# Memorandum

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**The above referenced document is being issued after USACE review.**

☒ Comments received from the Army have been addressed in the revised document.
☐ No comments were received.

Should you have any questions, please contact Shirley Tudor at 831-883-5827.

# 2009 ANNUAL BIOLOGICAL MONITORING REPORT FORMER FORT ORD, CALIFORNIA

# TOTAL ENVIRONMENTAL RESTORATION CONTRACT CONTRACT NO. DACW05-96-D-0011

Submitted to:

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Corps of Engineers
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February 2010

Revision 0

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# 2009 ANNUAL BIOLOGICAL MONITORING REPORT
# FORMER FORT ORD, CALIFORNIA

## TOTAL ENVIRONMENTAL RESTORATION CONTRACT
## CONTRACT NO. DACW05-96-D-0011

February 2010

Revision 0

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# *Table of Contents*

## *List of Tables*



## *List of Figures*

## *List of Photographs*

## *List of Photographs (Cont.)*

## *List of Photographs (Cont.)*

# *List of Appendices*

## *List of Acronyms and Abbreviations*

| | |
|---|---|
| Army | U.S. Department of the Army |
| BLL | black legless lizard |
| BLM | Bureau of Land Management |
| CMC | central maritime chaparral |
| CTP | Carbon Tetrachloride Plume |
| CTS | California tiger salamander |
| FONR | Fort Ord Natural Reserve |
| GPS | global positioning system |
| HA | Historical Area |
| HMP | Habitat Management Plan |
| OU | Operable Unit |
| sqft | square feet |
| TERC | Total Environmental Restoration Contract |
| USACE | U.S. Army Corps of Engineers |
| USFWS | United States Fish and Wildlife Service |

# 1.0 Report Introduction

This report contains results of the 2009 biological monitoring surveys that are required as part of the *Installation-Wide Multispecies Habitat Management Plan* (HMP) *for Former Fort Ord, California* (USACE, 1997). Shaw Environmental, Inc. (Shaw) prepared this report under the Total Environmental Restoration Contract II (TERC II) No. DACW05-96-D-0011.

The HMP identifies rare, threatened, or endangered species and habitats occurring on former Fort Ord that are designated for protection and future management. The habitat types requiring surveys for potential protection and monitoring of rare species are: central maritime chaparral (CMC), wetlands or vernal ponds, and any other habitats where listed species are known or suspected to occur, including coastal scrub, coast live oak woodlands, and grasslands with a significant native component of grasses or forbs.

The following special status species are listed in the HMP, and are addressed in these surveys. There are three special status annual plants that may occur within maritime chaparral, coastal scrub, or grasslands or disturbed areas: sand gilia (*Gilia tenuiflora arenaria*), Monterey spineflower (*Chorizanthe p. pungens*), and Seaside bird's beak (*Cordylanthus rigidus littoralis*). Five special status shrub species may occur within maritime chaparral: Hooker's manzanita (*Arctostaphylos h. hookeri*), sandmat manzanita (*Arctostaphylos pumila*), Monterey manzanita (*Arctostaphylos montereyensis*), Monterey Ceanothus (*Ceanothus cuneatus rigidus*), and Eastwood's golden bush (*Ericameria fasciculata*).

Wetland species considered in these surveys were California tiger salamander [CTS (*Ambystoma californiense*)] and California linderiella (*Linderiella occidentalis*). These species are typically found in vernal or seasonal ponds.

Before and after the completion of munitions removal, soil remediation, groundwater remediation, and other related environmental cleanup operations within Fort Ord lands designated as Habitat Reserve, baseline biological and follow-up surveys are conducted to: establish whether protected species are present prior to work operations, map locations, and quantify abundance; and monitor the protected species and habitat after work completion. Follow-up monitoring helps determine whether work activities have significantly impacted rare species or habitat. The HMP also outlines avoidance measures and mitigation measures such as habitat restoration, which would be necessary if the U.S. Department of the Army (Army)'s cleanup activities significantly impact protected species or habitats.

To determine whether mitigation measures would be needed to restore populations of affected HMP-listed special-status species, a baseline biological survey is conducted within a proposed

cleanup site, and three to five monitoring events are conducted for rare species following completion of the cleanup operations. Monitoring data are compared to a site's baseline survey data to assess whether there have been significant impacts related to the cleanup operations, and whether recovery or restoration of the protected habitat (maritime chaparral, wetlands, etc.) and associated species is proceeding toward the baseline conditions.

In addition to the HMP, three Biological Opinions have been issued by the United States Fish and Wildlife Service [(USFWS) 1999, 2002, 2005)] as a result of consultation with the Army. These Biological Opinions contain additional mitigation measures and recommendations relating to biological monitoring at former Fort Ord cleanup sites.

For the 2009 monitoring season, Shaw was tasked by the U.S. Army Corps of Engineers (USACE) to conduct the following biological baseline and follow-up surveys for various former Fort Ord sites where work related to the environmental cleanup has either already begun, or will begin in the future. Biological surveys began early in 2009 and continued through August 2009.

List of 2009 Biological Monitoring Sites included in this Annual Report:

- **Site 39 Non-Burn Areas** – Baseline vegetation surveys in areas where vegetation will be cut to support munitions and explosives of concern remediation.
- **Carbon Tetrachloride Plume (CTP) Pilot Project** – Second year of follow-up biological monitoring following completion of work at CTP Pilot Project site on the University of California, Santa Cruz - Fort Ord Natural Reserve (FONR).
- **Operable Unit (OU) Carbon Tetrachloride Plume (CTP) System 2B** – Baseline biological monitoring in preparation for well installation and remediation activities on the University of California, Santa Cruz - FONR, scheduled to begin in 2010-2011.

# 2.0 Site 39 Non-Burn Areas Baseline Vegetation Survey and Pond Monitoring

## 2.1 Site 39 Non-Burn Areas Baseline Monitoring – Introduction

The work plan for the Site 39 Non-Burn Areas is contained in the *Site-Specific Work Plan, Munitions and Explosives of Concern Remedial Action, Non-Burn Areas* (USACE, 2009c). The Site 39 Non-Burn Areas have been identified by the Army as sites where munitions removal can proceed without requiring a vegetation burn beforehand. The Non-Burn Areas consist predominantly of grasslands, wetlands, coastal scrub, and other non-chaparral vegetation types. The HMP requires burning instead of mowing or other vegetation removal methods in areas of maritime chaparral. Burning enhances the recovery of the maritime chaparral community and enhances recovery of protected species and habitat.

To protect wetland habitats and rare, threatened, or endangered species that could be impacted by munitions removal activities in the designated Non-Burn Areas, the HMP requires baseline monitoring surveys before work begins. Usually, baseline surveys consist of shrub transect surveys to characterize the CMC or other shrub vegetation communities on the sites, and surveys to identify locations and population sizes of the HMP annual species (sand gilia, Monterey spineflower, and Seaside bird's beak). For these Non-Burn Areas, which primarily consist of grasslands, vernal ponds, and oak woodlands, only surveys for annual plants were conducted, since it is expected there will be little to no impacts to maritime chaparral communities. The Non-Burn Areas that are designated 100-foot buffer areas are within CMC habitat areas within HMP Habitat Reserves and require transects and annual plant surveys for baseline conditions. Line-intercept transects will be established in the Track 3 buffer areas.

This section presents results of 2009 HMP annual forb species surveys for all the Non-Burn Areas listed in Table 2-1. These sites are generally small in size, ranging from about 2.7 to 37.9 acres. The locations of these sites within the Site 39 (Impact Area) are shown in each of the individual site maps. Note that some of the designated Non-Burn Sites have received previous baseline surveys in preparation for either soil remediation or munitions removal, and so are not included in this survey.

The baseline data are used to ascertain that recovery of sites after munitions removal meets the HMP requirements for ensuring conservation of HMP species and habitat. Follow-up surveys after completion of munitions removal at each site that has HMP forb species present in the baseline survey will be conducted in years 1, 3, 5, and 8 following work completion. Baseline survey results are summarized in Section 2.3.1.

Ten ponds are associated with Non-Burn Areas, and each of these is subject to a faunal baseline survey to establish baseline data on the HMP wetland species, CTS and California linderiella. All 10 ponds were checked during the 2008/2009 rainy seasons, but only 5 received enough rainfall to pond. The *Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remedial Activities at Former Fort Ord* (USACE, 2006a) requires baseline and follow-up monitoring of ponds, where feasible, to identify any potential impacts to these habitats during and after munitions removal. Continued attempts will be made to conduct surveys at ponds not yet sampled, up until the start of work in each area. Pond monitoring for HMP faunal species, CTS and California linderiella, were conducted by Denise Duffy and Associates. The report is included as Appendix A of this monitoring report.

In addition to pond sampled in Non-Burn Areas, one additional pond sampling was attempted for Pond #8, which is associated with HA 39/40, a proposed remediation site. Although baseline sampling has been attempted in the past 2 years, the pond has not filled because of inadequate rainfall.

Ponds identified for survey, those successfully surveyed, and results are summarized in Section 2.3.2.

## 2.2 Site 39 Non-Burn Areas Baseline Monitoring – Methods

Methods for HMP forb monitoring were consistent with the *Protocol for Conducting Vegetation Monitoring in Compliance with the Installation-wide Multispecies Habitat Management Plan at Former Fort Ord* (USACE, 2006b), with exceptions as noted below.

**HMP Forb Sampling:** Sand gilia populations were surveyed during mid-April through mid-May to capture the peak bloom. Sand gilia patches were mapped either using GPS, or hand-mapped on aerial photos, and digitized, and abundance was recorded as a density class as shown below. Seaside bird's beak surveys were conducted at the same time as sand gilia surveys to search for populations, and if found, final mapping and abundance was completed in June when the populations were at their peak. In accordance with the vegetation sampling protocol, density of populations was recorded as a cover class.

Low = 0-50 plants per 10,000 square feet (sqft)
Medium = 51-100 plants per 10,000 sqft
High = 101-500 plants per 10,000 sqft
Very High = > 500 plants per 10,000 sqft

Monterey spineflower surveys were conducted mainly between mid-May and mid-June to capture peak densities. Monterey spineflower patches were mapped, and the density of plants, recorded as an estimated percent cover class, was recorded for each patch. Note, that this is a departure from the vegetation sampling protocol. For a prostrate species that forms low growing

mats, percent of ground cover was measured for plant abundance rather than number of plants. Individual plants are difficult to count for this species, when the plants have formed extensive mats during their peak bloom period. Monterey spineflower density classes (as percent cover) were as follows:

Low = 0-5 percent
Medium = 6-25 percent
High = 26-50 percent
Very High = >50 percent

## 2.3 Site 39 Non-Burn Areas Baseline Monitoring – Results and Discussion

Data for each of the Non-Burn sites where HMP forb baseline surveys for sand gilia, Monterey spineflower, and Seaside bird's beak were conducted are shown in Table 2-1. Photographs 2-1 through 2-9 show a representative view of several of the Non-Burn Areas. Figures 2-1 through 2-19 present maps of the survey finds.

### 2.3.1 HMP Forb Data

Sand gilia was found at two Non-Burn Areas, although one area probably has the non-HMP species *Gilia tenuiflora tenuiflora* (see footnote below Table 2-1), and Monterey spineflower was identified at 14 Non-Burn Areas. Seaside bird's beak was not found at any of the sites. Table 2-1 shows where sand gilia and Monterey spineflower were found, and gives the figure number where a map of the data is presented in this report.

**Table 2-1 – List of Non-Burn Areas Surveyed and Summary of Results.***

| Non-Burn Site | Site Acreage | Figure Number | Sand Gilia Acreage | Monterey Spineflower Acreage | Seaside Bird's Beak Acreage |
|---|---|---|---|---|---|
| 2 A,D | 8.0 | 2-1 | -- | 2.3 | -- |
| 4 A/ 5 E,F | 7.4 | 2-2 | -- | -- | -- |
| 4 B,C | 11.2 | 2-3 | -- | 0.04 | -- |
| 5 A,C | 8.7 | 2-4 | -- | 0.71 | -- |
| 6 A,B,C | 15.9 | 2-5 | -- | -- | -- |
| 7 A,B | 9.1 | 2-6 | -- | 1.2 | -- |
| 8 B | 11.5 | 2-7 | -- | 0.15 | -- |
| 9 A | 4.1 | 2-8a, 2-8b | 0.4 ** | 1.9 | -- |
| 10 A,B | 3.7 | 2-9 | -- | 2.33 | -- |
| 11 A | 4.8 | 2-10 | -- | 0.93 | -- |
| 12 B | 31.7 | 2-11 | -- | 12.5 | -- |
| 13 A | 10.8 | 2-12 | -- | 0.31 | -- |
| 13 B,D | 3.8 | 2-13 | -- | -- | -- |

| Non-Burn Site | Site Acreage | Figure Number | Sand Gilia Acreage | Monterey Spineflower Acreage | Seaside Bird's Beak Acreage |
|---|---|---|---|---|---|
| 13 C | 27.8 | 2-14 | -- | 4.1 | -- |
| 14 A | 7.8 | 2-15 | -- | -- | -- |
| 17 E | 2.7 | 2-16 | -- | -- | -- |
| 19 I | 14.7 | 2-17a, 2-17b | 7.3 | 9.8 | -- |
| 20 A | 15.4 | 2-18 | -- | 4.08 | -- |
| 21 F,G | 37.9 | 2-19 | -- | 1.40 | -- |

* The table includes the figure number in this report, and presence (with acreage if present) or absence of sand gilia, Monterey spineflower, and Seaside bird's beak. Dash mark indicates a survey was conducted and the species was not found.

** This is probably *Gilia tenuiflora tenuiflora*. The species can be difficult to distinguish, but *Gilia t. t.* has historically tended to be found on the east side of the Impact Area. Its distinguishing characteristics are a wider throat than *Gilia t. arenaria*, and stamens exerted well above the stigma.

The HMP species occurrences provided in this report describe and quantify abundance in habitat the Non-Burn Areas, and in the proposed access routes to the areas. These data are intended to provide baseline data for areas that will be subject to future munitions clearance.

### *2.3.2 Pond Monitoring*

Ponds identified for survey, those successfully surveyed, and results are summarized in Table 2-2. Details are provided in the separate report in Appendix A.

**Table 2-2 – List of Ponds Surveyed and Summary of Results.**

| Pond Number | Non-Burn Area or Remediation Site (HA) | Sampled for CTS and California Linderiella in 2009 | CTS Found | Linderiella Found |
|---|---|---|---|---|
| 8 | HA 39/40 | No | | |
| 11 | 21A | No | | |
| 16 | 13C | Yes | Yes, eggs and larvae | Yes |
| 17 | 13A | Yes | | |
| 21 | 5A | Yes | | |
| 30 | 4B and 4C | No | | |
| 46 | 6A | No | | |
| 49 | 5C | Yes | | |
| 54 | 14A | Yes | Yes, eggs only | |
| No ID | 8B | No | | |

HA - Historical Area

# 3.0 CTP Pilot Project Biological Monitoring Survey – Year 2

## 3.1 CTP Pilot Project Vegetation Monitoring Survey – Introduction

The second year of the 3 years of follow-up monitoring was conducted at the University of California's FONR, at the site of the 2007-2008 pilot study designed to address ongoing groundwater remediation of a CTP within Operable Unit 1 (OU-1). The study was conducted from June 2007 through February 2008. All above-ground equipment was removed from the site by July 2008. The project consisted of installation of 25 wells for injection of remediation media, and extraction and monitoring of water samples. Location of the wells and access routes within the study area is shown in Figure 3-1. Views of the site in 2009 are shown in Photographs 3-1 through 3-6.

Results of the baseline vegetation survey conducted in the spring and summer of 2007 were published in the *2007 Annual Biological Monitoring Report* (USACE, 2008). Results of the first year monitoring survey conducted in the spring and summer of 2008 were published in the *2008 Annual Biological Monitoring Report* (USACE, 2009a). HMP species found on the site during the baseline survey included two annual plant species, the federally endangered sand gilia (*Gilia tenuiflora arenaria*) and federally threatened Monterey spineflower (*Chorizanthe pungens pungens*); and two HMP-listed shrub species, sandmat manzanita (*Arctostaphylos pumila*) and Monterey Ceanothus (*Ceanothus rigidus rigidus*).

## 3.2 CTP Pilot Project Vegetation Monitoring Survey – Methods

For consistency with past surveys, the methods used for the current survey were the same as those used for vegetation surveys at FONR completed previously by Hydrologic, Inc. with Denise Duffy and Associates (USACE, 2007), and Shaw (USACE, 2008, 2009a).

Sand gilia populations were surveyed during mid-April through mid-May to capture the peak bloom. Sand gilia patches were mapped using global positioning system (GPS) equipment, and the total number of plants recorded for each patch.

The Monterey spineflower survey was conducted between mid-May and mid-June to capture peak densities, as measured by percent ground cover. Monterey spineflower areas were mapped to show both overall distribution over the study site, and also distribution of the patches in density classes greater than Very Sparse.

Monterey Spineflower density classes (consistent with previous FONR surveys) were as follows:

Very Sparse = <3 percent
Sparse = 3-25 percent

Medium-Low = 26-50 percent
Medium = 51-75 percent
Medium-High = 76-97 percent
High = 98-100 percent

Invasive annual grass areas were mapped by hand onto aerial photo maps in the field, and later digitized into the Geographic Information System database. The following density cover classes were used for annual grasses:

Very Low = <3 percent
Low = 3-25 percent
Medium = 26-50 percent
High = 51-75 percent
Very High = >75 percent

Areas of *Arctostaphylos pumila* impacted by access to wells (initially reported in the *2007 Annual Biological Monitoring Report* [USACE, 2008]) were re-visited and assessed for their condition.

## 3.3 CTP Pilot Project Vegetation Monitoring Survey – Results and Discussion

### 3.3.1 Sand Gilia Survey – Results and Discussion

The locations of sand gilia surveyed in Spring 2009 are shown in Figure 3-2. This map shows location and area of gilia patches, and total number of plants per patch. The term "patch" refers to the location of a close grouping of plants, which are likely to be germinating from local seed bank. Numbers per patch ranged from one to 1000 plants.

**Total area of sand gilia in 2009** (2008, 2007) = **0.07 acre** (0.01 acre, 0.075 acre)

**Total number of plants in 2009** (2008, 2007) = **1,650** (61, 528)

Total number of plants observed in the survey area (1,650), was very high compared to the 61 recorded in the previous year. In particular, the two densest patches of gilia, numbering 138 and 150 in 2009, had zero and one respectively in 2008. One of these locations is shown in Photograph 3-1. This area in particular is being monitored for gilia abundance following an incident of accidental disturbance and grading in December of 2006.

Sand gilia numbers were much higher in the two mapped areas to the east of the perimeter road and fuel break, which are located outside the work boundaries. Other sand gilia locations within the work boundaries have received very little to no impacts from work activity throughout the project area. The areas were off limits to all foot traffic during the bloom period, and at most received minimal foot-traffic during work operations during the dry season. One exception is the largest gilia patch to the west of the perimeter road. This patch consisted of 76 plants in 2009,

compared with 138 in the baseline data (4 months following an incident in which the area was accidentally disturbed by vehicle tracks and subsequently graded to repair the tracks); and zero plants in 2008.

Sand gilia numbers were much higher than both the two previous years in two of the largest sand gilia patches. The 2008-2009 rain season resulted in 17.2 inches compared to the 19.4-inch average value at the National Weather Service Climatological Station (Naval Post Graduate School, Monterey, California). This is higher than the last two rain-years (with only 14.8 inches for 2007-2008, and 13.6 inches for 2006-2007). This higher rainfall may explain the higher successful gilia germination in these undisturbed areas to the east of the perimeter road.

As is true for all plant monitoring programs, climate variations should be taken into consideration when interpreting data comparisons, and continued monitoring over several years is necessary to provide an accurate picture of the sand gilia population at this site.

This report summarizes results of the second year of follow-up monitoring. One more year of monitoring will be conducted per the Biological Opinion to document the recovery of HMP annual plant populations within this project area. These results will be compared to earlier data, including the 2007 baseline data, to assess the project impacts on HMP populations and species.

### *3.3.2 Monterey Spineflower Survey – Results and Discussion*

The total distribution of Monterey spineflower is shown in Figure 3-3.

Approximate 2009 acreage for each density class is shown below, with the 2008 and 2007 data shown in parentheses for comparison.

**Total area occupied by Monterey spineflower in 2009** (2008, 2007) = **1.7 acres** (1.75, 2.17)

**Area at Very Sparse density (0-3 percent) in 2009** (2008, 2007) = **1.60 acres** (1.66, 1.94)

**Area at Sparse density (3-25 percent) in 2009** (2008, 2007) = **0.05 acre** (0.05, 0.15)

**Area at Medium-Low density (26-50 percent) in 2009** (2008, 2007) = **0.03 acre** (0.04, 0.05)

**Area at Medium density (51-75 percent) in 2009** (2008, 2007) = **0.02 acre** (0, 0.03)

**Area at Medium-High density (51-75 percent) in 2009** (2008, 2007) = **0.004 acre** (0, 0)

No areas were surveyed that had greater than medium-high density.

Total acreage was 1.70 acres, compared to 1.75 and 2.17 acres identified in 2008 and 2007, respectively. The 2009 spineflower total cover was similar to that observed in 2008 and was found in all areas mapped in 2008, but covered 0.05 acre (2,178 sqft) less area.

Almost 94 percent of the mapped spineflower area was in the Very Sparse (0-3 percent) density category. The other 5 percent of the area consisted of small patches of higher density, exceeding 3 percent in percent cover, as shown in Figure 3-4.

This report summarizes results of the second year of follow-up monitoring. The 2010 season will be the final year monitoring, after which all monitoring data will be evaluated against the baseline data for the site.

### *3.3.3 Annual Grass Survey – Results and Discussion*

Grass location and densities are shown in Figure 3-5, and in Photographs 3-2 through 3-6.

The following numbers indicate the 2009 acreage occupied by annual grass for each density class, with the 2008 and 2007 acreages in parentheses for comparison:

**Total area occupied by annual grasses in 2009** (2008, 2007) = **6.7 acres** (7.21, 6.7)

**Area at Very Low density (0-5 percent) in 2009** (2008, 2007) = **1.5 acres** (1.38, 0.35)

**Area at Low density (6-25 percent) in 2009** (2008, 2007) = **0.9 acre** (0.57, 0.6)

**Area at Medium density (26-50 percent) in 2009** (2008, 2007) = **1.6 acres** (1.19, 1.41)

**Area at High density (>50 percent) in 2009** (2008, 2007) = **2.7 acres** (4.07, 4.34)

Total acreage of annual grass cover in 2009 was very similar to the two previous years. Acreages in 2009 were distributed more towards the lower density classes than in 2007 and 2008. Much of this difference was explained by a lower density of grasses in the northeast sloped section of the fuel break shown in Figure 3-5 and in Photograph 3-5. Consistent with previous years, however, most of the site (more than 40 percent), was occupied by annual grasses at High density.

Photograph 3-3 shows a view of the burned chaparral area (from a small 2006 burn) where annual grasses invaded due to the burn, which has about the same density of grasses as in previous years. The south perimeter road along the fence line has begun to recover from soil compaction due to heavy use as an access road. Grasses are recovering along this route compared to last year. While the grasses are primarily the less desirable non-native species, this growth is likely to improve aeration and other soil conditions for native forbs over time.

There were no locations where well access has resulted in higher density of grasses in 2009.

The site will be monitored for a third event in 2010. After this, data from the 2008-2010 monitoring events will be compared to the baseline conditions to assess whether the project activities have resulted in encroachment of non-native grasses into areas that previously had no- to low densities of grasses, particularly in Monterey spineflower or sand gilia habitat.

Annual Fusilade® treatment or a seasonally timed mechanical vegetation clearance will be considered for well locations and access routes if it is determined at the end of the 3-year monitoring that there is a significant increase in non-native grass invasion.

### *3.3.4 Other HMP Species Occurring on CTP Site*

Other species encountered during the annual survey included:

**Monterey Ceanothus** (*Ceanothus rigidus rigidus*) – In the 2007, cages with live *Ceanothus* plants were marked with red-colored flagging for avoidance during pilot study activities. There were no activities that impacted *Ceanothus* plants in 2009.

**Sandmat Manzanita –** Sandmat manzanita stands occurred in several areas of the study site. There were three well locations where the only access was through sandmat stands. IW-07, IW-02, and MW-01 were located within low-growing stands of sandmat manzanita. In 2007, heavy-duty synthetic matting was laid down over the vehicle access routes to these areas to minimize undue damage to shrub roots, and to minimize the soil disturbance and burial of the seed bank. Several sandmat manzanita plants were flattened near the road entrance to the aisle where matting was placed on the ground, comprising an estimated 74 sqft. Whereas in 2008, no new growth was observed, by May 2009, new growth of existing sandmat plants was observed at the entrance to the access route. Sandmat manzanita is a slow growing species and it may take several years before plants resume the coverage of the baseline conditions. Photograph 3-7 shows a view of this area in 2009.

**Other Site Impacts –** In 2006, an area approximately 24 foot by 42 foot (1,008 sqft) of coastal sage scrub was cut near IW-01 and IW-07 to access wells that were located within a stand of shrubs. Shrubs were cut to a height of about 4 inches. Shrubs cut were California sage brush (*Artemesia californica*), black sage (*Salvia mellifera*), coffeeberry (*Rhamnus californica*), monkey flower (*Mimulus aurantiacus*), and poison oak (*Toxicodendron diversilobum*). None of these are HMP special-status species, no protection or mitigations are required for these species or for this vegetation type. In 2009, all of these species had continued crown-sprouting. Regrowth is expected to continue gradually over time, toward the initial 2007 baseline cover.

# 4.0 OUCTP System 2B (Groundwater) – Baseline Biological Monitoring Survey

## 4.1 OUCTP System 2B Baseline Vegetation Monitoring Survey – Introduction

A baseline vegetation survey was conducted at the University of California's FONR, at a new site where 16 new wells will be installed as part of the ongoing groundwater remediation of the CTP. The survey was conducted in April through July, at the appropriate peak bloom times for sand gilia and Monterey spineflower. Location of the biological survey area with wells and access routes is shown in Figure 4-1. Well installation is proposed to begin in January of 2009. The project will include well drilling, above-ground pipe installation, groundwater remediation, and ongoing sampling. Views of the locations of some of the well sites are shown in Photographs 4-1 through 4-8. The entire process will continue at least through 2011. The description of the project is in the *Final Operable Unit Carbon Tetrachloride Plume Remedial Action Work Plan, Former Fort Ord, California* (USACE, 2009b). Three years of follow-up monitoring after completion of the project is required for sites in habitat areas that have groundwater remediation activity.

HMP species found on the site during the baseline survey included two annual plant species, the federally endangered sand gilia (*Gilia tenuiflora arenaria*) and federally threatened Monterey spineflower (*Chorizanthe pungens pungens*). Two HMP-listed shrub species, sandmat manzanita (*Arctostaphylos pumila*) and Monterey Ceanothus (*Ceanothus rigidus rigidus*), are both present on the site.

## 4.2 OUCTP System 2B Baseline Vegetation Monitoring Survey – Methods

Methods used for the survey were the same as those described in Section 3.2. For consistency with past surveys, the methods used for the current survey were the same as those used for vegetation surveys at FONR completed previously by Hydrologic, Inc. with Denise Duffy and Associates (USACE, 2007), and Shaw (USACE, 2008, 2009a).

## 4.3 OUCTP System 2B Baseline Vegetation Monitoring Survey – Results and Discussion

### 4.3.1 Sand Gilia Survey – Results and Discussion

An April 2009 survey was conducted to determine the location and population size of sand gilia within the project area. The locations of sand gilia found are shown in Figure 4-2. This map also shows the area of sand gilia patches, and total number of plants per patch. The term "patch" refers to the location of a close grouping of plants, which are likely to be germinating from a local seed bank. Numbers per patch ranged from 5 to 100 plants.

**Total area of sand gilia in 2009 within biological survey area = 0.06 acre**

**Total number of sand gilia plants in 2009 within biological survey area = 213**

Three of the proposed wells (EW-BW-150A, EW-BW148A, and IW-BW-152A) and their access routes are located in or near areas with sand gilia. EW-BW-150A location had the largest number (100) of plants in the vicinity. Its proposed location was moved several feet to the southeast to reduce the impact to the sand gilia population in that area. Access routes will be carefully flagged out in the field to ensure that disturbance in these areas is minimized as much as possible.

This report summarizes results of the baseline monitoring for the CTP System 2B area. Three more years of follow-up monitoring will be conducted to document the recovery of HMP annual plant populations within this study area. These results will be compared to the 2009 baseline data to assess the possible project impacts.

### *4.3.2 Monterey Spineflower Survey – Results and Discussion*

The total distribution of Monterey spineflower is shown in Figure 4-3, with a total acreage of 1.74 acres.

Almost 92 percent of the mapped spineflower area was in the Very Sparse (0-3 percent) density category. The other 7.5 percent and 0.5 percent of the mapped area consisted of patches of Sparse (4-25%) and Medium-Low (26-50%) densities.

Total acreage and acreage for each density class for 2009 is shown below.

**Total area occupied by Monterey spineflower = 1.74 acres**

**Area at Very Sparse density (0-3 percent) = 1.6 acres**

**Area at Sparse density (3-25 percent) = 0.13 acre**

**Area at Medium-Low density (26-50 percent) = 0.01 acre**

No areas were mapped that had greater than Medium-Low density.

Distribution of Monterey spineflower was concentrated within 2 to 5 feet of shrub edges, where non-native grass cover tended to be low. Generally no spineflower was present within the mowed fuel breaks greater than 4 to 6 feet from the shrub edges.

### *4.3.3 Annual Grass Survey – Results and Discussion*

Grass location and densities are shown in Figure 4-4.

The following numbers indicate the acreage occupied by annual grass at each density class.

**Area at Very Low density (0-5 percent) = 7.7 acres**

**Area at Low density (6-25 percent) = 0 acre**

**Area at Medium density (26-50 percent) = 1.9 acres**

Total annual grass cover was distributed in two classes, based on location. Most of the perimeter fuel break had grass at Medium (26-50%) cover. Within the shrub line and along a swathe about 2 to 5 feet from the shrub line, annual grasses occurred at Very Low (0-5%) cover.

Areas within Very Low density class will continue to be monitored in the future to determine whether there is significant encroachment of non-native annual grasses in these areas, particularly if they are obscuring available ground for sand gilia and Monterey spineflower, where spineflower is currently present.

Annual Fusilade® treatment or seasonally timed mechanical vegetation clearance will be considered for well locations and access routes if it is determined through continued monitoring that there is a significant increase in grass densities in previously Low density areas.

## *4.4 Other HMP Species Within OUCTP System 2B Project Area*

Other HMP species encountered during the 2009 baseline survey:

**Black Legless Lizard –** No black legless lizards (BLL) were encountered during the survey. Based on the habitat and sandy soil type over most of the site, BLL are potentially present here.

**California Tiger Salamander –** CTS could potentially be encountered on the site. Site personnel will be briefed on the CTS protocol for encounters. Any CTS individuals encountered must be reported to both the Shaw Biologist and the Army's Natural Resource Manager. Handling and relocation if necessary is authorized only by these persons.

**Other Site Impacts –** Well placement was designed to minimize impact within stands of intact CMC as much as possible, and located along the disturbed mowed fuel break of the main perimeter road. Some of the wells had to be located within vegetation for the most effective sampling of the groundwater CTP. Widening of access routes by mowing within chaparral stands will be required in some areas where well locations are set back within the shrub line. Mowing to a total width of 8 feet will be needed to access the following wells: EW-BW-132A, EW-BW-143A, EW-BW148A, EW-BW-149A, EW-BW-150A, and IW-BW-152A. A Bobcat with a mower head will be used. Total distance to be mowed is approximately 820 feet, at an average width of 4 feet. Vegetation within these areas consists primarily of shaggy bark manzanita (*Arctostaphylos tomentosa tomentosa*), sandmat manzanita (*Arctostaphylos pumila)*, and chamise (*Adenostoma fasciculata*). Some small coast live oak trees will also need to be pruned to gain access to the well locations.

**Sandmat Manzanita** – Sandmat manzanita stands were found in several areas of the work site. There were two well locations where the mowed access is through chaparral stands that contain sandmat plants. Wells EW-BW-150A and EW-BW148A are located within low-growing stands of sandmat manzanita. Several sandmat plants will be mowed back to access these wells. Photographs 4-1 and 4-3 show a view of this area. Shrub regrowth will be monitored during follow-up surveys for the 3 years following work completion. While most species of chaparral shrubs crown-sprout after cutting, sandmat manzanita, a Fort Ord HMP listed species, does not resprout from the mowed portion of the plant. Typically however, mowed sandmat reestablishes over time from the remaining unmowed edges of a plant.

# 5.0 Site 39 Soil Remediation Activities

## 5.1 Mitigation Measures to Reduce Impacts during Soil Remediation Activities

Late in 2009, soil remediation activities were initiated for Phase 1 of the Site 39 activities. Excavation was completed at three sites. Site preparation, including identification of access routes and staging areas, were initiated for an additional five sites.

Measures were taken to reduce impacts to HMP species where possible. Mitigation measures for soil remediation are specifically addressed in HMP and in the 1999 Biological Opinion. These measures are summarized as follows:

- Access routes and staging areas for each site were placed to minimize impacts to surrounding habitat and HMP species as much as possible. Existing roads and trails were used for access wherever possible. Pre-existing disturbed areas were used for access or staging wherever available.
- No grading for access roads was permitted in areas of high quality habitat where HMP species were present and in areas of CMC. No road grading was permitted, with the exception of repairing existing erosion ruts.
- Oak trees outside of remediation areas were avoided. Some branch pruning was conducted as needed to allow access, using best management practices to create clean cuts.
- CTS measures were implemented in November through June or when adjacent vernal ponds were wet. Escape boards were placed in each corner of every excavation hole, regular ground checks were made during the rainy season, and employee briefings were conducted to ensure the field staff understood the protocols for CTS avoidance and reporting. No CTS were encountered.
- BLL were also searched for to the extent possible during excavation activities. None were encountered during Site 39 activities.
- Excavation areas and soil stockpiles were protected from erosion using appropriate erosion control materials (straw wattles and snow fencing).

# 6.0 Other Biological Support Activities in 2009

## 6.1 HMP Species Reports

### 6.1.1 California Tiger Salamander Encounters

In 2009, there were no CTS encounters by Shaw on Fort Ord.

### 6.1.2 Black Legless Lizard Encounters

In 2009, there were four BLL encounters on OU-1 development land to the north of the University of California's FONR, during trenching to install pipes for support of the groundwater remediation. All lizards were alive and apparently uninjured when found. The individuals were relocated to an adjacent area with 20 feet of the trench area.

## 6.2 Employee Education

New Shaw employees and sub-contracting workers receive natural resources training specific to Fort Ord prior to starting work. Training includes the following topics:

- Recognition of sensitive HMP habitat and species, including CTS, BLL, sand gilia, Monterey spineflower, Seaside bird's beak, Monterey manzanita, sandmat manzanita, Hooker's manzanita, Eastwood's golden fleece, and Monterey Ceanothus among other species. The species associated with beach dunes habitat - snowy plover and Smith's blue butterfly - are mentioned briefly, as cleanup work has been completed in these areas.
- Specific guidance for CTS protection, such as instruction for reporting all encounters to the Shaw or Army biologist (who are qualified to handle and relocate CTS), placing escape ramps in any open trenches, and checking excavations for trapped CTS during the migration season.
- Instructions to minimize all work impacts and work footprints, avoid areas flagged for sensitive species wherever possible.
- Instructions to restrict vehicle movement and parking to roads, staging areas, and other designated work areas where at all possible.
- Reduce soil disturbances in sensitive habitat particularly areas containing seedbank or live individuals of HMP-listed plant species.

In 2009, Shaw trained 12 new workers on the measures to be taken for natural resource protection.

# 7.0 References


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USACE, 2006a. *Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remedial Activities at Former Fort Ord.* Prepared by Burleson Consulting, Inc. Folsom, California.

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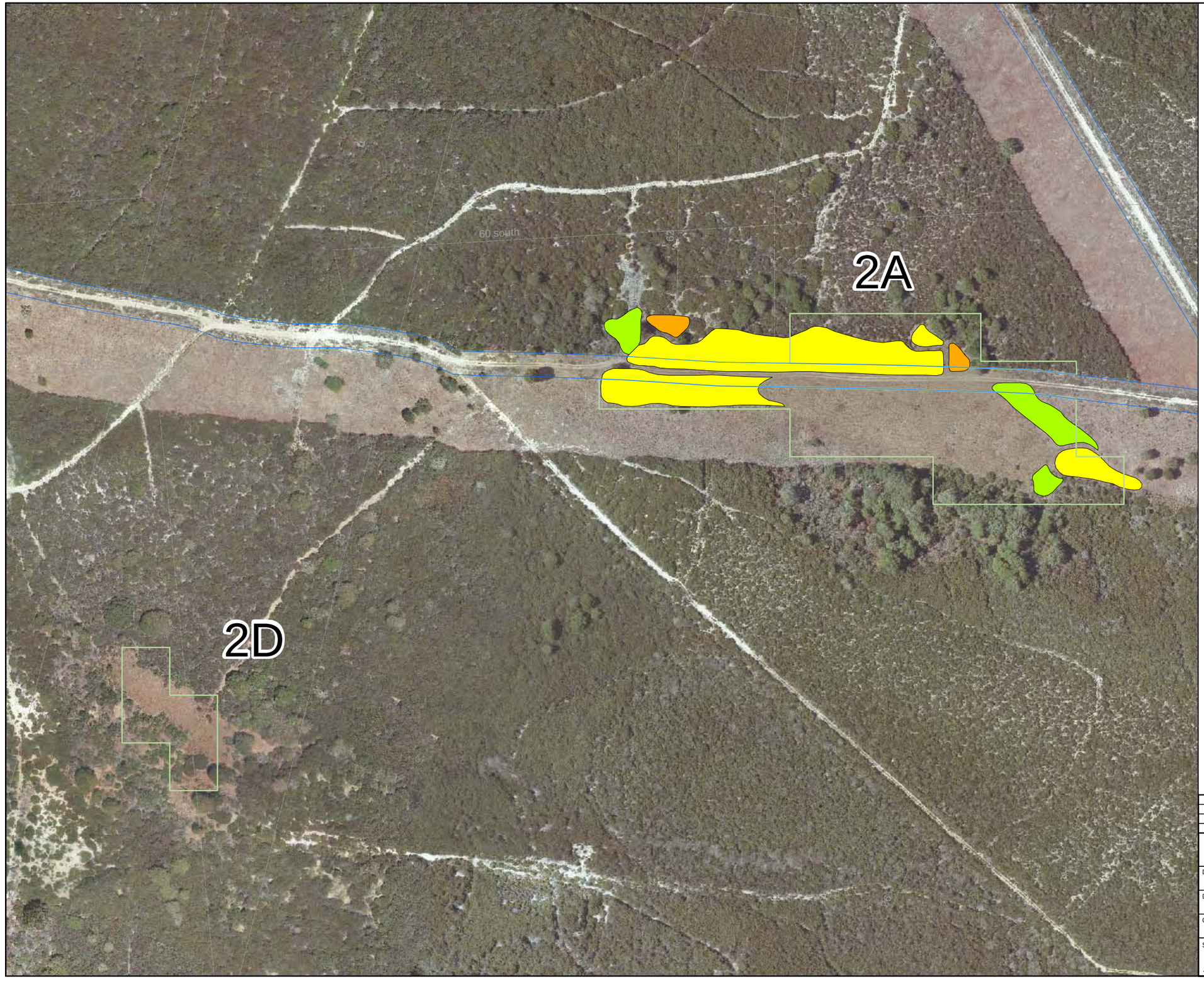
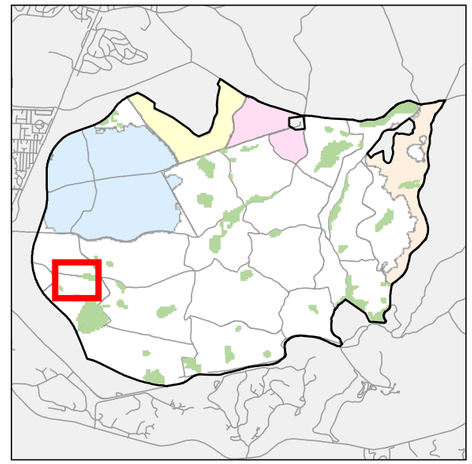
United States Fish and Wildlife Service (USFWS), 1999. *Biological Opinion on the Closure and Reuse of Fort Ord, Monterey County, California.*

USFWS, 2002. *Biological Opinion on the Closure and Reuse of Fort Ord, as it affects Monterey Critical Habitat.*

USFWS, 2005. *Biological Opinion on the Closure and Reuse of Fort Ord, as it affects CTS and Critical Habitat for Contra Costa Goldfields. And Amendment* (dated June 1, 2007).

# *Figures*



## Legend

Monterey Spineflower Cover

- Low (<5%); 0.4 acres
- Medium (6-25%); 1.8 acres
- High (26-50%); 0.1 acres
- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 200 400 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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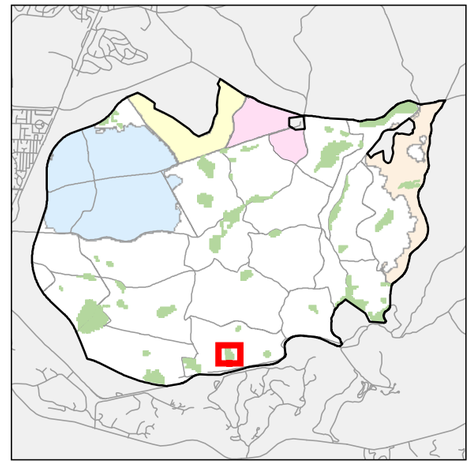
FIGURE 2-1
NON-BURN AREAS 2A AND 2D
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB2A2D_SF.mxd

## Legend

- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 100 200 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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FIGURE 2-2

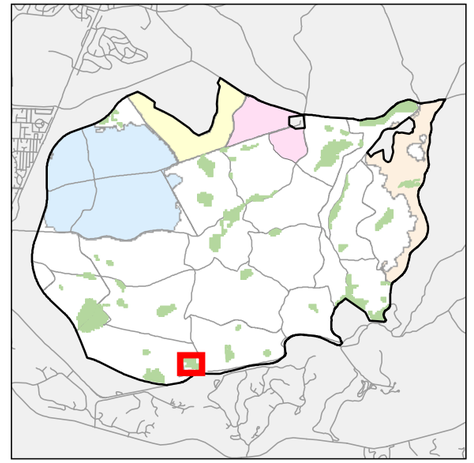
NON-BURN AREAS 4A, 5E, AND 5F
NO HMP FORBS FOUND DURING SURVEYS

FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.

SHEET FILE No. 2009_NB4A5E5F_none.mxd

## Legend

Monterey Spineflower Cover

- Low (<5%); 0.04 acres
- Medium (6-25%); 0 acres
- High (26-50%); 0 acres
- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Pond
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 100 200 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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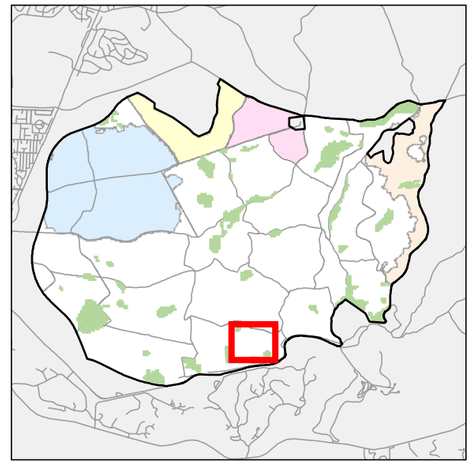
FIGURE 2-3
NON-BURN AREAS 4B AND 4C
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB4B4C_SF.mxd

## Legend

Monterey Spineflower Cover

- Low (<5%); 0.67 acres
- Medium (6-25%); 0.04 acres
- High (26-50%); 0 acres
- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Pond
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 200 400 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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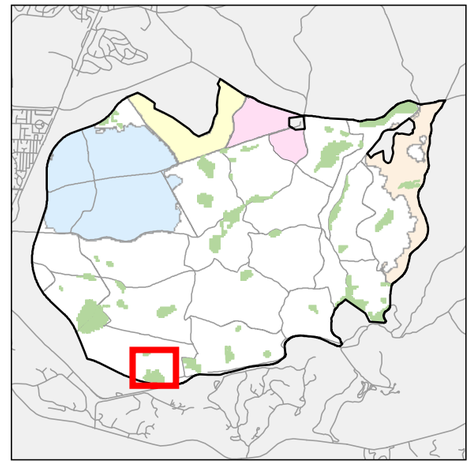
FIGURE 2-4
NON-BURN AREAS 5A AND 5C
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB5A5C_SF.mxd

## Legend

- Proposed Clearance Area
- Proposed 100-ft. Buffer
- Pond
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 200 400 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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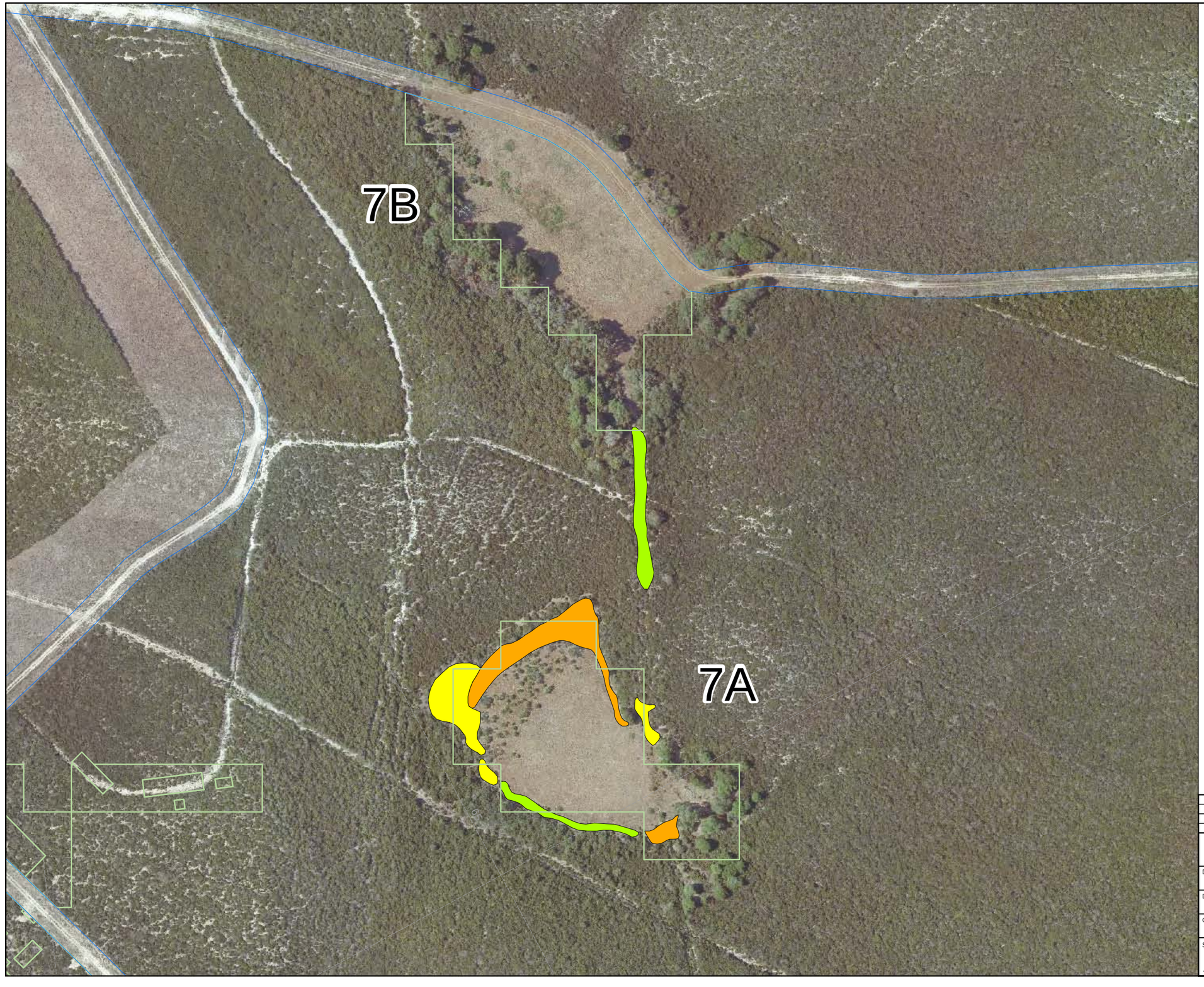
FIGURE 2-5

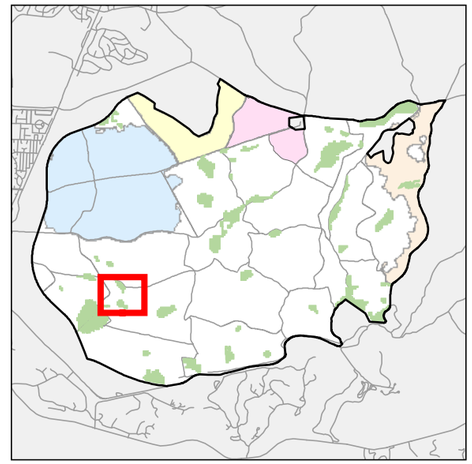
NON-BURN AREAS 6A, 6B AND 6C
NO HMP FORBS FOUND DURING SURVEYS

FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB6A6B6C_none.mxd



## Legend

Monterey Spineflower Cover

- Low (<5%); 0.3 acres
- Medium (6-25%); 0.4 acres
- High (26-50%); 0.5 acres
- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 200 400 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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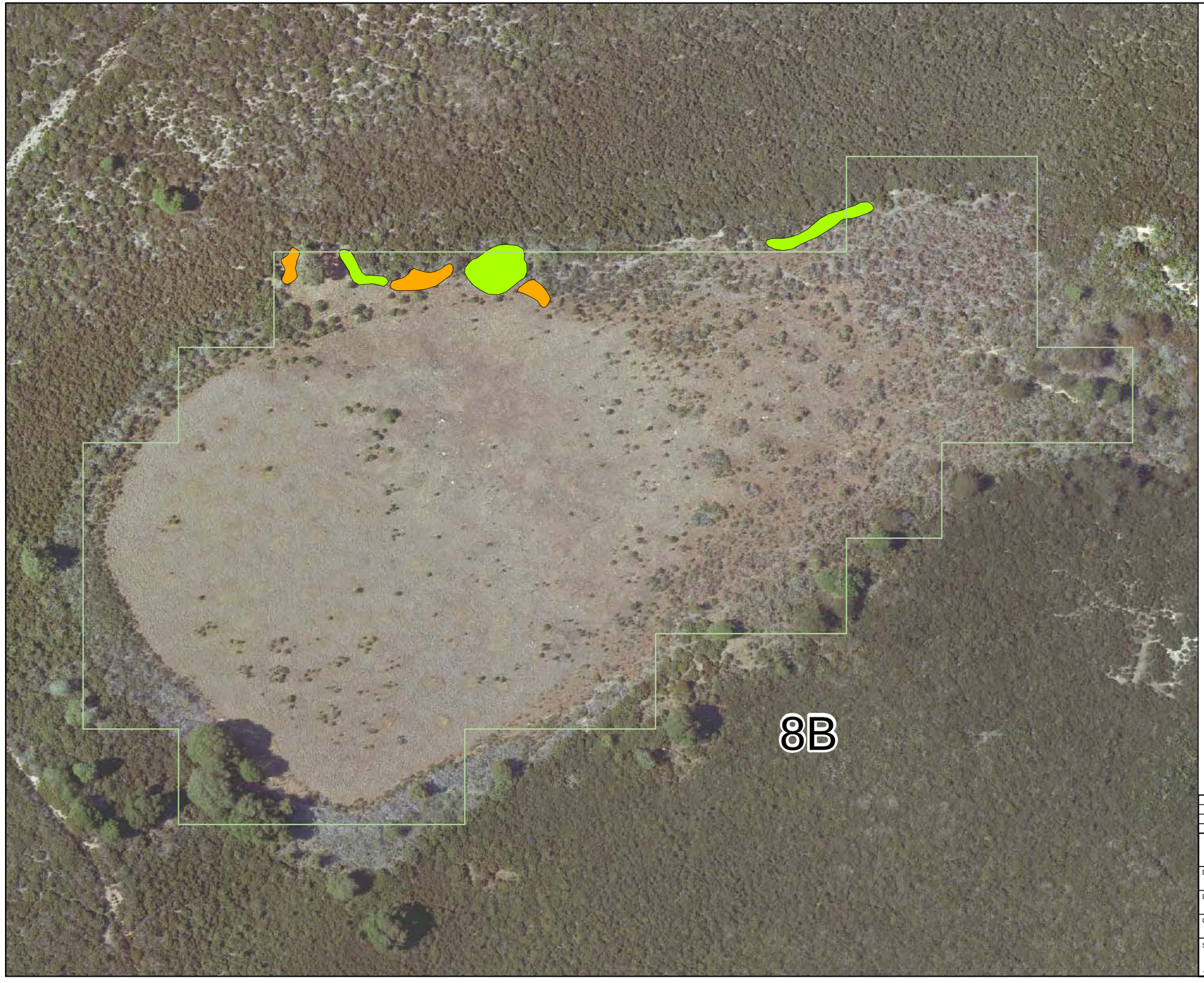
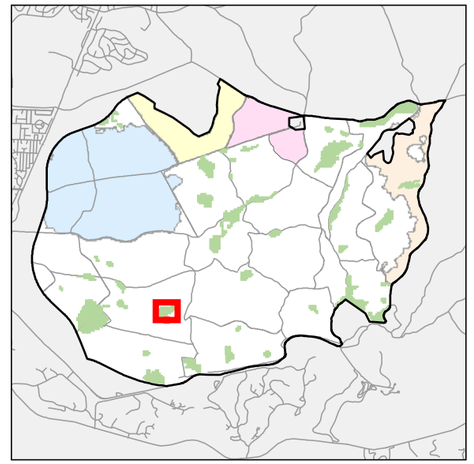
FIGURE 2-6
NON-BURN AREAS 7A AND 7B
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB7A7B_SF.mxd



## Legend

Monterey Spineflower Cover

- Low (<5%); 0.1 acres
- Medium (6-25%); 0 acres
- High (26-50%); 0.05 acres
- Proposed Clearance Area
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 100 200 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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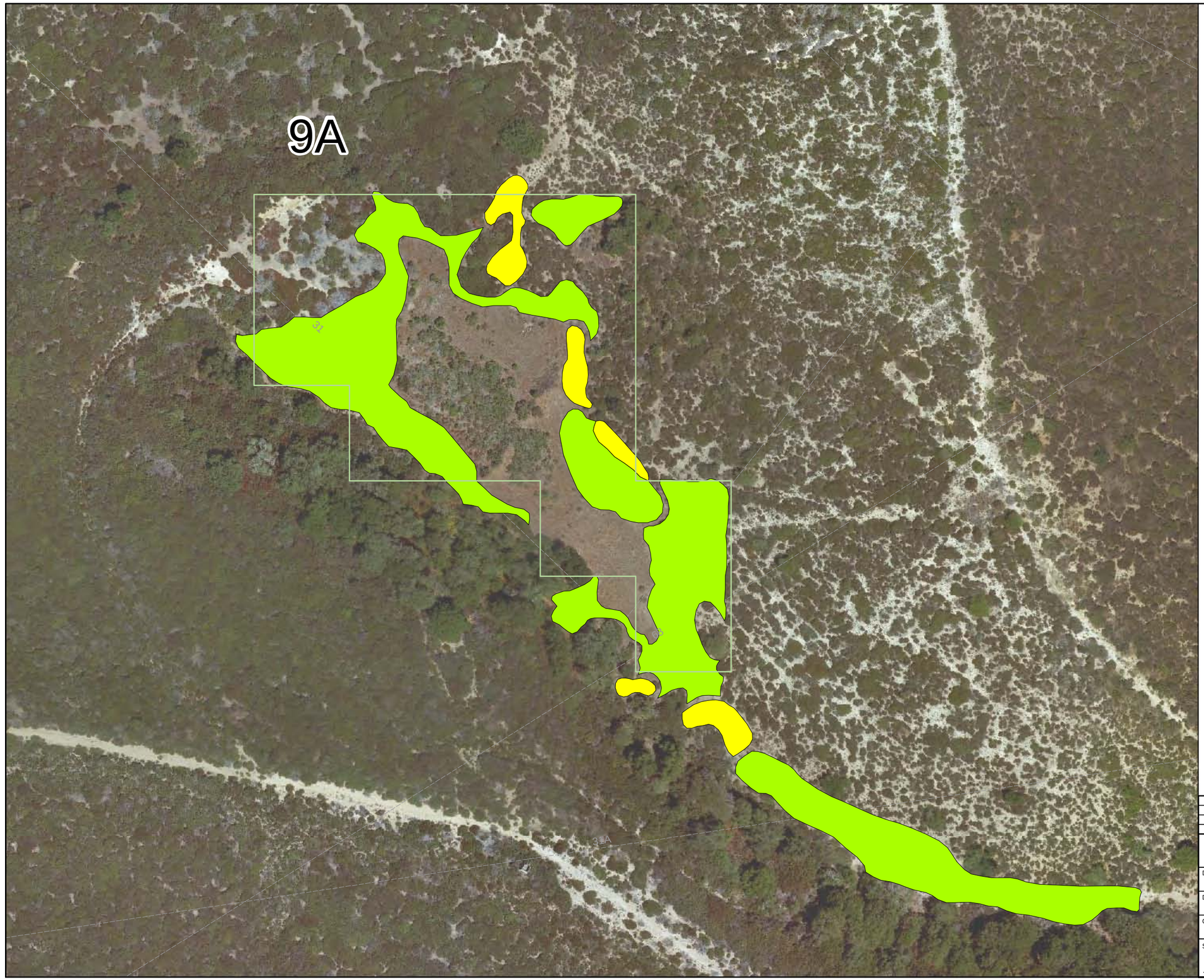
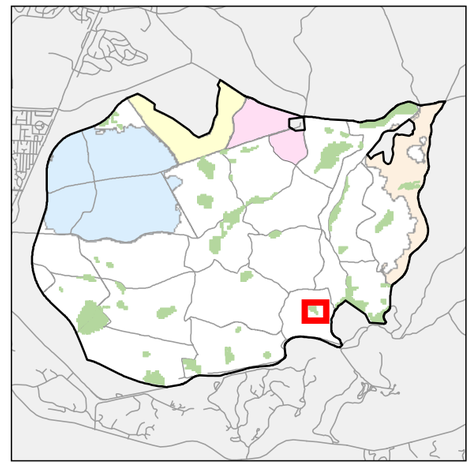
FIGURE 2-7
NON-BURN AREA 8B
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB8B_SF.mxd



## Legend

Monterey Spineflower Cover

- Low (<5%); 1.7 acres
- Medium (6-25%); 0.2 acres
- High (26-50%); 0 acres
- Proposed Clearance Area
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 100 200 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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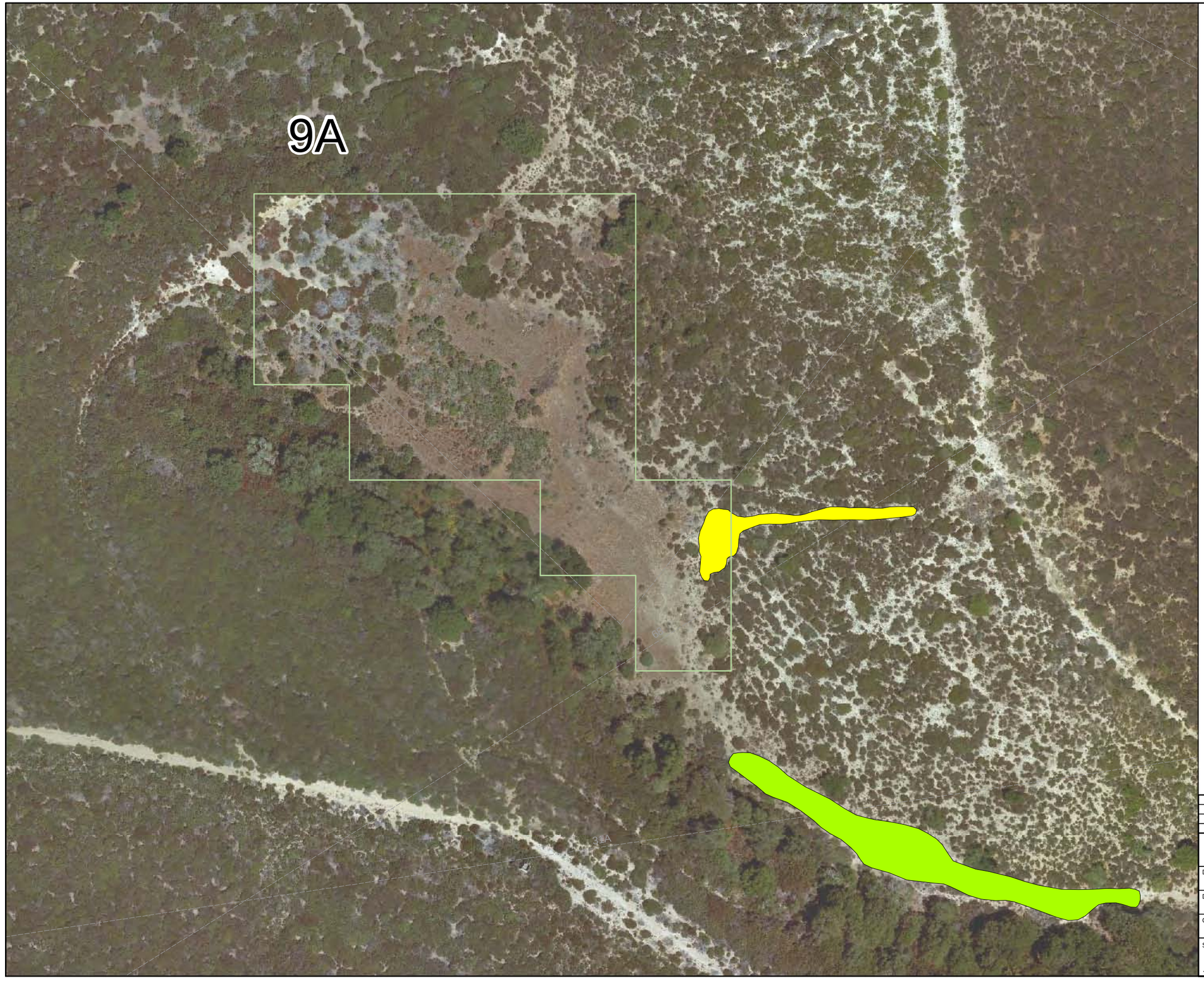
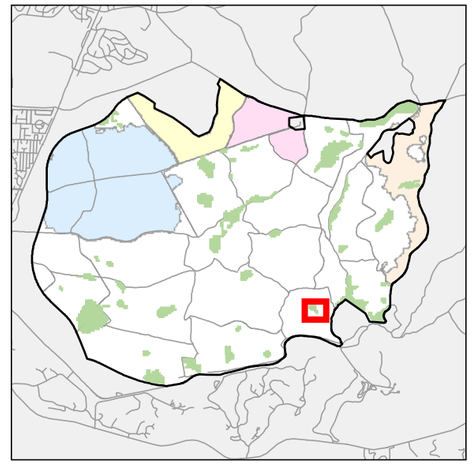
FIGURE 2-8a
NON-BURN AREA 9A
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB9A_SF.mxd



## Legend

Sand Gilia Cover

- Low Density (0-50 plants per 10,000 sq ft); 0.3 acres
- Medium Density (51-100 plants per 10,000 sq ft); 0.1 acres
- Proposed Clearance Area
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 100 200 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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FIGURE 2-8b

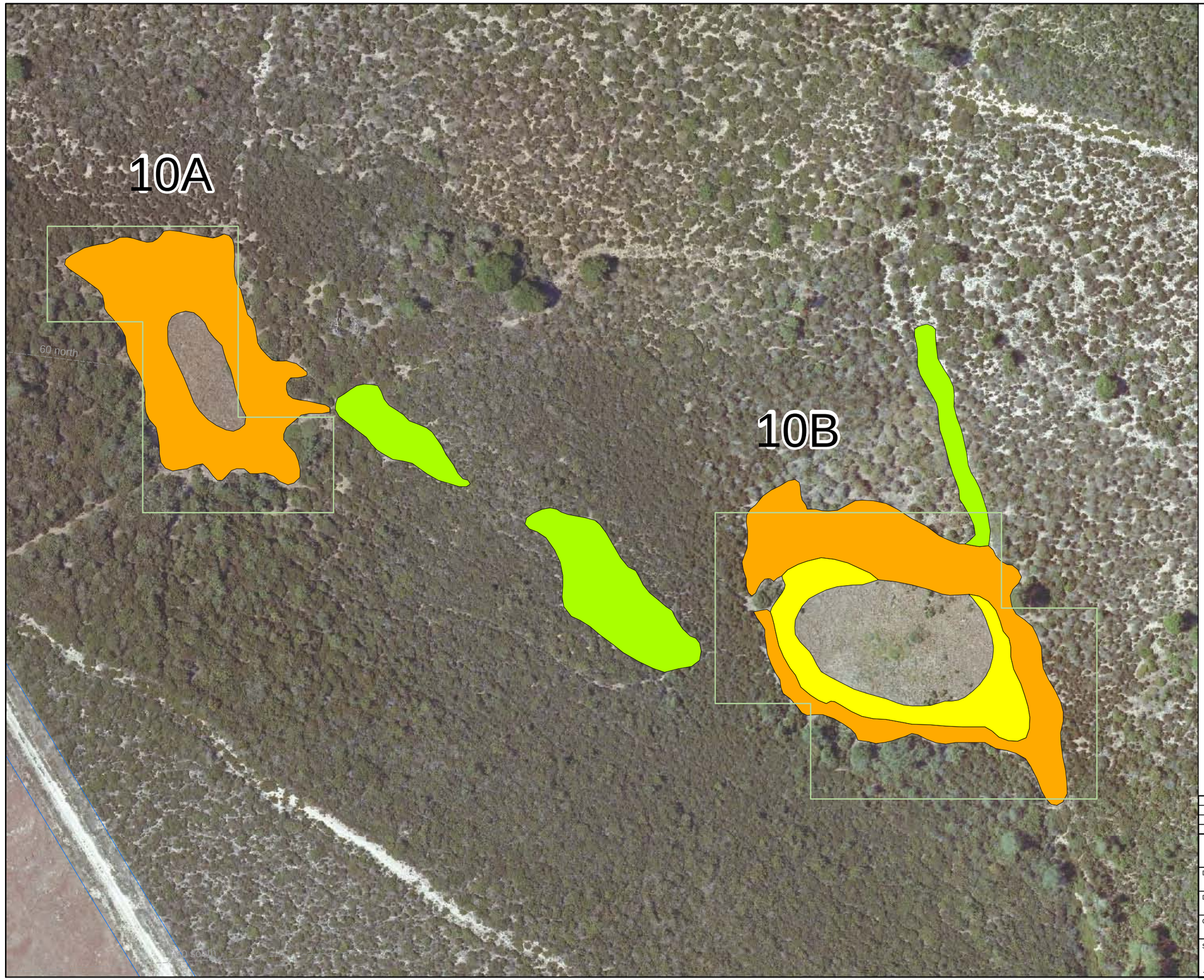
NON-BURN AREA 9A
2009 SAND GILIA LOCATIONS

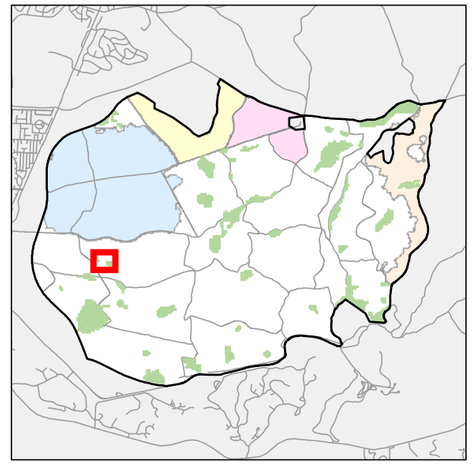
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.

SHEET FILE No. 2009_NB9A_sandgilia.mxd



## Legend

Monterey Spineflower Cover

- Low (<5%); 0.55 acres
- Medium (6-25%); 0.32 acres
- High (26-50%); 1.46 acres
- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 100 200 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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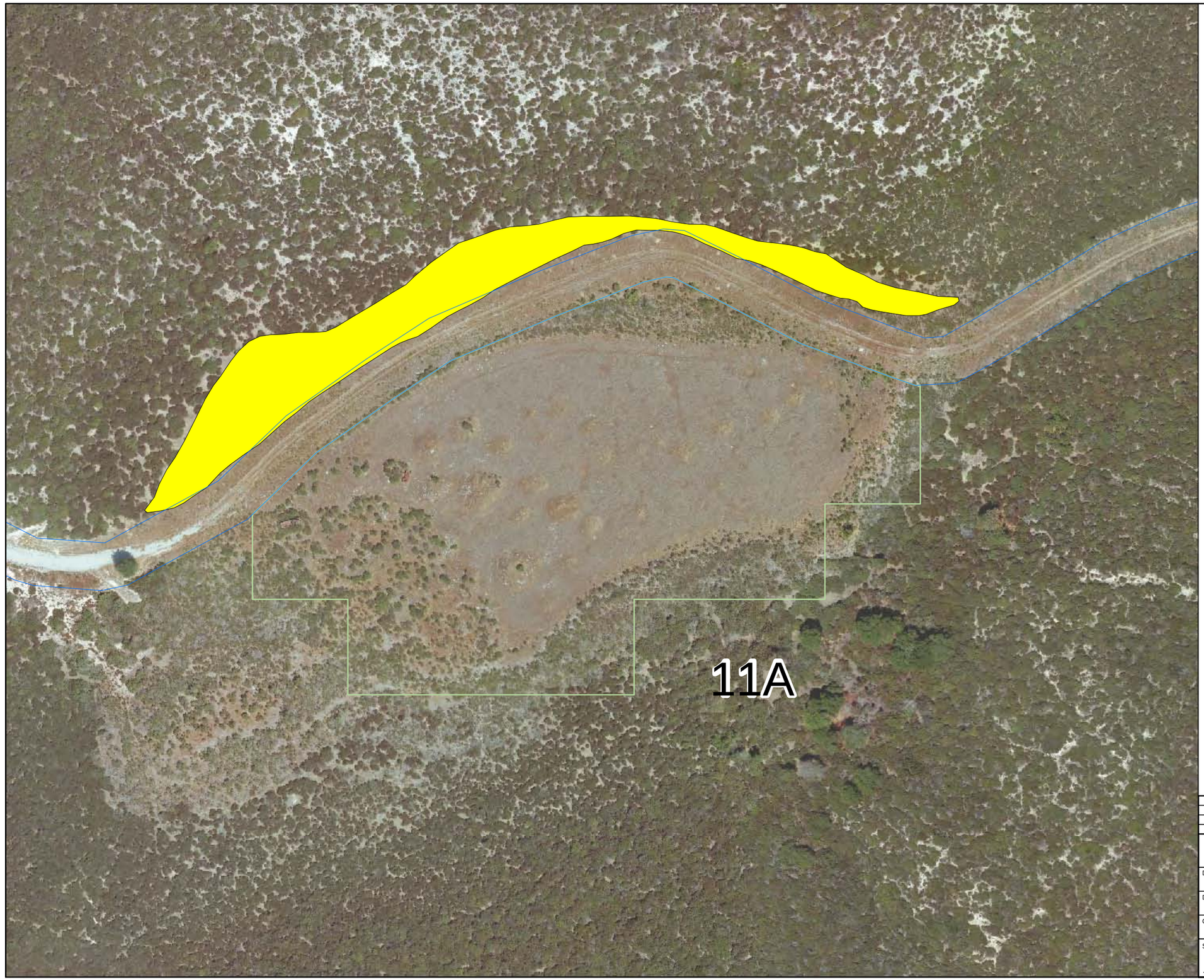
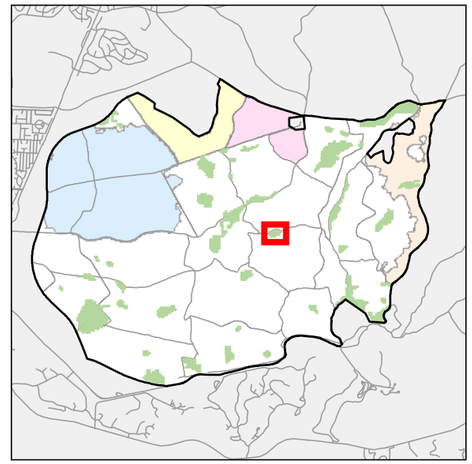
FIGURE 2-9
NON-BURN AREAS 10A AND 10B
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB10A10B_SF.mxd



## Legend

Monterey Spineflower Cover

- Low (<5%); 0 acres
- Medium (6-25%); 0.93 acres
- High (26-50%); 0 acres
- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 100 200 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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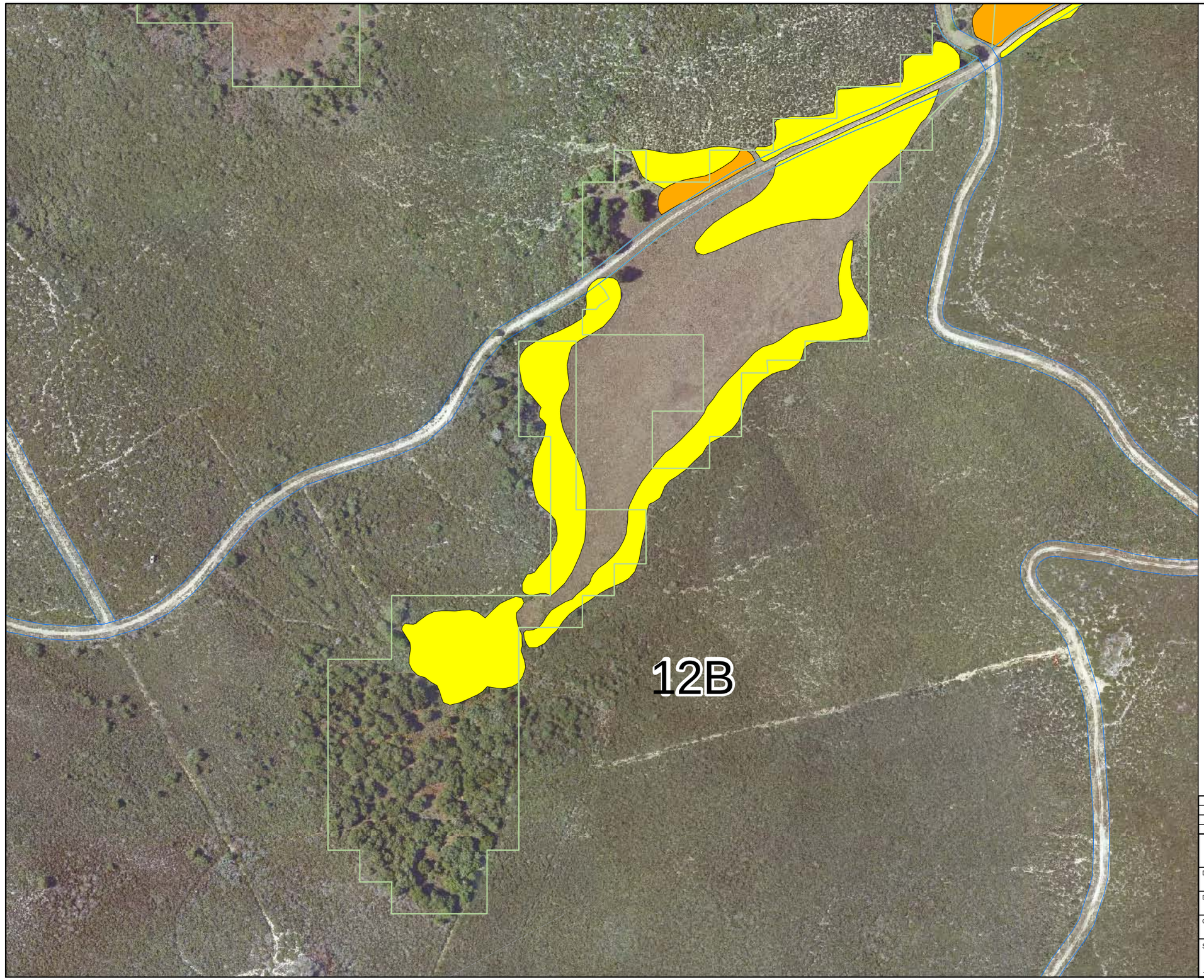
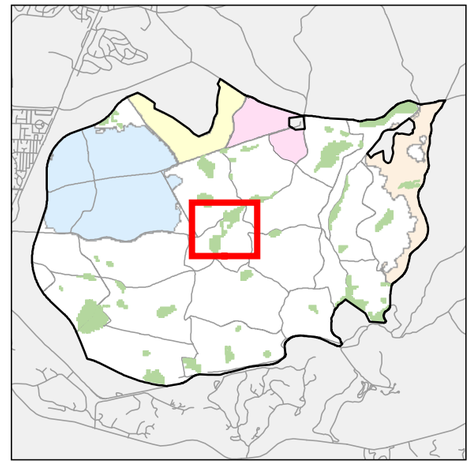
FIGURE 2-10
NON-BURN AREA 11A
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB11A_SF.mxd



## Legend

Monterey Spineflower Cover

- Low (<5%); 0 acres
- Medium (6-25%); 12.1 acres
- High (26-50%); 0.4 acres
- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

0 300 600 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
|---|---|---|---|---|
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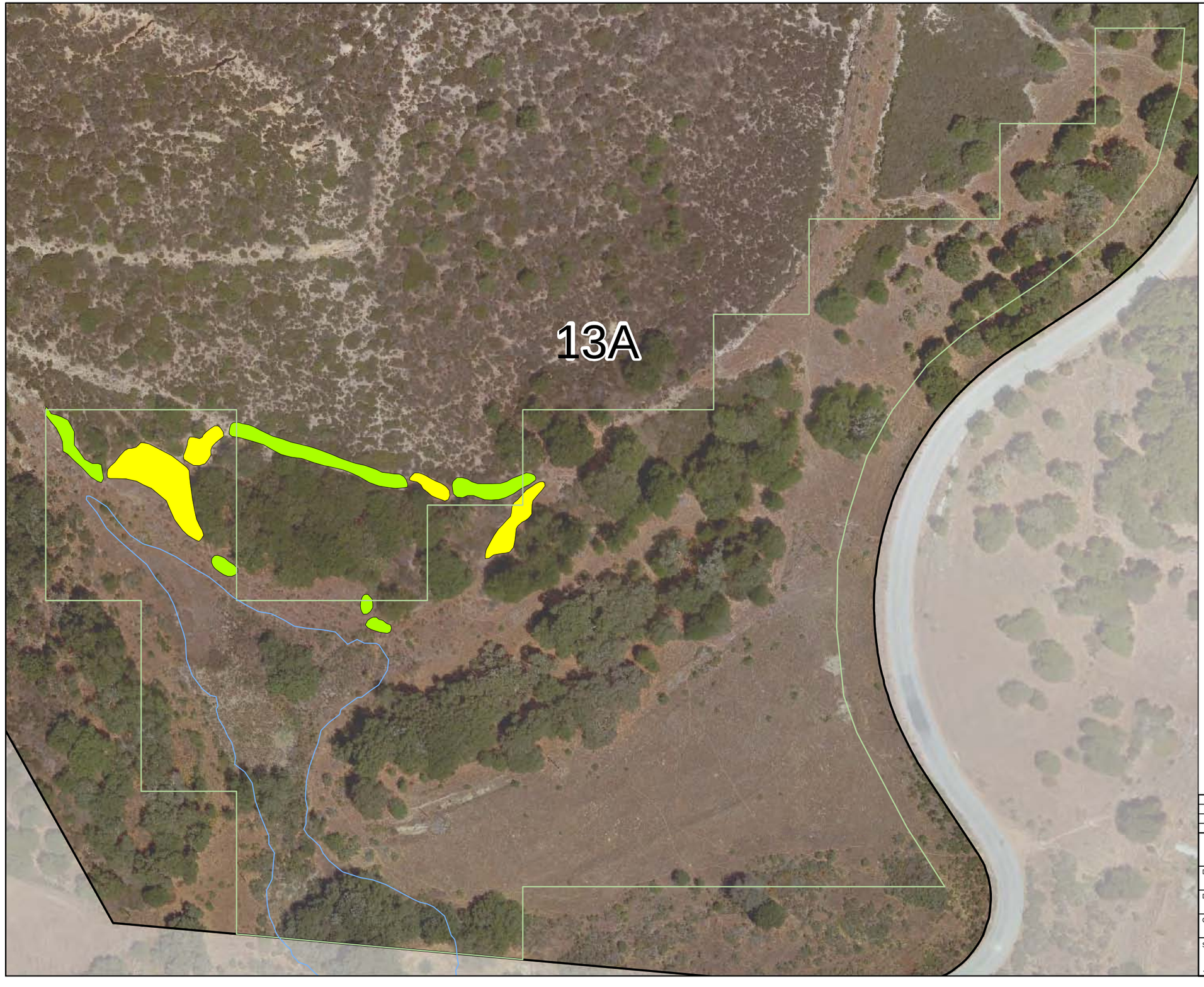
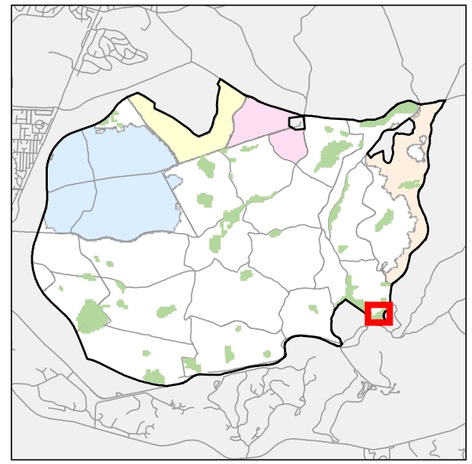
FIGURE 2-11
NON-BURN AREA 12B
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB12B_SF.mxd



## Legend

Monterey Spineflower Cover

- Low (<5%); 0.14 acres
- Medium (6-25%); 0.17 acres
- High (26-50%); 0 acres
- Proposed Clearance Area
- Pond
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 100 200 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
|---|---|---|---|---|
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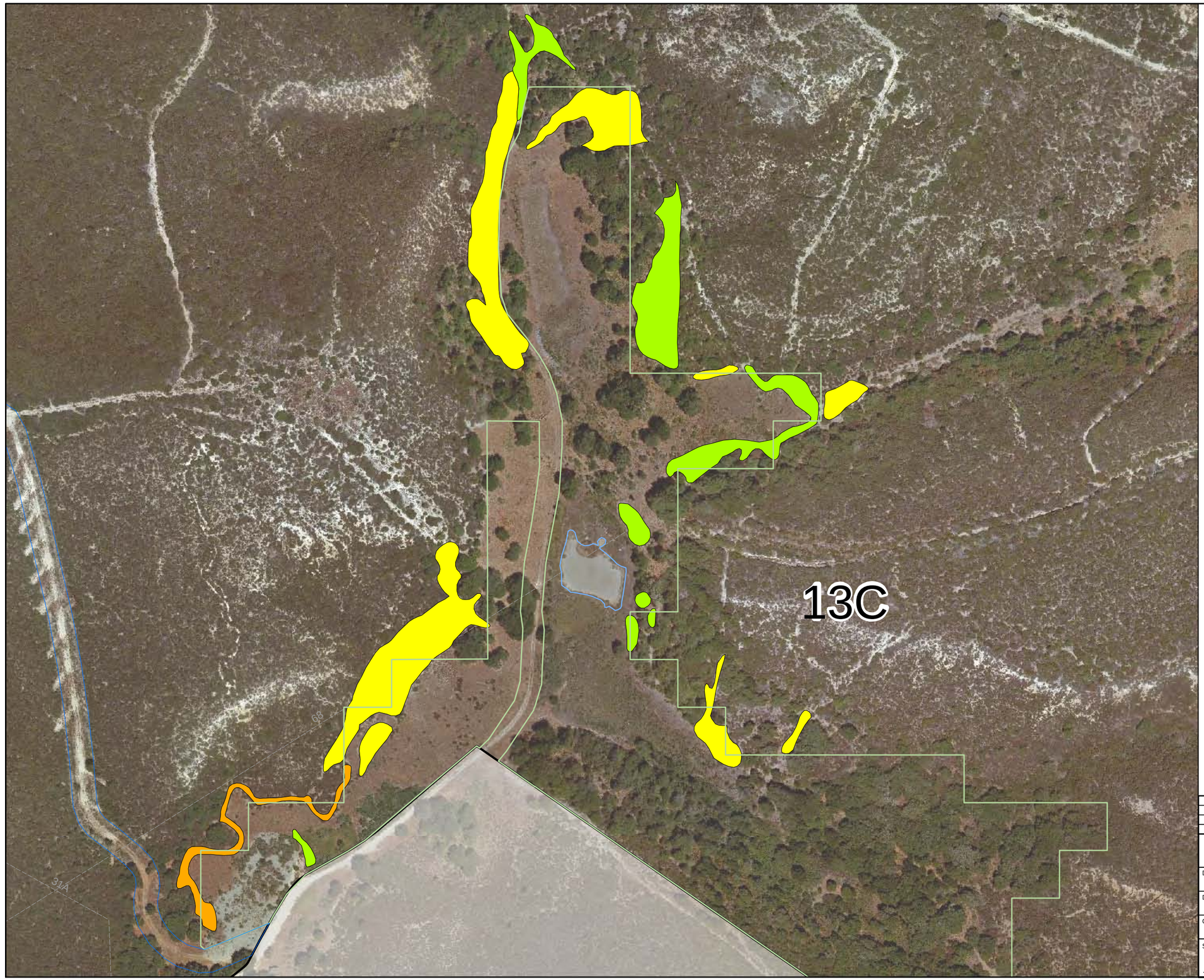
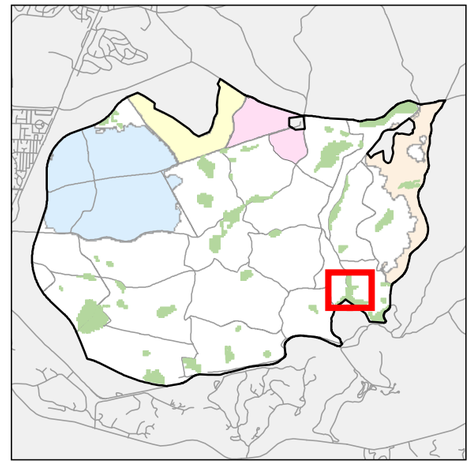
FIGURE 2-12
NON-BURN AREA 13A
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB13A_SF.mxd



## Legend

Monterey Spineflower Cover

- Low (<5%); 1.3 acres
- Medium (6-25%); 2.5 acres
- High (26-50%); 0.3 acres
- Proposed 45-ft. Fuelbreak
- Pond
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 200 400 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
|---|---|---|---|---|
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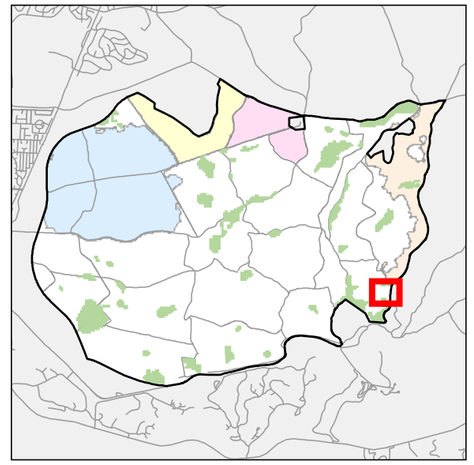
FIGURE 2-13
NON-BURN AREA 13C
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB13C_SF.mxd

13D

13B



## Legend

- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 125 250 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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FIGURE 2-14

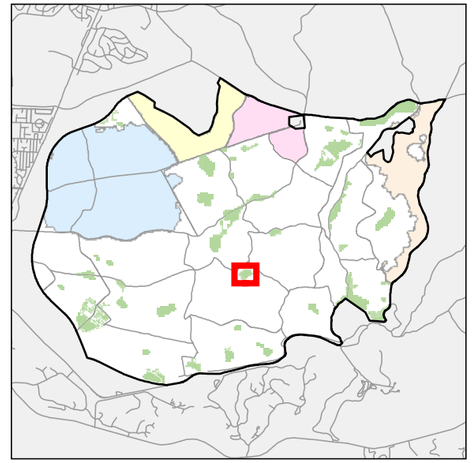
NON-BURN AREAS 13B AND 13D
NO HMP FORBS FOUND DURING SURVEYS

FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.

SHEET FILE No. 2009_NB13B13D_none.mxd

## Legend

- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 100 200 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
|---|---|---|---|---|
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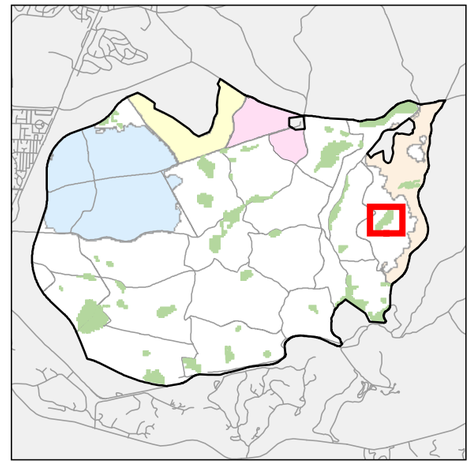
FIGURE 2-15

NON-BURN AREA 14A
NO HMP FORBS FOUND DURING SURVEYS

FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB14A_none.mxd

## Legend

- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 150 300 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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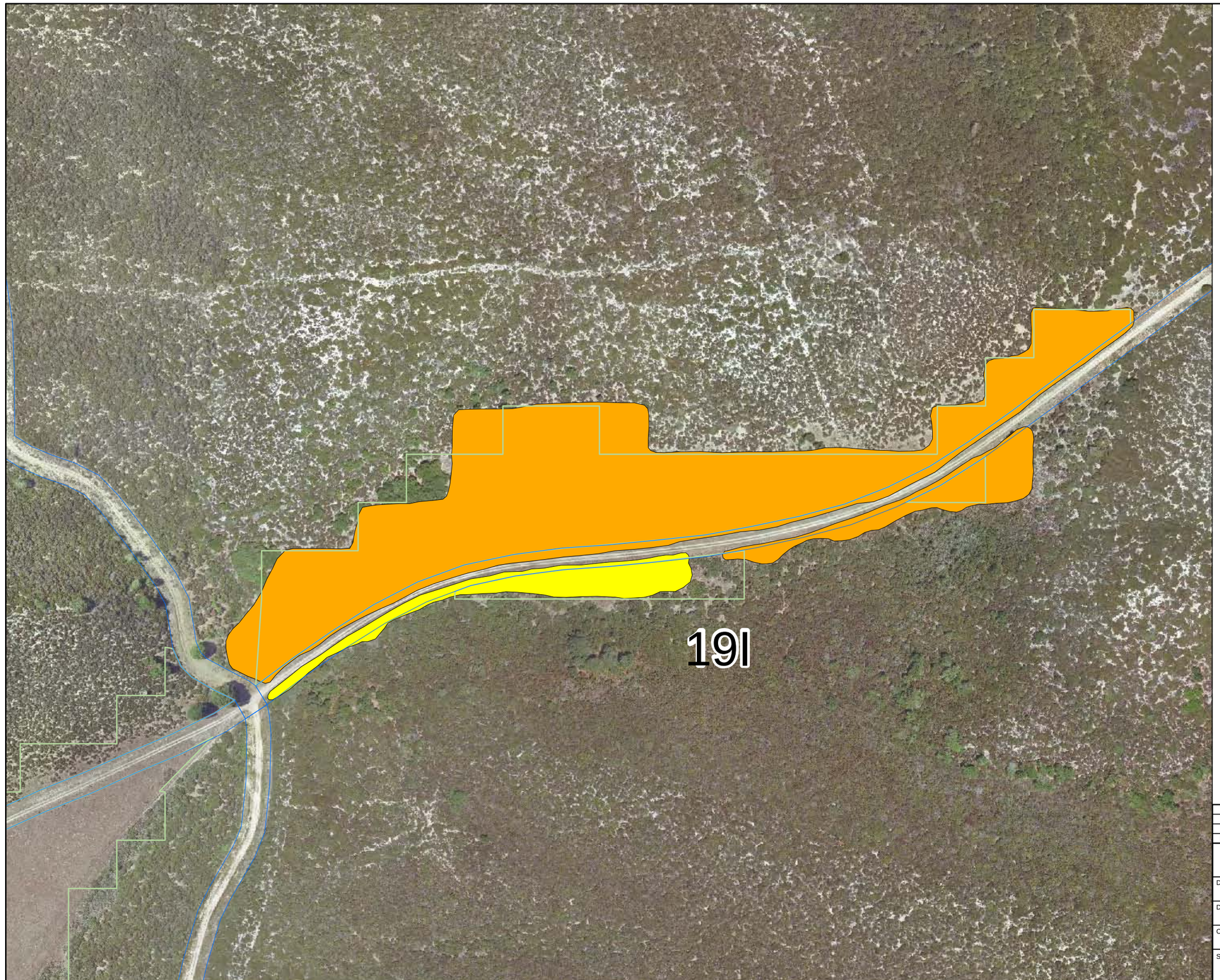
FIGURE 2-16

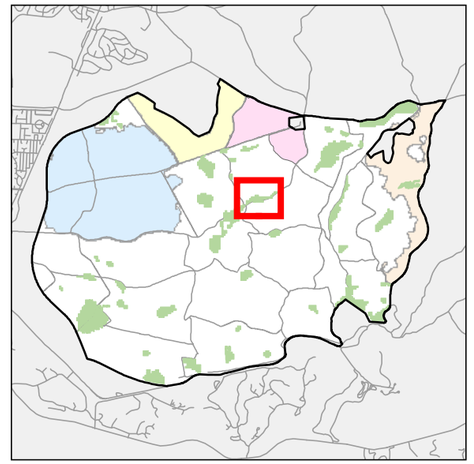
NON-BURN AREA 17E
NO HMP FORBS FOUND DURING SURVEYS

FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB17E_none.mxd



## Legend

Monterey Spineflower Cover

- Low (<5%); 0 acres
- Medium (6-25%); 0.9 acres
- High (26-50%); 8.9 acres
- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 200 400 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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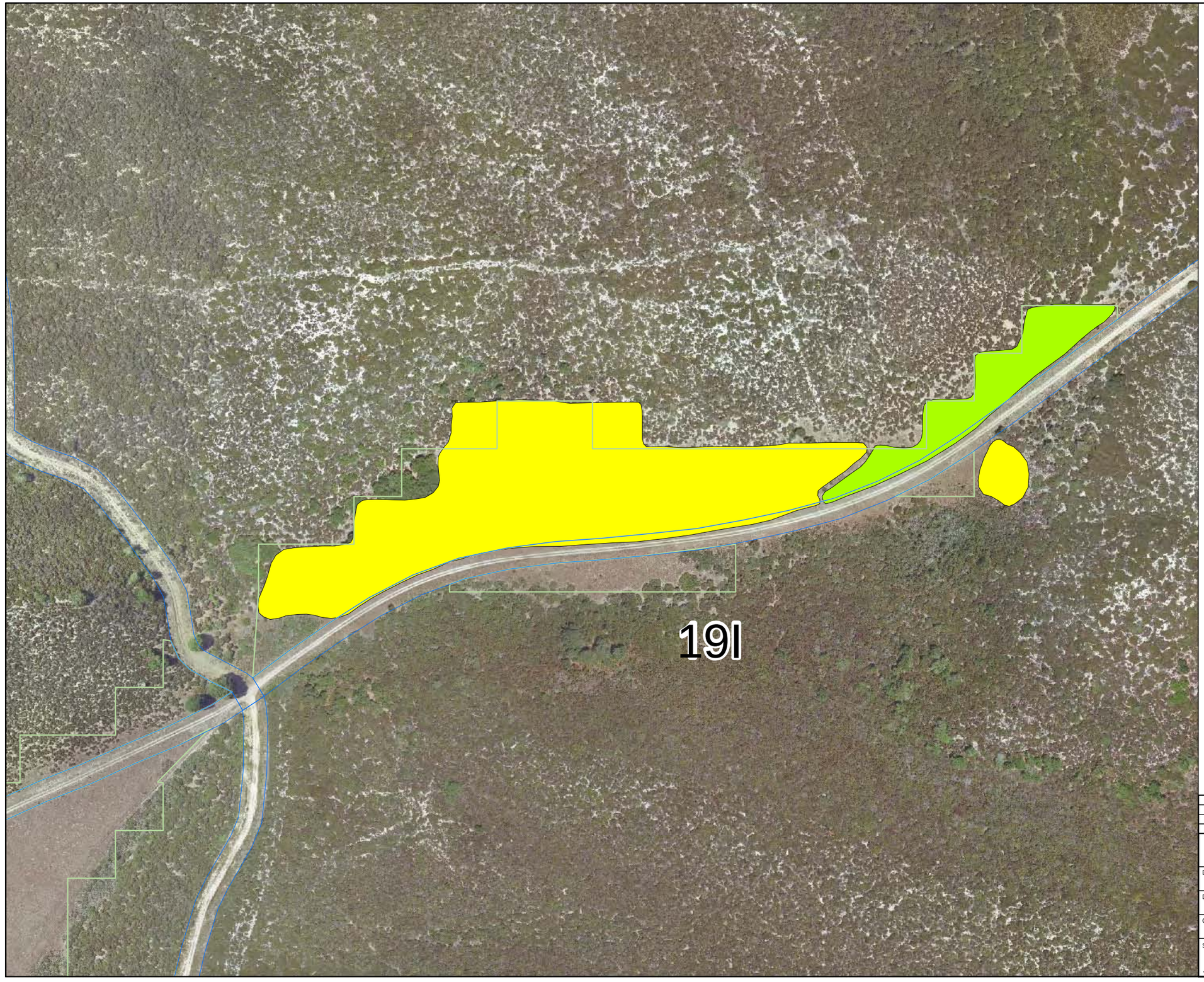
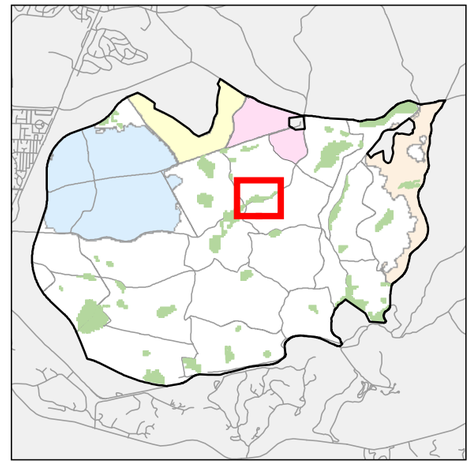
FIGURE 2-17a
NON-BURN AREA 19I
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB19I_SF.mxd



## Legend

Sand Gilia Cover

- Low Density (0-50 plants per 10,000 sq ft); 1.2 acres
- Medium Density (51-100 plants per 10,000 sq ft); 6.1 acres
- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 200 400 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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FIGURE 2-17b

NON-BURN AREA 19I
2009 SAND GILIA LOCATIONS

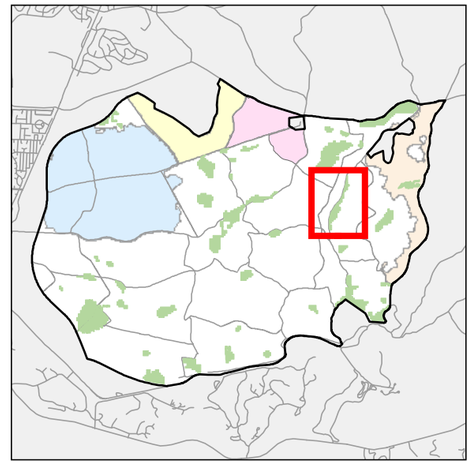
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.

SHEET FILE No. 2009_NB19I_sandgilia.mxd

20A



## Legend

Monterey Spineflower Cover

- Low (<5%); 3.0 acres
- Medium (6-25%); 0.75 acres
- High (26-50%); 0.33 acres
- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 300 600 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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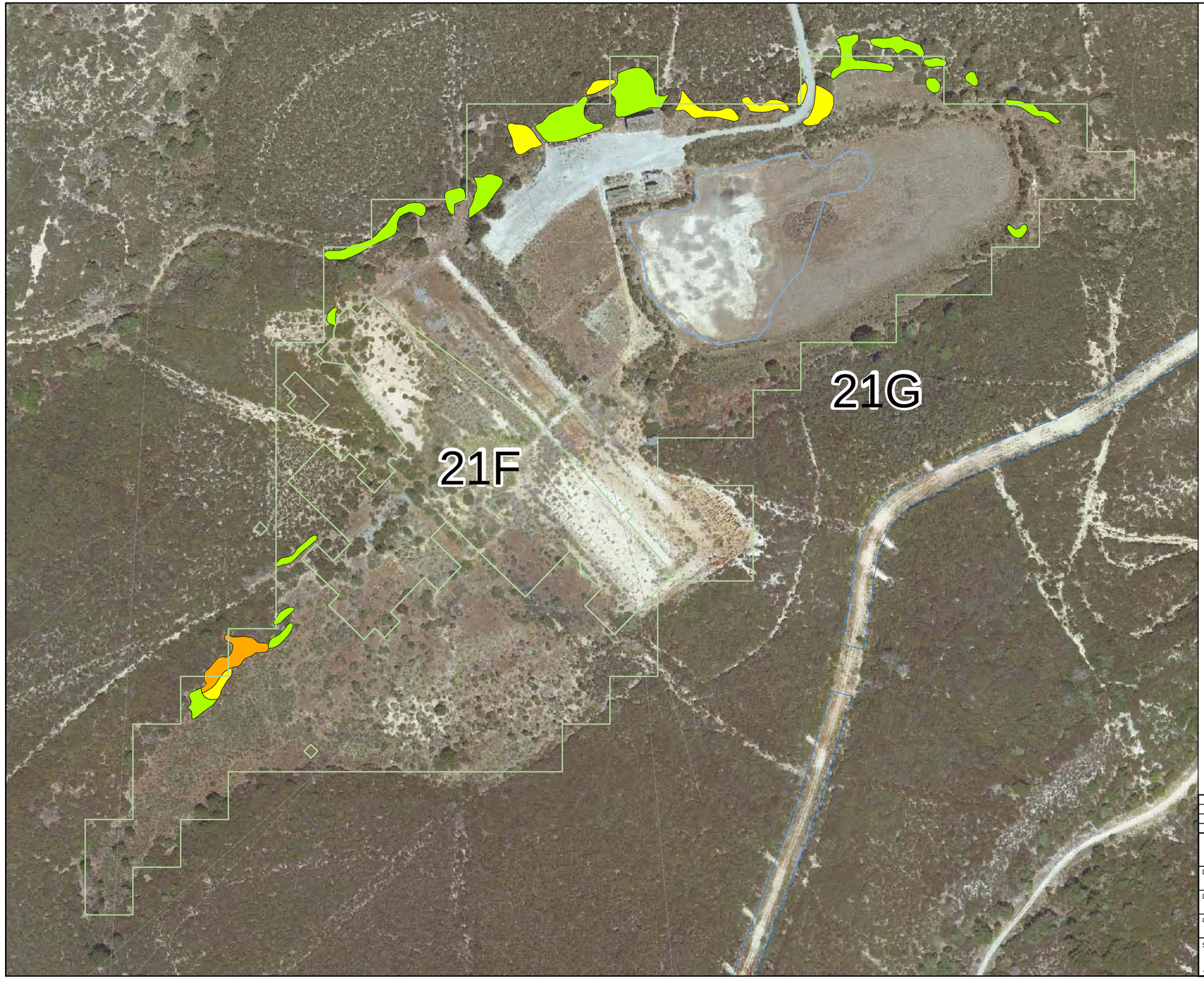
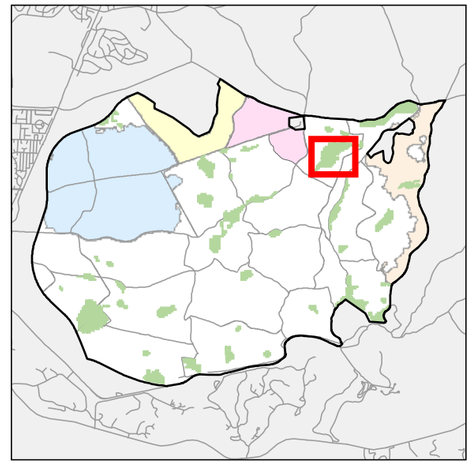
FIGURE 2-18
NON-BURN AREA 20A
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB20A_SF.mxd



## Legend

Monterey Spineflower Cover

- Low (<5%); 0.95 acres
- Medium (6-25%); 0.32 acres
- High (26-50%); 0.13 acres
- Proposed Clearance Area
- Proposed 45-ft. Fuelbreak
- Pond
- Firing Range Fans
- Eucalyptus Burn
- Watkins Gate Burn
- Previous Surface Clearance (Range 43-48)
- Burn Units 18 & 22
- Impact Area MRA

N

0 200 400 FEET

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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FIGURE 2-19
NON-BURN AREAS 21F AND 21G
MONTEREY SPINEFLOWER LOCATION AND DENSITY
FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. 2009_NB21F21G_SF.mxd


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FIGURE 3-1

CTP PILOT STUDY SITE
LOCATION OF SITE AND WELLS

FORMER FOR ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.

SHEET FILE No. CTP_location2009.mxd


| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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FIGURE 3-2
CTP PILOT STUDY SITE
2009 SAND GILIA LOCATIONS
AND DENSITY
FORMER FOR ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. CTP_sandgilia2009.mxd


| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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FIGURE 3-3
CTP PILOT STUDY SITE
2009 MONTEREY SPINEFLOWER
TOTAL DISTRIBUTION
FORMER FOR ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. CTP_spineflower2009.mxd

SHULER CIR

TALLMON ST

Marina

CRESCENT AVE

Former
Fort Ord

RESERVATION RD

N

0 100 200 FEET

**Legend**

- Well Location
- Access Route

Monterey Spineflower Cover

- Sparse (3-25%); 0.05 acres
- Medium Low (26-50%); 0.03 acres
- Medium (51-75%); 0.02 acres
- Medium High (76-97%); 0.004 acres
- Baseline Biological Survey Area
- Boundary of Former Fort Ord

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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FIGURE 3-4
CTP PILOT STUDY SITE
2009 MONTEREY SPINEFLOWER LOCATIONS
WITH DENSITY >3% COVER
FORMER FOR ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. CTP_SF density2009.mxd

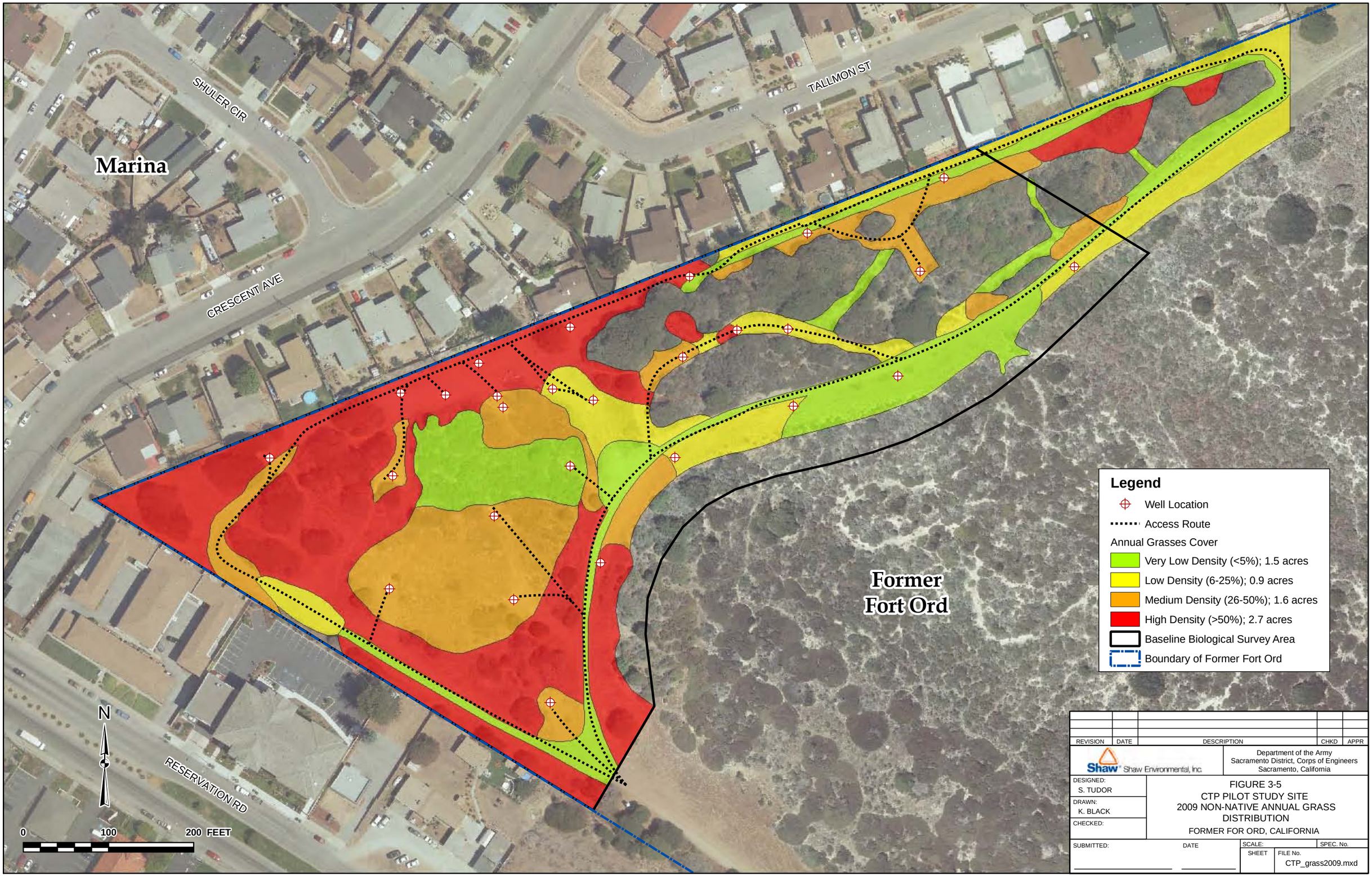


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FIGURE 3-5
CTP PILOT STUDY SITE
2009 NON-NATIVE ANNUAL GRASS DISTRIBUTION
FORMER FOR ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. CTP_grass2009.mxd

N

EW-BW-156-A
EW-BW-155-A
EW-BW-154-A
IW-BW-153-A
IW-BW-152-A
EW-BW-150-A
IW-BW-151-A
EW-BW-149-A
EW-BW-148-A
IW-BW-147-A
EW-BW-146-A
IW-BW-145-A
EW-BW-143-A
IW-BW-139-A
IW-BW-136-A
EW-BW-132-A

RESERVATION RD

0 150 300 FEET

## LEGEND

- Well Location
- Access Route
- Baseline Biological Survey Boundary
- Boundary of Former Fort Ord

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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FIGURE 4-1

OUCTP SYSTEM 2B
LOCATION OF SITE AND WELLS

FORMER FORT ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.

SHEET FILE No. OUCTP_baseline _area2009.mxd

5 plants
100 plants
5 plants
10 plants
12 plants
6 plants
40 plants
5 plants
30 plants
RESERVATION RD
N
0
150
300 FEET

## Legend

- Well Location
- Access Route
- Mapped area of Sand Gilia (0.06 acres) showing number of plants (213 total) at each location
- Baseline Biological Survey Boundary
- Boundary of Former Fort Ord

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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FIGURE 4-2
OUCTP SYSTEM 2B
2009 SAND GILIA LOCATIONS
AND DENSITY
FORMER FOR ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. OUCTP_sandgilia2009.mxd

RESERVATION RD

N

0 150 300 FEET

## Legend

- Well Location
- Access Route

Monterey Spineflower Cover

- Very Sparse (0-3%); 1.6 acres
- Sparse (3-25%); 0.13 acres
- Medium Low (26-50%); 0.01 acres
- Baseline Biological Survey Boundary
- Boundary of Former Fort Ord

| REVISION | DATE | DESCRIPTION | CHKD | APPR |
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FIGURE 4-3
OUCTP SYSTEM 2B
2009 MONTEREY SPINEFLOWER
LOCATIONS AND DENSITY
FORMER FOR ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. OUCTP_spineflower2009.mxd

RESERVATION RD

N

0 150 300 FEET

**Legend**

- Well Location
- Access Route

Annual Grasses Cover

- Very Low Density (<5%); 7.7 acres
- Low Density (6-25%); 0 acres
- Medium Density (26-50%); 1.9 acres
- Baseline Biological Survey Boundary
- Boundary of Former Fort Ord

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FIGURE 4-4
OUCTP SYSTEM 2B
2009 NON-NATIVE ANNUAL GRASS DISTRIBUTION
FORMER FOR ORD, CALIFORNIA

SUBMITTED: DATE

SCALE: SPEC. No.
SHEET FILE No. OUCTP_grass2009.mxd

# *Photographs*

**Photograph 2-1**

Non-Burn Area 2A – View of area 2A (6.2 acres) consisting mostly of grasslands, and mowed central maritime chaparral, where a fuel break was cut. Monterey spineflower was found in this area, concentrated near the shrub line.

**Photograph 2-2**

Non-Burn Area 5C – View of a wetland area (6.2 acres) surrounded by central maritime chaparral and oaks. Monterey spineflower was found on the north and east shrub edges and slopes.

**Photograph 2-3**
Non-Burn Area 6A – View of a small wetland area (2.3 acres) surrounded by central maritime chaparral and scattered oaks.

**Photograph 2-4**
Non-Burn Area 7A – View of a grassland area (4.8 acres). Monterey spineflower was found along the shrub line of the central maritime chaparral.

**Photograph 2-5**

Non-Burn Area 8B – View of a wetland area (11.5 acres). Monterey spineflower was found in scattered locations along the shrub line of the central maritime chaparral.

**Photograph 2-6**

Non-Burn Area 9A – View of a grassland area within central maritime chaparral and oaks (4.1 acres). Monterey spineflower was found in many locations around the grassland, and concentrated along the shrub line of the chaparral. Gilia, most likely *Gilia tenuiflora tenuiflora*, a non-rare gilia related to sand gilia (*G.t. arenaria)*, was found in openings on the east side of the grassland.

**Photograph 2-7**
Non-Burn Area 14A – View of a wetland area (7.8 acres). No HMP annual forbs were found at this site. The vernal pond is suspected to be a California tiger salamander breeding pond, as egg masses were identified there in 2009.

**Photograph 2-8**
Non-Burn Area 19I – View of a grassland area (8.6 acres). Monterey spineflower and sand gilia were both found in extensive populations in this area.

**Photograph 2-9**

Non-Burn Area 21G – View of a wetland area and surrounding uplands (31.8 acres). Monterey spineflower was found in scatted locations on the north side of the site. The vernal pond is known to be an important California tiger salamander breeding pond.

**Photograph 3-1**

CTP Pilot Project – View of area that had high sand gilia and Monterey spineflower density in 2007. No sand gilia were found here in 2008. In 2009, sand gilia and spineflower were both found. Ground squirrel activity within the area was evident in 2009.

**Photograph 3-2**

CTP Pilot Project – South perimeter access route in May 2009. The route still has lower density of annual grasses and forbs compared to the two previous years, due to concentrated use for access and staging, but vegetation recovery is beginning.

**Photograph 3-3**
CTP Pilot Project – View of the central maritime chaparral burn area, with similar cover of annual grasses as in the previous year.

**Photograph 3-4**
CTP Pilot Project – Access route to well IW-03 (in background) taken from the south end of the access route. Monterey spineflower was present in 2007 throughout this route. This is an area of relatively high annual grass density in the south part of the route.

**Photograph 3-5**

CTP Pilot Project – View of fuel break just south of well EW-02. Annual grass density is low in this section. Monterey spineflower was found, particularly along the shrub line.

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**Photograph 3-6**

CTP Pilot Project – View of fuel break at well EW-08. Annual grass density is medium in this section. Monterey spineflower was found along the shrub line.

**Photograph 3-7**
CTP Pilot Project – View of access route to well IW-02. Sandmat manzanita have shown regrowth since impacts to the plants in 2007.

**Photograph 3-8**
CTP Pilot Project – View of access route to well IW-01 in the 20 x 30-ft area. Coastal scrub species (coffeeberry, poison oak, sticky monkey flower) have begun to resprout since mowing of the area in 2007.

**Photograph 4-1**

OUCTP System 2B – View of access route to wells EW-BW-148A and 150A from the perimeter road. The route required mowing about 2 ft on either side (up to red flagging, as marked in photo) to create a total width of 10 ft to accommodate access for a drill rig and fork lift. The vegetation is primarily a low-growing stand of sandmat manzanita, with shaggy-barked manzanita.

**Photograph 4-2**

OUCTP System 2B – View of access route to well EW-BW-150A (orange flagged stake). The blue flagged area was demarcated to protect a significant sand gilia patch (100 plants) to the left of the flagging. Mowing of shrubs was required to establish a vehicle access route (to the red flagging in photo).

**Photograph 4-3**

OUCTP System 2B – View of location for well EW-BW-148A (wooden stake), located within the shrub line, along the above shown access route. Mowing of shrubs was required up to the orange flagging shown in photo to establish a vehicle access route. A small patch of sand gilia (10 plants) was located in the vicinity of this well.

**Photograph 4-4**

OUCTP System 2B – View of access route for well IW-BW-152A leading in from the perimeter road. A one-way loop access route was mowed to accommodate access to three wells in this area. Shrub growth was mowed between the red flagging to a width of 10 ft. Shrubs were mostly shaggy-barked manzanita, coyote brush, chamise, and black sage.

**Photograph 4-5**

OUCTP System 2B – View of location for well IW-BW-154A (wooden stake), located at the edge of the fuel break and shrub line. The shrub line zone typically provides habitat for relatively high densities of Monterey spineflower, and low densities of annual grasses and forbs.

**Photograph 4-6**

OUCTP System 2B – View of location for well EW-BW-143A (wooden stake), located about 75 ft inside the shrub line of the fuel break. Mowing of a 10-ft-wide route was required for vehicle access to this location. Plant surveys of the area indicated presence of Monterey spineflower at Very Sparse (0-3%) cover in this area.

**Photograph 4-7**

OUCTP System 2B – View of location for well IW-BW-154A (wooden stake), located at the edge of the fuel break and shrub line. This area had Monterey spineflower at Very Sparse (0-3%) cover. Shrubs were mowed to a width of 10 ft to create an access route.

**Photograph 4-8**

OUCTP System 2B – View of location for well EW-BW-149A (wooden stake), located along a trail about 75 ft from the perimeter fuel break. This route had Monterey spineflower at Very Sparse (0-3%) cover. Shrubs required mowing to a width of 10 ft to accommodate drill rig and forklift. Shrubs in this area were shaggy-barked manzanita, chamise, and black sage.

# *Appendix A*
# *California Tiger Salamander and California Fairy Shrimp Aquatic Sampling Survey Report*

# California Tiger Salamander and California Fairy Shrimp Aquatic Sampling Survey Report

**Prepared for:**
**Shaw Environmental, Inc.**

**Prepared By:**
**Denise Duffy & Associates, Inc.**

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**October 2009**

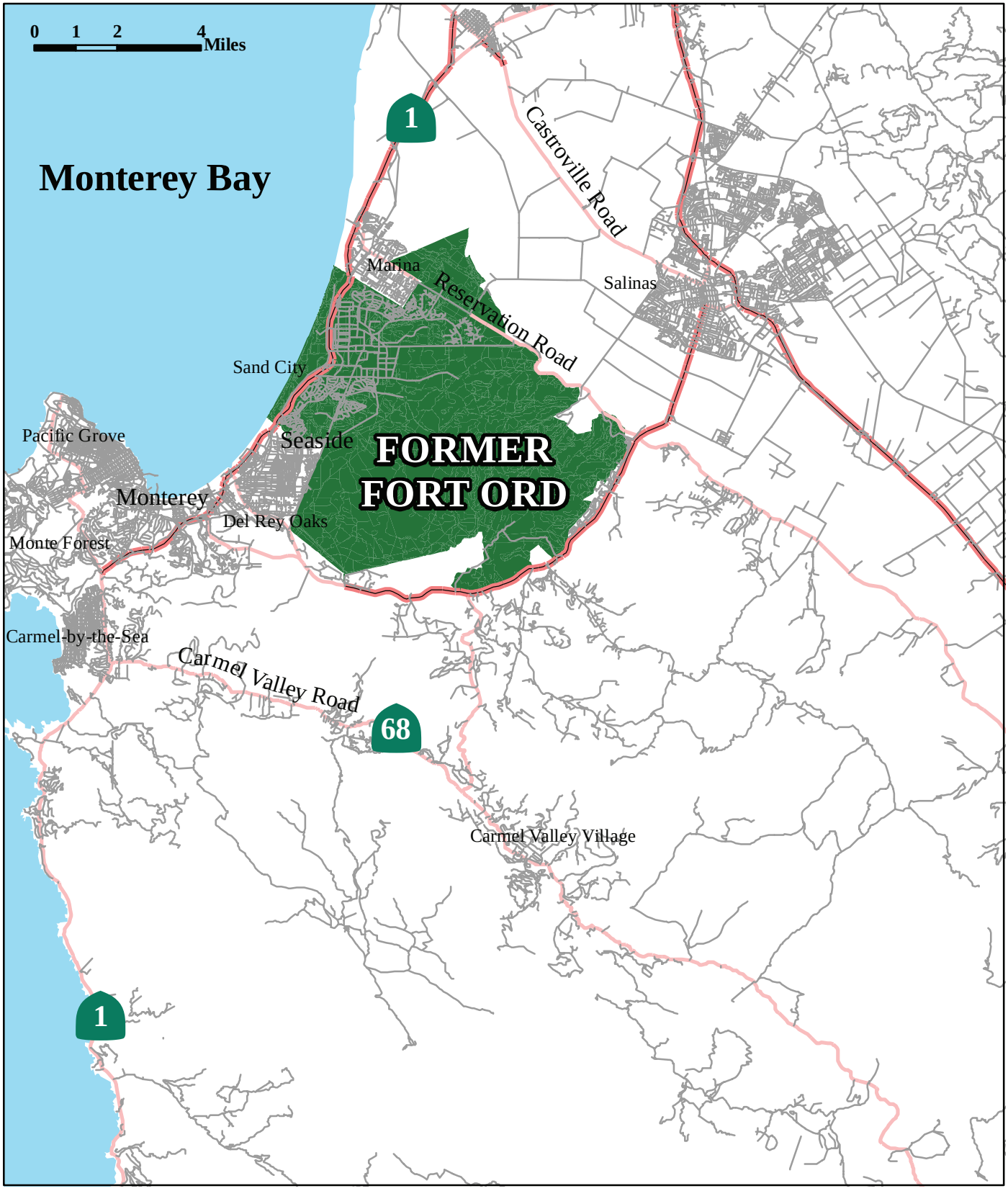
## SUMMARY

The Army is required to conduct wetland monitoring surveys in any areas where environmental cleanup activities could possibly impact protected wetland species on the Former Fort Ord U.S. Army base (Fort Ord), in Monterey County, California (Figure 1). This study provides faunal wetland baseline data for Ranges where soil remediation is likely to be performed in the near future, and could possibly have biological impacts on protected wetland species or habitat. The monitoring study is consistent with the "*Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remedial Activities at Former Fort Ord*" (USACOE, 2006). Faunal baseline aquatic sampling studies were conducted by Denise Duffy and Associates, Inc. (DD&A) to determine the presence/absence of the federally Threatened California tiger salamander (*Ambystoma californiense,* CTS) and invertebrates, including the California fairy shrimp (*Linderiella occidentalis*), a federal species of special concern, at several locations within Fort Ord. Five study sites (Pools 54, 49, 21, 17, and 16) were identified for surveys (Figure 2). All of the pools were sampled on 12 March and 2 April, but only Pool 16 had enough water to be sampled a third time on 22 April. All five water bodies were sampled twice between January and March 2007 for invertebrates. Methods for invertebrate sampling included using dip nets to sample representative portions of each water body to determine presence/absence of California fairy shrimp and collecting samples for branchiopod abundance counts. Methods for CTS sampling followed guidelines provided in the "*Interim guidance on site assessment and field surveys for determining presence or a negative finding of the California tiger salamander"* developed by the United States Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG) in 2003.

During invertebrate sampling, California fairy shrimp were observed only at Pool 16. Other branchiopods observed were cladocerans (water fleas) and conchostracans (clam shrimp) at all five water bodies. Additional species observed during these sampling events were copepods, ostracods, water beetles, diving beetles, mosquitoes, dragonfly and damselfly larvae, and Pacific tree frog (*Hyla regilla*), waterfowl, and other birds. During CTS aquatic sampling, CTS eggs were observed at Pools 54 and 16 during the first round of sampling on 12 March. CTS larvae were observed only at Pool 16 during the last round of surveys on 22 April.

## INTRODUCTION

DD&A was contracted by Shaw Environmental, Inc. (Shaw) to conduct aquatic sampling surveys for the federally Threatened CTS and California fairy shrimp, a federal species of special concern, at several locations within Fort Ord, in Monterey County, California (Figure 1). This work was conducted in support of the Shaw Total Environmental Restoration Contract (TERC) with the U.S. Department of the Army Corps of Engineers (USACOE). This report presents the results of invertebrate and protocol-level CTS aquatic sampling surveys within five study sites (Pools 54, 49, 21, 17, and 16).

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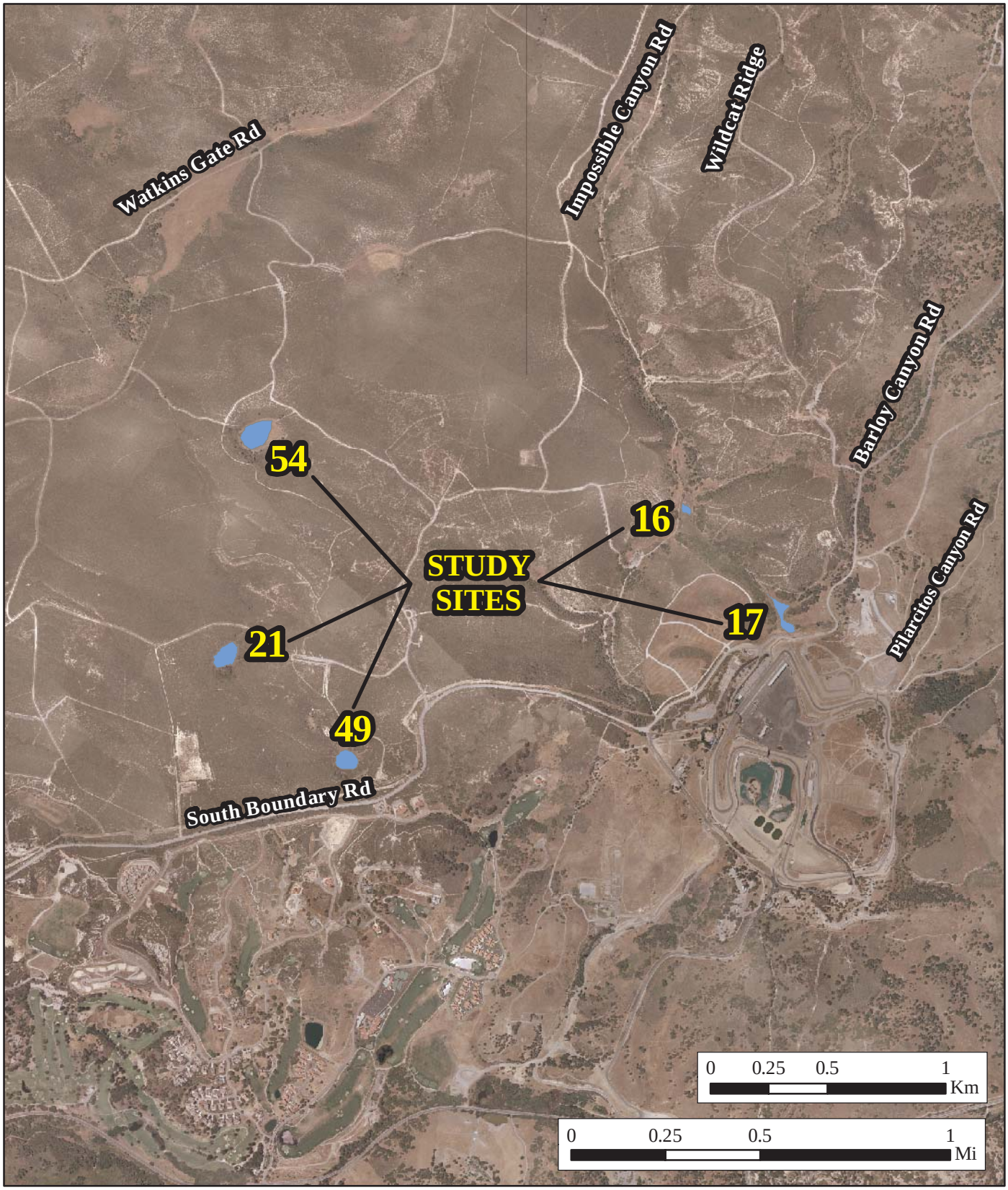
# Project Vicinity

Figure 1

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# Project Study Sites

Figure 2

DD&A biologists were authorized to initiate aquatic sampling at the Fort Ord water bodies by the 1999 USFWS Biological Opinion on the Closure and Reuse of Fort Ord, Monterey County, California, and via project-specific authorization from the USFWS Ventura Field Office. All initial observations of CTS larvae were reported to the USFWS Ventura Field Office via e-mail within 72 hours.

## SPECIES DESCRIPTIONS

### *California Tiger Salamander*

CTS, specifically the Central California Distinct Population Segment (DPS), were listed as a federally Threatened species on August 4, 2004 (USFWS, 2004), and are also a designated California state species of special concern. Critical Habitat was designated for CTS on August 23, 2005 (USFWS, 2005a), and went into effect on September 22, 2005. However, Critical Habitat on Fort Ord was excluded for economic reasons.

CTS is a large, stocky salamander that inhabits grasslands and oak savanna habitats in the valleys and low hills of central and coastal California. Adults spend most of their lives underground, typically in burrows of ground squirrels and other animals. During winter rains, between November and February, adults emerge from underground retreats to breed (Stebbins, 2003). Adults may travel long distances between upland sites and breeding sites, and above-ground activity may occur under suitable environmental conditions through May. During breeding migrations, individuals are sometimes found under surface objects such as rocks and logs.

CTS persist in disjunct remnant vernal pool complexes in Sonoma County and Santa Barbara County, in vernal pool complexes and isolated stocks scattered along a narrow strip of rangeland on the fringes of the Central Valley from southern Colusa County south to northern Kern County, and in sag ponds and human maintained stockponds in the coast ranges from the San Francisco Bay Area south to the Temblor Range. Tiger salamanders breed and lay eggs primarily in vernal pools and other temporary rainwater ponds following relatively warm rains in November to February. Adults have been found more than two km (1.24 miles) from breeding sites. Permanent human-made ponds are sometimes utilized if predatory fishes are absent; streams are rarely used for reproduction. Males typically spend six to eight weeks at breeding ponds, while females typically spend only one to two weeks (Loredo et al., 1996). Eggs are laid singly or in clumps on both submerged and emergent vegetation and on submerged debris in shallow water (Stebbins, 1972; Jennings and Hayes, 1994). In years of below average rainfall, or when rains occur late in the season, females may forego breeding (Trehnam et al., 2000). CTS has been eliminated from an estimated 55 to 58 percent of its documented historic breeding sites. Currently, about 150 known local populations of California tiger salamanders are extant.

### *California Fairy Shrimp*

The California fairy shrimp (*Linderiella occidentalis*) is a federal species of special concern. It was proposed for listing along with the vernal pool tadpole shrimp (*Lepidurus packardi*), vernal pool fairy shrimp (*Branchinecta lynchi*), conservancy fairy shrimp (*B. conservatio*), and longhorn fairy shrimp (*B. longiantenna*); however, the proposal was withdrawn when the other four species were listed. The Federal Register (USFWS, 1994) states that the USFWS "has determined that the California linderiella is not likely to become either endangered or threatened

throughout all or a significant portion of its range in the foreseeable future, and it does not qualify for listing under the Act."

The California fairy shrimp is the most common fairy shrimp in the Central Valley (USFWS, 2007). The range extends from Shasta County south to Fresno County and across the valley to the Coast and Transverse Ranges from Willits in Mendocino County south to near Sulfur Mountain in Ventura County. They are most often found in large, relatively clear vernal pools and lakes; however, they can also survive in very small pools, and/or in clear to turbid water with pH from 6.1 to 8.5 and water temperatures from 41° to 85° F.

California fairy shrimp are small (approximately 0.4 inch long) crustaceans in the Linderiellidae family of the order Anostraca. They have delicate elongate bodies; large red, stalked, compound eyes; no carapaces; and eleven pairs of swimming legs. They swim upside down, by beating their legs in a complex, wavelike movement that passes from front to back. Fairy shrimp feed on algae, bacteria, protozoa, rotifers and bits of detritus.

Female California fairy shrimp carry their eggs in a ventral brood sac, and are either dropped to the bottom of the pool or remain in the brood sac until the mother dies and sinks. When the pool dries out, so do the eggs. The resting eggs, known as cysts, are able to withstand heat, cold and prolonged desiccation. They remain in the dry pool bed until rains and other environmental stimuli hatch them. Not all of the cysts may hatch when the pools refill, but may instead remain in the soil for several years before hatching. Once hatched, the average time for fairy shrimp to reach maturity is about forty-five days. Thirty-one days is the approximate minimum time required for maturity, which is the longest minimum for any Central Valley fairy shrimp. Adults are present from late December to early May.

Suitable habitat for the California fairy shrimp has declined dramatically over the past century. The largest threat to their survival is the conversion of grassland-vernal pool ecosystems to urban or agricultural uses. In addition, California fairy shrimp populations have declined due a variety of activities that render existing vernal pools unsuitable for the species. Alteration of vernal pool hydrology, in particular, can dramatically degrade vernal pool habitats. Vernal pool hydrology can be altered by a variety of activities, including the construction of roads, trails, ditches, or canals that block the flow of water into, or drain water away from the vernal pools and vernal pool complexes. Water contamination by toxic chemicals has also caused a decline in California fairy shrimp populations due to the sensitivity of the species to the water chemistry of their habitats. In addition, California fairy shrimp habitats have declined as a result of several other incompatible land uses, including off-road vehicle use, dumping, invasion of non-native species, vandalism, erosion and sedimentation.

## SITE DESCRIPTION

Fort Ord was established in 1917 as a military training base for infantry troops. In January 1991, the Secretary of Defense announced the downsizing/closure of the base. Fort Ord consists of approximately 28,000 acres near the cities of Seaside, Sand City, Monterey, Del Rey Oaks, and Marina (Figure 1). Monterey Bay marks the western boundary, Toro Regional Park borders the base to the southeast and land use east is primarily agricultural. A variety of habitats occur

within Fort Ord, including oak woodland, maritime chaparral, grasslands, riparian forest, coastal scrub, and vernal pools.

## METHODS

Sampling methods for both CTS and California linderiella were consistent with the Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remedial Activities at Former Fort Ord.

Table 1 below identifies the dates of aquatic sampling events at each of the study pools.

**Table 1. Aquatic Sampling Dates**

| Water Body Name | Date Sampled | |
|---|---|---|
| | Invert. | CTS |
| Pool 54 | 3/12/09 | 3/12/09 |
| | 4/2/09 | 4/2/09 |
| Pool 49 | 3/12/09 | 3/12/09 |
| | 4/2/09 | 4/2/09 |
| Pool 21 | 3/12/09 | 3/12/09 |
| | 4/2/09 | 4/2/09 |
| Pool 17 | 3/12/09 | 3/12/09 |
| | 4/2/09 | 4/2/09 |
| Pool 16 | 3/12/09 | 3/12/09 |
| | 4/2/09 | 4/2/09 |
| | | 4/22/09 |

### *CTS Study*

DD&A biologists were authorized to conduct protocol-level CTS surveys at five Fort Ord water bodies by the 2005 USFWS *Biological Opinion on the Cleanup and Reuse of Fort Ord as it affects California Tiger Salamander and Critical Habitat for Contra Costa Goldfields*, and via project-specific written authorization from the USFWS Ventura Field Office. Senior Environmental Biologist Josh Harwayne was the lead biologist on this project, with the assistance of Dave Keegan, and Matt Johnson of DD&A. Josh Harwayne, Dave Keegan, and Matt Johnson possess all appropriate state and federal permits to conduct CTS studies independently. Survey methods followed the *"Interim guidance on site assessment and field surveys for determining presence or a negative finding of the California tiger salamander"* developed by the USFWS and CDFG in 2003, except that aquatic sampling continued after initial detection to collect general estimates of the number of CTS larvae over time.

Fine-mesh seines (4' by 10' with 1/8" mesh) were used to capture larvae, tadpoles, and invertebrates. For deeper water bodies, the biologists would wade to a depth of three to four feet, unfurl the seine and pull it to the shore. Care was taken to pull the seine at a speed slow enough to keep the seine dragging along the bottom without collecting much sediment, but fast enough to capture mobile larvae and tadpoles. Long-handled D-shaped dip-nets (fine mesh) were frequently utilized in combination with seine nets and were particularly useful in very deep, steeply banked, and/or densely vegetated water bodies with problematic substrates (i.e., deep mud).

Samples were collected from each site until the habitat was adequately represented. Between one-quarter hours to two person-hours were spent seining and/or dip-netting each water body per sampling effort, depending on water body size. Sampling locations were selected to survey different portions of large water bodies. Both the shallow and deeper portions of each site were sampled to the greatest extent possible.

All eggs and tadpoles larvae were easily distinguished in the field. Individuals were kept in wet nets or in Nalgene© collection boxes (containing water) for rapid identification. All animals were immediately returned to the water unharmed.

The number of CTS and other species observed at each pool was totaled and the relative abundance defined as follows:

- Few: 1 to 10 individuals;
- Common: 11 to 100 individuals; and
- Abundant: greater than 101 individuals

The length of several CTS larvae was also measured in order to track metamorphosis over time.

To reduce the possibility of spreading disease, nets and waders were scrubbed with Quat-128 solution and completely air-dried or different sets of gear were used before moving from one pool to another. Up to four different sets of seines and dip-nets were used. At the end of each day, all nets and waders were again treated with Quat-128 solution and completely air-dried.

***Invertebrate Study***

DD&A biologists were authorized to conduct aquatic surveys for California fairy shrimp at seven Fort Ord water bodies by the 1999 USFWS Biological Opinion on the Closure and Reuse of Fort Ord, Monterey County, California, and via project-specific written authorization from the USFWS Ventura Field Office. A quantitative assessment of the abundance of branchiopods, maxillopods (copepods), and ostracods was conducted while the presence/absence of other invertebrates was recorded for each water body sampled. Dip nets were used to sample representative portions of each pool. Vernal pool branchiopod species detected were identified to genus with the aid of a field-magnifying lens. Samples were collected from each pool until habitat was represented. The abundance of vernal pool branchiopods was estimated by collecting 5 to 10 samples from each pool (depending on the size and complexity of each pool). The number of vernal pool branchiopods in each sample was totaled and the relative abundance defined as follows (please note that the abundance categories are consistent with previous annual monitoring reports):

- Low abundance: 1 to 10 vernal pool branchiopods;
- Moderate abundance: 11 to 100 vernal pool branchiopods;
- High abundance: 101 to 300 vernal pool branchiopods; and
- Very high abundance: more than 300 vernal pool branchiopods.

## RESULTS

### *CTS Study*

CTS eggs were found at Pool 54 and 16 during the first aquatic sampling survey. CTS larvae were found at Pool 16 during the last aquatic sampling survey. Size ranged from 20-40 mm during the last survey in March. Two size classes were observed. The results of these surveys are presented below in Table 2.

**Table 2. CTS Aquatic Sampling Results**

| Pond Name | Date | Time | Sampling Time (min) | CTS | | | TREEFROG | | | BUGS | CLAM SHRIMP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | E | L | A | E | L | A | | |
| Pond 54 | 3/12/09 | 11:30am | 30 | C | | | F | F | | F | A |
| | 4/2/09 | 9:30am | 30 | | | | | C | | C | F |
| Pond 49 | 3/12/09 | 10:45am | 60 | | | | C | A | F | C | C |
| | 4/2/09 | 10:05am | 45 | | | | | A | | C | F |
| Pond 21 | 3/12/09 | 9:55am | 60 | | | | C | A | | F | C |
| | 4/2/09 | 10:40am | 30 | | | | | C | | F | F |
| Pond 17 | 3/12/09 | 1:50pm | 60 | | | | F | F | F | F | F |
| | 4/2/09 | 12:05pm | 45 | | | | | C | | C | C |
| Pond 16 | 3/12/09 | 2:35pm | 60 | F | | | | | F | F | C |
| | 4/2/09 | 11:10am | 90 | | | | | C | | C | F |
| | 4/22/09 | 10:15am | 60 | | C | | | A | | | |

(F = Few, C = Common, A = Abundant)
(E = Egg, L = Larvae, A = Adult)

***Invertebrate Study***

California fairy shrimp were found at Pool 16 during both of the aquatic sampling surveys. Thirty-two and 105 individuals were observed during the February and March surveys, respectively. Other branchiopods observed were cladocerans and conchostracans at all five water bodies. The abundance of branchiopods observed is presented below in Table 3. Additional species observed during these sampling events were copepods, ostracods, water beetles, diving beetles, mosquitoes, dragonfly and damselfly larvae, and pacific tree frog, waterfowl, and other birds. The complete results of these surveys are presented below in Table 4.

**Table 3. Abundance of Branchiopods**

| Water Body | Date | Abundance |
|---|---|---|
| Pond 54 | 3/12/09 | Unknown |
| | 4/2/09 | Very High |
| Pond 49 | 3/12/09 | Moderate |
| | 4/2/09 | High |
| Pond 21 | 3/12/09 | Very High |
| | 4/2/09 | Moderate |
| Pond 17 | 3/12/09 | High |
| | 4/2/09 | Moderate |
| Pond 16 | 3/12/09 | Moderate |
| | 4/2/09 | Moderate |

## Table 4. Invertebrate Aquatic Sampling Results

| Invertebrates Observed | Ponds | | | Pond 54 | | Pond 49 | | Pond 21 | | Pond 17 | | Pond 16 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dates | | | 3/12/09 | 4/2/09 | 3/12/09 | 4/2/09 | 3/12/09 | 4/2/09 | 3/12/09 | 4/2/09 | 3/12/09 | 4/2/09 |
| Class | Order/Suborder | Family | Common Name | | | | | | | | | | |
| BRANCHIOPODA | Anostraca | | Fairy shrimp | | | | | | | | | 20 | 15 |
| | Cladocera | | Water fleas | | 250 | 85 | 75 | 350 | 60 | 4 | 5 | | 25 |
| | Conchostraca | | Clam shrimp | | 100 | 4 | 20 | 8 | 50 | 2 | 2 | 15 | 5 |
| MAXILLOPODA | Copepoda | | Copepods | | 500 | 150 | 60 | 175 | 200 | 125 | 50 | | 5 |
| OSTRACODA | Ostracods | | Seed shrimp | | 75 | 75 | 250 | 150 | 75 | 125 | 50 | | 15 |
| INSECTA | Anisoptera | | Dragonfly | | X | X | X | | X | X | X | | X |
| | Zygoptera | | Damselfly | | | X | X | | X | | | | |
| | Coleoptera | Hydrophilidae | Water beetles | | | | | | | X | | | |
| | | Dytiscidae | Diving beetles | | | X | X | | | | | | |
| | Hemiptera | Corixidae | Water boatmen | | X | X | X | | X | | | | X |
| | Ephemeroptera | | Mayflies | | | | | | | | | | |
| | Diptera | | Flies | | | | | | | | | | |
| | | Chaoboridae | Phantom midges | | | | | | | | | | |
| | | Culicidae | Mosquitoes | | | | | | | X | | | |
| MALACOSTRACA | Amphipoda | | Crustaceans | | | | | | | | | | |
| AMPHIBIA | | | Frogs (All Hyla) | | X | X | | X | X | X | | X | X |
| AVES | | | Waterfowl | | | X | | | | X | | X | |
| | | | Other Birds | | | X | | | | | | | |

Presence is indicated by an (X) and a blank cell indicates absence in the table above.

## CONCLUSION

DD&A was contracted by Shaw Environmental to conduct aquatic sampling surveys for California fairy shrimp and CTS at five sites located within Fort Ord in Monterey County, California (Pools 54, 49, 21, 17, and 16). Surveys were conducted at four of the sites twice (3 March and 2 April). Pool 16 was sampled a third time on 22 April. CTS eggs were identified at sites 54 and 16. While larvae had been identified at Pool 54 prior to this study, no eggs or larvae had been identified previously at Pool 16, making this a new CTS location on the former Fort Ord. No larvae were detected at Pool 54 in subsequent surveys, likely a result of insufficient ponding. Larvae were detected at Pool 16 in large numbers during subsequent surveys and likely transformed to exit the pond as the depth and duration of ponding were sufficient to do so.

While no detection of CTS was made at Pools 49, 21, and 17, CTS may use these sites in years when depth and duration of inundation are greater.

California fairy shrimp were observed only in Pool 16. Other branchiopods (cladocerans and conchostracans) were observed in all five water bodies. Additional species observed during these sampling events were copepods, ostracods, water beetles, diving beetles, mosquitoes, dragonfly and damselfly larvae, and pacific tree frog, waterfowl, and other birds.

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