☒ YES ☐ NO

Is the sampling point within a wetland? ☒ YES ☐ NO

Remarks:

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site: Moffett Federal Airfield / Bay View site	Date: 9/27/00
Applicant/Owner: NASA	County: Santa Clara
Investigator(s): Bane / Webber	State: CA
	T/R/S
Do normal circumstances exist on the site? ☒ YES ☐ NO	Community ID: non-native grassland / disturbed
Is the site significantly disturbed (atypical situation)? ☒ YES ☐ NO	Transect ID:
Is the area a potential problem area? ☒ YES ☐ NO	Plot ID: 7
(If needed, explain below) Site is on fill material	

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Avena fatua		25	—				
Picris echioides		25	—				
Lotus corniculatus		20	FAC				
Lolium multiflorum		10	—				

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): _____

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☐ YES ☒ NO

Remarks: Site is mowed.

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____ ☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Field Observations:

- Depth of Surface Water: 0 inches
- Depth to Free Water in Pit: >6 inches
- Depth to Saturated Soil: >6 inches

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 below)

Wetland Hydrology Present? ☐ YES ☒ NO

Remarks: Site is on a slope (convex)

(1)

SOILS

Map Unit Name: (series and phase) Aviso clay — Drainage Class: _____

Taxonomy (subgroup): _____ Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure

Hydric Soil Indicators: (check all that apply):

☐	Histosol	☐	Matrix Chroma ≤2 with Mottles
☐	Histic Epipedon	☐	Mn or Fe Concretions
☐	Sulfidic Odor	☐	High Organic Content in Surface Layer of Sandy Soils
☐	Aquic Moisture Regime	☐	Organic Streaking in Sandy Soils
☐	Reducing Conditions	☐	Listed on National/Local Hydric Soils List
☐	Gleyed or Low-Chroma (=1) matrix	☐	Other (explain below)

Hydric Soils Present? ☐ YES ☐ NO

Remarks: Fill with rocks. Not sampled due to extent of rockiness – pit could not be dug.

WETLAND DETERMINATION :

Hydrophytic vegetation present?	☐ YES ☑ NO	
Wetland hydrology present?	☐ YES ☒ NO	
Hydric soils present?	☐ YES ☒ NO	Is the sampling point within a wetland? ☐ YES ☒ NO

Remarks:

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site: Moffett Federal Airfield / Bay View site	Date: 9/27/00
Applicant/Owner: NASA	County: Santa Clara
Investigator(s): Bane / Webber	State: CA
	T/R/S
Do normal circumstances exist on the site? ☒ YES ☐ NO	Community ID: Seasonal salt marsh/Ruderal
Is the site significantly disturbed (atypical situation)? ☐ YES ☒ NO	Transect ID:
Is the area a potential problem area? ☒ YES ☐ NO	Plot ID: 8
(If needed, explain below)	

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Salicornia virginica	H	75	OBL				
Frankenia grandiflora	H	25	FACW+				

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 100%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☒ YES ☐ NO

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____ ☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Field Observations:

Depth of Surface Water:	Ø inches
Depth to Free Water in Pit:	>12 inches
Depth to Saturated Soil:	>12 inches

Wetland Hydrology Indicators:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated 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 below)

Wetland Hydrology Present? ☒ YES ☐ NO

Remarks: Site is adjacent to a spoil pile that [illegible] of dikes for salt ponds, that has been farmed in the past.

SOILS

Map Unit Name: (series and phase) Alvisol clay

Drainage Class:

Taxonomy (subgroup):

Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-12		10YR 2/1	—	—	clay, rocky

Hydric Soil Indicators: (check all that apply):

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma (=1) matrix
- ☐ Matrix Chroma ≤2 with Mottles
- ☐ Mn or Fe Concretions
- ☐ High Organic Content in Surface Layer of Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on National/Local Hydric Soils List
- ☐ Other (explain below)

Hydric Soils Present? ☒ YES ☐ NO

Remarks:

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☒ YES ☐ NO

Wetland hydrology present? ☒ YES ☐ NO

Hydric soils present? ☒ YES ☐ NO

Is the sampling point within a wetland? ☒ YES ☐ NO

Remarks:

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	Moffett Federal Airfield / Bay View site	Date:	9/27/00
Applicant/Owner:	NASA	County:	Santa Clara
Investigator(s):	Bane / Webber	State:	CA
		T/R/S	

Do normal circumstances exist on the site?	☒ YES ☐ NO	Community ID:	Ruderal (Weed Dominated)
Is the site significantly disturbed (atypical situation)?	☐ YES ☒ NO	Transect ID:	
Is the area a potential problem area?	☒ YES ☐ NO	Plot ID:	9
(If needed, explain below)			

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Lepidium latifolium		95%	FACW				

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): ______

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☑ YES ☐ NO

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) ______
☐ Other (explain) ______

Typical length: ______ Days 5% = ______

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Field Observations:

Depth of Surface Water: >12 inches
Depth to Free Water in Pit: >12 inches
Depth to Saturated Soil: >12 inches

Wetland Hydrology Indicators:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated 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 below)

Wetland Hydrology Present? ☐ YES ☑ NO

Remarks: On a berm (spoil pile) [illegible] [illegible] [illegible]
site is upslope [illegible] [illegible] - [illegible].

SOILS

Map Unit Name: (series and phase) Alviso clay — Drainage Class: —

Taxonomy (subgroup): — Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-12		10YR 3/1	—	—	clay, Rocky

Hydric Soil Indicators: (check all that apply):

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma (=1) matrix
- ☐ Matrix Chroma ≤2 with Mottles
- ☐ Mn or Fe Concretions
- ☐ High Organic Content in Surface Layer of Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on National/Local Hydric Soils List
- ☐ Other (explain below)

Hydric Soils Present? ☑ YES ☐ NO

Remarks:

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☑ YES ☐ NO

Wetland hydrology present? ☐ YES ☑ NO

Hydric soils present? ☑ YES ☐ NO

Is the sampling point within a wetland? ☐ YES ☑ NO

Remarks: Site is elevated on a berm and

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DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site: Moffett Federal Airfield / Bay View site	Date: 9/27/00
Applicant/Owner: NASA	County: Santa Clara
Investigator(s): Bane / Webber	State: CA
	T/R/S
Do normal circumstances exist on the site? ☒ YES ☐ NO	Community ID: Seasonal wetland / PEMCh
Is the site significantly disturbed (atypical situation)? ☐ YES ☒ NO	Transect ID:
Is the area a potential problem area? ☒ YES ☐ NO	Plot ID: 10
(If needed, explain below)	

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Lepidium latifolium	H	90	FACW*	Picris echioides	H	10	FAC

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 100%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☒ YES ☐ NO

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____ ☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☒ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: Ø inches

Depth to Free Water in Pit: >12 inches

Depth to Saturated Soil: >12 inches

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 below)

Wetland Hydrology Present? ☒ YES ☐ NO

Remarks: Site is within a diked basin of former tidal salt marsh. The area was in agriculture in the past (dates?).

10

SOILS

Map Unit Name: (series and phase) Alviso clay Drainage Class: _____

Taxonomy (subgroup): _____ Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-12		10YR 2/1	—	—	clay (no rocks)

Hydric Soil Indicators: (check all that apply):

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☒ Gleyed or Low-Chroma (=1) matrix
- ☐ Matrix Chroma ≤2 with Mottles
- ☐ Mn or Fe Concretions
- ☐ High Organic Content in Surface Layer of Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on National/Local Hydric Soils List
- ☐ Other (explain below)

Hydric Soils Present? ☒ YES ☐ NO

Remarks: Salt deposits present on soil surface.

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☒ YES ☐ NO

Wetland hydrology present? ☒ YES ☐ NO

Hydric soils present? ☒ YES ☐ NO

Is the sampling point within a wetland? ☒ YES ☐ NO

Remarks:

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site: Moffett Federal Airfield / Bay View site	Date: 9/27/00
Applicant/Owner: NASA	County: Santa Clara
Investigator(s): Bane / Webber	State: CA
	T/R/S
Do normal circumstances exist on the site? ☒ YES ☐ NO	Community ID: Seasonal wetland / PEMCh
Is the site significantly disturbed (atypical situation)? ☐ YES ☒ NO	Transect ID:
Is the area a potential problem area? ☒ YES ☐ NO	Plot ID: 11
(If needed, explain below)	

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Picris echioides	H	95%	FAC*	Cirsium vulgare	H	<10	—

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 100%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☒ YES ☐ NO

Remarks: * This species is listed as not occurring in Calif. in Reed, 1988, but is listed as FAC in Reed, 1996.

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____

☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: 0 inches

Depth to Free Water in Pit: >12 inches

Depth to Saturated Soil: >12 inches

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 below)

Wetland Hydrology Present? ☐ YES ☐ NO

Remarks: [illegible]

(11)

SOILS

Map Unit Name: (series and phase) Alviso clay Drainage Class: _____

Taxonomy (subgroup): _____ Field observations confirm mapped type? ☐ YES ☒ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-12		10YR 2/1	—	—	clay

Hydric Soil Indicators: (check all that apply):

☐	Histosol	☐	Matrix Chroma ≤2 with Mottles
☐	Histic Epipedon	☐	Mn or Fe Concretions
☐	Sulfidic Odor	☐	High Organic Content in Surface Layer of Sandy Soils
☐	Aquic Moisture Regime	☐	Organic Streaking in Sandy Soils
☐	Reducing Conditions	☐	Listed on National/Local Hydric Soils List
☒	Gleyed or Low-Chroma (=1) matrix	☐	Other (explain below)

Hydric Soils Present? ☒ YES ☐ NO

Remarks:

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☒ YES ☐ NO

Wetland hydrology present? ☒ YES ☐ NO

Hydric soils present? ☒ YES ☐ NO Is the sampling point within a wetland? ☒ YES ☐ NO

Remarks:

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	Moffett Federal Airfield / Bay View site	Date:	9/27/00
Applicant/Owner:	NASA	County:	Santa Clara
Investigator(s):	Bane / Webber	State:	CA
		T/R/S	

Do normal circumstances exist on the site?	☒ YES	☐ NO	Community ID: hA6
Is the site significantly disturbed (atypical situation)?	☐ YES	☒ NO	Transect ID:
Is the area a potential problem area?	☒ YES	☐ NO	Plot ID: 12
(If needed, explain below)			

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Lolium multiflorum	H	30	—	Rumex crispus	H	10	FACW
Vulpia myosurus	H	20	FACU	Cirsium vulgare	H	<10	FAC
Picris echioides	H	20	FAC				

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 33%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☐ YES ☒ NO

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____
☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):
- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:
Primary Indicators:
- ☐ Inundated
- ☐ Saturated Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☒ Drainage Patterns in Wetlands

Field Observations:
- Depth of Surface Water: 0 inches
- Depth to Free Water in Pit: >12 inches
- Depth to Saturated Soil: >12 inches

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 below)

Wetland Hydrology Present? ☒ YES ☐ NO

Remarks: See notes on Form # 9, 10 & 11

(12)

SOILS

Map Unit Name: (series and phase) Sunnyvale silty clay, drained Drainage Class: _____

Taxonomy (subgroup): _____ Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-4		10 YR 2/1	—	—	clay, white powdery particles
4-12		10 YR 2/1	2.5Y 7/4	very large/few	clay

Hydric Soil Indicators: (check all that apply):

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☒ Gleyed or Low-Chroma (=1) matrix
- ☐ Matrix Chroma ≤2 with Mottles
- ☐ Mn or Fe Concretions
- ☐ High Organic Content in Surface Layer of Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on National/Local Hydric Soils List
- ☐ Other (explain below)

Hydric Soils Present? ☒ YES ☐ NO

Remarks: "Mottles" are actually large inclusions of sandy loam.

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☐ YES ☒ NO

Wetland hydrology present? ☒ YES ☐ NO

Hydric soils present? ☒ YES ☐ NO

Is the sampling point within a wetland? ☐ YES ☒ NO

Remarks:

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	Moffett Federal Airfield / Bay View site	Date:	9/27/00
Applicant/Owner:	NASA	County:	Santa Clara
Investigator(s):	Bane / Webber	State:	CA
		T/R/S	

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 below)

Community ID: Ferch / diked seasonal salt marsh
Transect ID:
Plot ID: 13

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Distichlis spicata	H	80	FACW				
Heliotropum curassavicum		<20	OBL				

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 100%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☒ YES ☐ NO

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____
☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:
Primary Indicators:

- ☐ Inundated
- ☐ Saturated Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☒ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: 0 inches
Depth to Free Water in Pit: >12 inches
Depth to Saturated Soil: >12 inches

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 below)

Wetland Hydrology Present? ☒ YES ☐ NO

Remarks: See notes on form #'s 8, 10, 11

(13)

SOILS

Map Unit Name: (series and phase) Sunnyvale silty clay, drained Drainage Class: ____

Taxonomy (subgroup): ____ Field observations confirm mapped type? ☐ YES ☐ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-4		10YR 2/1	—	—	clay
4-12		10YR 2/1	2.5Y 6/3	few fine/medium	clay w/ sandy, light-gloved inclusions

Hydric Soil Indicators: (check all that apply):

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☒ Gleyed or Low-Chroma (=1) matrix
- ☐ Matrix Chroma ≤2 with Mottles
- ☐ Mn or Fe Concretions
- ☐ High Organic Content in Surface Layer of Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on National/Local Hydric Soils List
- ☐ Other (explain below)

Hydric Soils Present? ☒ YES ☐ NO

Remarks:

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☒ YES ☐ NO

Wetland hydrology present? ☒ YES ☐ NO

Hydric soils present? ☒ YES ☐ NO

Is the sampling point within a wetland? ☒ YES ☐ NO

Remarks:

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	Moffett Federal Airfield / Bay View site	Date:	9/27/00
Applicant/Owner:	NASA	County:	Santa Clara
Investigator(s):	Bane / Webber	State:	CA
		T/R/S	

Do normal circumstances exist on the site?	☒ YES	☐ NO	Community ID:
Is the site significantly disturbed (atypical situation)?	☐ YES	☒ NO	Transect ID:
Is the area a potential problem area?	☒ YES	☐ NO	Plot ID: 14
(If needed, explain below)			

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Lolium multiflorum	H	60	—	Lactuca serriola	H	5	—
Vulpia myosuros	H	15	FACU	Picris echioides	H	5	FAC
Hordeum leporinum	H	15	NL				
Lotus corniculatus	H	10	FAC				

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 25%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☐ YES ☒ NO

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On:
- ☐ Soil Temp (record) _____
- ☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):
- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:

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

Field Observations:
- Depth of Surface Water: 0 inches
- Depth to Free Water in Pit: >12 inches
- Depth to Saturated Soil: >12 inches

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 below)

Wetland Hydrology Present? ☐ YES ☒ NO

Remarks:

(14)

SOILS

Map Unit Name: (series and phase) Alvisa clay — Drainage Class: _____

Taxonomy (subgroup): _____ Field observations confirm mapped type? ☐ YES ☑ NO

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell moist)	Mottle Colors (Munsell moist)	Mottle Abundance/ Size	Texture, Concretions, Structure
0-12		10yR2/1	—	—	clay / rocky

Hydric Soil Indicators: (check all that apply):

☐	Histosol	☐	Matrix Chroma ≤2 with Mottles
☐	Histic Epipedon	☐	Mn or Fe Concretions
☐	Sulfidic Odor	☐	High Organic Content in Surface Layer of Sandy Soils
☐	Aquic Moisture Regime	☐	Organic Streaking in Sandy Soils
☐	Reducing Conditions	☐	Listed on National/Local Hydric Soils List
☒	Gleyed or Low-Chroma (=1) matrix	☐	Other (explain below)

Hydric Soils Present? ☒ YES ☐ NO

Remarks:

WETLAND DETERMINATION :

Hydrophytic vegetation present? ☐ YES ☒ NO

Wetland hydrology present? ☐ YES ☒ NO

Hydric soils present? ☒ YES ☐ NO — Is the sampling point within a wetland? ☐ YES ☒ NO

Remarks:

Jones & Stokes

DATA FORM
ROUTINE WETLAND DETERMINATION

Project/Site:	Moffett Federal Airfield / Bay View site	Date:	9/27/00
Applicant/Owner:	NASA	County:	Santa Clara
Investigator(s):	Bane / Webber	State:	CA
		T/R/S	
Do normal circumstances exist on the site?	☒ YES ☐ NO	Community ID:	PEMWr
Is the site significantly disturbed (atypical situation)?	☐ YES ☒ NO	Transect ID:	
Is the area a potential problem area?	☒ YES ☐ NO	Plot ID:	15
(If needed, explain below)			

VEGETATION

Dominant Plant Species	Strata	% Cover	Indicator	Associate Plant Species	Strata	% Cover	Indicator
Distichlis spicata	H	90	FACW	Lotus corniculatus	H	10	FAC
				Picris echioides	H	10	FAC

Percent of Dominants that are OBL, FACW, or FAC (excluding FAC-): 100%

Check all other indicators that apply & explain below:

- ☐ Morphological Adaptations
- ☐ Physiological/Reproductive Adaptations
- ☐ Visual Observation of Plant Species Growing in Areas of Prolonged Inundation/Saturation
- ☐ Personal Knowledge of Regional Plant Communities
- ☑ Technical Literature (Reed, 1988)
- ☐ Other (explain below)

Hydrophytic Vegetation Present? ☒ YES ☐ NO

Remarks:

HYDROLOGY

Is it the growing season? ☑ YES ☐ NO

Based On: ☐ Soil Temp (record) _____
☐ Other (explain) _____

Typical length: _____ Days 5% = _____

Recorded Data (describe below):

- ☐ Stream, Lake, or Tide Gauge
- ☑ Aerial Photographs
- ☐ Other
- ☐ None Available

Wetland Hydrology Indicators:
Primary Indicators:

- ☐ Inundated
- ☐ Saturated Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☒ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	inches
Depth to Free Water in Pit:	>12	inches
Depth to Saturated Soil:	2-3	inches

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 below)

Wetland Hydrology Present? ☐ YES ☐ NO

Remarks: This site is at a slightly lower elevation than site #14

US ARMY CORPS OF ENGINEERS LETTER

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS
333 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94105-2197

JUN 20 2001

Regulatory Branch

Subject: File Number 25926S

Mr. Brian Staab
NASA Ames Research Center
Building #218
Moffett Field, California 94035

Dear Mr. Staab:

Thank you for the submittal of May 22, 2001 by Jones & Stokes on your behalf requesting confirmation of the extent of Corps of Engineers jurisdiction at National Aeronautics and Space Administration (NASA) Research Park on Moffett Field. Moffett Field is located on the southwest shoreline of San Francisco Bay in an unincorporated area of Santa Clara County, California. Enclosed are 2 maps titled "Mapped Wetlands for Moffett Field, Figures 5 and 6" dated March 12, 2001, showing the extent and location of Corps of Engineers jurisdiction on the project site.

We have based this jurisdictional delineation on the current conditions of the site. A change in those conditions may also change the extent of our jurisdiction. This jurisdictional delineation will expire in five years from the date of this letter. However, if there has been a change in circumstances which affects the extent of Corps jurisdiction, a revision may be done before that date.

All proposed discharges of dredged or fill material into waters of the United States must be authorized by the Corps of Engineers pursuant to Section 404 of the Clean Water Act (CWA) (33 U.S.C. 1344). Waters of the United States generally include tidal waters, lakes, ponds, rivers, streams (including intermittent streams), and wetlands.

Your proposed work appears to be within our jurisdiction and a permit may be required. Application for Corps authorization should be made to this office using the application form in the enclosed pamphlet. To avoid delays it is essential that you enter the file number at the top of this letter into Item No. 1. The application must include plans showing the location, extent and character of the proposed activity, prepared in accordance with the requirements contained in this pamphlet. You should note, in planning your work, that upon receipt of a properly completed application and plans, it may be necessary to advertise the proposed work by issuing a public notice for a period of 30 days.

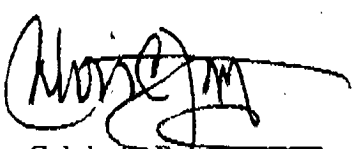
If an individual permit is required, it will be necessary for you to demonstrate to the Corps that your proposed fill is necessary because there are no practicable alternatives, as outlined in the U. S. Environmental Protection Agency's Section 404(b)(1) Guidelines. A copy is enclosed to aid you in preparation of this alternative analysis.

However, our nationwide or regional permits have already authorized certain activities provided specified conditions are met. Your completed application will enable us to determine whether your activity is already authorized. You are advised to refrain from commencement of your proposed activity until a determination has been made that it is covered by an existing permit. Commencement of work before you received our notification may be interpreted as a violation of our regulations.

You are advised that the Corps has established an Administrative Appeal Process, as described in 33 CFR Part 331 (65 FR 16,486; Mar. 28, 2000), and outlined in the enclosed flowchart and "Notification of Administrative Appeal Options, Process, and Request for Appeal" form (NAO-RFA). If you do not intend to accept the approved jurisdictional determination, you may elect to provide new information to the District Engineer for reconsideration or submit a completed NAO-RFA form to the Division Engineer to initiate the appeal process. You will relinquish all rights to appeal, unless new information or a completed NAO-RFA form is received by the Corps within sixty (60) days of the date of the NAO-RFA.

If you have any questions, please call Gordon Liu of our Regulatory Branch at telephone 415-977-8463. All correspondence should reference the file number at the head of this letter.

Sincerely,



Calvin C. Fong
Chief, Regulatory Branch

Enclosure

Copy Furnished:

Jones & Stokes, San Jose, CA 95134, Attn: Ms. Shannon Bane