APPENDIX A

2007 RARE PLANT AND HABITAT SURVEY RESULTS

Results of 2007 Monterey Spineflower and Sand Gilia Surveys

OU-1, Fort Ord Natural Reserve, California

Prepared for HydroGeoLogic Inc.

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Acronym List

ACL	Aquifer Cleanup Level
Cal-IPC	California Invasive Plant Council
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CNDDB	California Natural Diversity Database
FDA	Fire Drill Area
FONR	Fort Ord Natural Reserve
GIS	Geographic Information System
GPS	Global Positioning System
GWETS	Groundwater Extraction and Treatment System
HGL	HydroGeoLogic, Inc.
OU	Operable Unit
TCE	trichloroethene
UCNRS	University of California Natural Reserve System
USCAE	U.S. Army Corps of Engineers
VOC	volatile organic compound

A1.0 Introduction

HydroGeoLogic, Inc. (HGL) is executing a groundwater remediation project at Operable Unit (OU)-1 at the former Fort Ord U.S. Army Base located in Monterey County, California. This work was awarded in December 2003 by the U.S. Army Corps of Engineers (USACE)-Sacramento District under Contract Number DACA45-03-D-0029; it is being administered by the USACE-Sacramento District.

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. In August 1994, portions of the property were transferred to the University of California and the FONR was established in June 1996. The former Fort Ord is located near Monterey Bay approximately 80 miles south of San Francisco (Figure A1.1). The base consists of approximately 28,000 acres near the cities of Seaside, Sand City, Monterey, Del Rey Oaks, and Marina. Monterey Bay marks the western boundary, Toro Regional Park borders the base to the southeast and land use east is primarily agricultural.

Activities conducted at the former Fort Ord Fritzsche Army Airfield Fire Drill Area (FDA) (i.e., OU-1) between 1962 and 1985 resulted in the release of contaminants to soils and groundwater. Although 10 separate volatile organic compounds (VOCs) were identified as contaminants of concern in groundwater underlying OU-1, trichloroethene (TCE) is the contaminant that was detected at the highest concentrations and across the greatest extent of the affected aquifer. A groundwater extraction and treatment system (GWETS) was constructed in 1988 to remediate TCE and other groundwater contaminants.

The components of the remediation project include wells, pipelines, infiltration trenches, and treatment facilities (Figure A1.2). A key factor affecting the design and implementation of the groundwater cleanup is the fact the groundwater plume lies beneath a part of the University of California Natural Reserve System (UCNRS) designated as the Fort Ord Natural Reserve (FONR). The FONR area potentially impacted by the construction of OU-1 remediation facilities is approximately 130 acres. Therefore, the project has the additional constraint that activities undertaken to achieve the OU-1 cleanup adequately protect and maintain the special-status species found within the FONR, specifically two federally listed plant species, Monterey spineflower (*Chorizanthe pungens* var. *pungens*) and sand gilia (*Gilia tenuiflora ssp. arenaria*).

OU-1 occupies a portion of the FONR in the southwestern corner of the former Fritzsche Army Airfield, west of Imjin Road and north of Reservation Road. The remediation project illustrated in Figure A1.2 is designed to avoid, mitigate, or minimize environmental impacts in the OU-1 area. To that end, the locations, extent, and populations of sand gilia and Monterey spineflower that are present in the footprint of proposed construction activities were identified through a rare plant survey conducted at specified sites. An inventory of the existing plant species in the areas of proposed or

potential new construction was also performed to support habitat management decisions during and after operation of the groundwater remediation project.

A1.1 Survey Objectives

The objectives of the 2007 rare plant survey and habitat inventory were to: 1) identify locations and estimate rare plant populations at each site for Monterey spineflower and sand gilia within the construction areas for the remediation system; 2) to map Monterey spineflower and sand gilia populations so that future activities could avoid or reduce impacts to those populations; and 3) conduct a habitat assessment within each site to provide data on species composition, including the presence of non-native and invasive species. A total of 15 construction sites, 21 constructed well locations and 3 previously used staging areas were surveyed for the presence of rare plants (Figure A1.3). A habitat inventory was also conducted at 10 of the 15 sites (Figure A1.3).

A1.2 Site Location and Description

The dominant habitats in this area include coast live oak woodland, maritime chaparral, coastal scrub, and annual grassland. Several special-status plant and wildlife species occur within the FONR, including sand gilia and Monterey spineflower. The northern and eastern boundary of OU-1 is adjacent to a large expanse of non-native grassland. Transmission of non-native grass species into OU-1 is accelerated by the prevailing winds, which blow seeds south and into the OU-1 area (Fusari 2004). Non-native grasses and weedy forbs are already present throughout much of the OU-1 area. The spread of non-native, invasive species into newly disturbed areas might result in population declines of Monterey spineflower and, especially, sand gilia, which is less tolerant of plant cover than Monterey spineflower.

A1.1.1 Sand Gilia

Sand gilia is a small annual in the phlox family (Polemonaceae). Plants range in height from two to six inches with a small, basal rosette of leaves. The lower branches of the stem are generally densely glandular. Plants typically bloom from April through June and have funnel-shaped flowers with narrow, purple to pinkish petal lobes and a purple throat. This species occurs in open sandy soils in dune scrub, coastal sage scrub, and maritime chaparral habitats. Sand gilia is endemic to Monterey Bay and the peninsular dune complexes. A search of the California Natural Diversity Database (CNDDB) revealed that there are 28 occurrences within Monterey County, including the occurrences at Fort Ord (CDFG 2007). It is likely that some of these occurrences are no longer present and the exact number of extant (still in existence) occurrences are unknown.

A1.1.2 Monterey Spineflower

Monterey spineflower is a small, prostrate annual in the buckwheat family (Polygonaceae) that blooms from April to June. The white to rose floral tube of Monterey spineflower distinguishes it from the more common, but closely related diffuse spineflower (*Chorizanthe diffusa*), which has a lemon-yellow floral tube. This species typically occurs on open sandy or gravelly soils in coastal dune, coastal scrub, and maritime chaparral habitats. There are 24 records of Monterey spineflower within

Monterey County in the CNDDB (CDFG 2007); however, it is not known how many of these are extant.

A2.0 Methods

The survey area consisted of selected well sites and discrete segments of the existing and proposed roads within OU-1. The well sites surveyed are located either adjacent to the roadway or at the terminus of access paths constructed to reach the well site. A total of 15 sites and 21 wells were identified for surveys. In addition, three staging areas that were used during the 2004 drilling effort to stage equipment and materials were included as survey sites. Figure A1.3 shows the survey sites.

Two separate surveys were conducted. The first survey was the rare plant survey, which was conducted between April 19 and April 24, 2007. The second survey was the habitat inventory in areas of proposed new construction, which was conducted between June 28 and July 3, 2007.

A2.1 Rare Plant Surveys

Surveys for sand gilia and Monterey spineflower were conducted by a DD&A biologist and a DD&A GPS technician between April 19 and April 24, 2007. The peak blooming period, late April 2007, was determined by observing a known occurrence of sand gilia in the vicinity of FONR. The rare plant survey area included the sites and staging areas shown in Figure A1.3.

Each of the surveys was conducted along existing or proposed roadways/access routes. In the absence of rare plants, the width of the survey area was approximately 10 feet beyond the edge of the roadway on either side. If a rare plant was identified, the survey in that area was extended to the boundary of the population encountered.

Mapping of rare plant species was done using a Trimble Pathfinder ProXH GPS unit with an additional Zephyr antenna system to boost reliability and accuracy of GPS data collection. Large areas of Monterey spineflower and sand gilia were mapped as polygons; smaller groups and individuals were mapped as points with attributes to identify the number of individuals at each location.

Individual counts were made for all sand gilia populations whether they were mapped using points (population < 10) or polygons (population ≥ 10). However, Monterey spineflower were only counted as individuals when groups of less than five were mapped. Monterey spineflower mapped as polygons were characterized according to the percent of cover. The categories ranged from Very Sparse (corresponding to an absolute cover of less than 3 percent), Sparse (3-25 percent), Medium Low (26-50 percent), Medium (51-76 percent), and Medium High (76-97 percent) to Very High (>97-100 percent). GPS data was exported to shapefile format for use in a Geographic Information System (ESRI ArcGIS) and mapped on high resolution aerial photography. These maps are represented in Figures A3.1 through A3.4.

A2.2 Habitat Inventory

DD&A was also contracted to conduct a habitat inventory within 10 of the 14 sites located on FONR in areas of proposed new construction – sites 4, 6, 7, 8, 8A, 9, 11 (which was split into sites: 11A and 11B), 12, and 13. These areas are shown on Figure A1.3. The inventory included identification of the type and distribution of native and invasive, non-native plant species. Invasive species include any plant species which is listed as a noxious weed by the California Department of Food and Agriculture (CDFA), included on any of the invasive plant lists maintained by the California Invasive Plant Council (Cal-IPC), or considered to be a species of concern by the FONR natural resource staff.

The habitat inventory was taken by placing 100-foot consecutive transects along the centerline of the surveyed area through the entire length of each site. A 1-m^2 quadrat was placed at ten foot intervals along each transect. Placement of the quadrat was sequentially staggered (i.e., center of site alignment, right edge of adjacent habitat, center of site alignment, and left edge of adjacent habitat) to create a more accurate representation of the entire area along each FONR site alignment. Therefore, two data sets were compiled: one along the "center" of the alignment, and one along the "edge" of adjacent habitat. A Trimble GPS Pathfinder ProXH was used to map each quadrat along the alignment, as well as take data points representing the photo positions that were taken at the beginning and ending of each 100-foot transect.

The percentage of total ground cover by vegetation (specifying type and species, where possible), soil crust, litter, and bare ground within each 1-m^2 quadrat was visually estimated by a DD&A botanist and recorded on data sheets in the field. Descriptions of the surrounding habitat was also described and recorded by a DD&A botanist.

A2.3 Photo Inventory

A photo inventory was taken to illustrate conditions at each site. Photographs were taken at each site location at the beginning and end of each 100-foot transect during the habitat inventory survey. A Trimble GPS Pathfinder ProXH as used to record all photo positions.

A3.0 Results and Discussion

A3.1 Rare Plant Survey Results

A3.1.1 Sand Gilia

Sand gilia was observed and mapped in 12 locations within the 15 potential construction sites, 21 well sites, and the three staging areas surveyed for rare plants (Table A3.1 and Figures A3.1 through A3.4). Population size estimates range from a single plant to approximately 100 plants, with an average of 28 plants per population. The total estimate of plants observed and mapped during the survey effort was 336 individuals. Five occurrences of sand gilia were mapped as points while 7 populations were mapped as

polygons. Seven of the 12 total populations of sand gilia (58%) contained 10 or more plants with five locations exceeding 25 plants.

Sand gilia was found in open, sandy areas and along access roads in the coast live oak woodland, coastal scrub and maritime chaparral habitats, but was not observed in areas with dense woody vegetation. At one site, Staging Area 2, sand gilia was found within a dense area of non-native annual grasses. Sand gilia was typically found growing in large open areas with coarse, sandy soil and relatively sparse vegetative cover within the coast live oak woodland and coastal scrub habitats. In the maritime chaparral habitat, sand gilia was observed primarily in openings and at the edges of manzanita shrubs in sandy coarse soils. Common associated species include filaree (*Erodium spp.*), sandmat (*Cardionema ramosissimum*), rip-gut brome (*Bromus diandrus*), deerweed (*Lotus* sp.), and occasionally sandmat manzanita (*Arctostaphylos pumila*), but total plant cover associated with sand gilia observations was generally low.

A3.1.2 Monterey Spineflower

A total of 54 populations (42 polygons and 12 points) of Monterey spineflower were mapped along the 15 rare plant survey areas, 21 well sites and three staging areas within FONR (Table A3.2 and Figures A3.1 through A3.4). A total of 21 individual plants were identified at the 12 mapped GIS points. Because population size estimates are not as easily quantified as the sand gilia populations, individual Monterey spineflower plants were not counted within the GIS polygons. As mentioned in the methods section of this document, populations of Monterey spineflower were given a percentage of cover using visual estimation. Of the 42 populations of Monterey spineflower that were mapped as polygons, one population had a Medium cover class (51-76 percent cover), one populations had a Medium Low cover class (26-50 percent), 25 populations had a Sparse cover class (3-25 percent), and 15 populations had a Very Sparse cover class (<3 percent). None of the Monterey spineflower populations observed and mapped exceeded the Medium cover class.

Plant density estimates in the polygon areas were typically Very Sparse or Sparse. Approximately 95% (40 of the 42 populations) fell into these two categories. Sparse populations out-numbered Very Sparse populations by 2:1 (60% of the total versus 36%).

Monterey spineflower was observed in all habitat types and was usually restricted to open sandy areas with sparse vegetative cover. In the live oak woodland and maritime chaparral habitats, this species was often found along access roads and other disturbed areas such as existing well locations, and in naturally occurring sandy or grassy open areas. In the annual grassland habitat, Monterey spineflower was most often restricted to relatively open areas around the perimeter of shrubs, small areas of disturbance, and along existing access roads. Common associated species include stork's bill geranium (*Erodium botrys*), sand mat (*Cardionema ramosissimum*), fescue (*Vulpia* sp.), rip-gut brome, and catchfly (*Silene gallica*). Populations of Monterey spineflower were often observed in areas with sparse to moderately abundant non-native annual grass cover, suggesting that this species may be somewhat more tolerant of annual grass cover than sand gilia.

A3.2 Habitat Inventory Results

A habitat inventory (see Section A2.2) was also conducted in 10 of the rare plant survey areas. The observed habitat types fell into five categories: Coast Live Oak Woodland; Central Maritime Chaparral; Coastal Scrub; Annual Grassland; and Disturbed/Developed. The latter category consists of dirt roadways, staging areas, well sites and groundwater treatment facilities. Non-native grasses including rip-gut brome, soft chess (*Bromus hordeaceus*), red brome (*Bromus madritensis ssp. rubens*), wild oat (*Avena fatua*), and rattail fescue (*Vulpia myuros*) are common and widespread in all habitats throughout OU-1. Distinguishing characteristics of the individual habitats observed in the 10 FONR areas inventoried are summarized in Table A3.3 and discussed in the following sections.

A3.2.1 Habitat Descriptions

Coast Live Oak Woodland

Coast live oak woodland within the FONR is characterized by a mosaic of coast live oak trees (*Quercus agrifolia*), intermixed with chaparral, grassy and sandy openings. The oak woodland within the FONR ranges from high canopy cover to low canopy cover. The areas with high canopy cover generally do not permit the existence of shrubs in the understory, and, therefore, the understory is limited to poison oak and the common annual grasses, such as rip-gut brome, wild oat, and annual fescue. In areas with a low to moderate canopy cover, the oak woodland is intermixed with chaparral shrub species such as California sagebrush (*Artemisia californica*), coyote brush (*Baccharis pilularis*), shaggy bark manzanita (*Arctostaphylos tomentosa ssp. tomentosa*), and sandmat manzanita. Common herbaceous species in these areas include native species such as miner's lettuce (*Claytonia perfoliata*), and non-native species such as rip-gut brome, and rattail fescue.

Grassy openings in the woodland habitat contain scattered coast live oak trees and shrubs with dense growth of annual grasses such as rip-gut brome, annual fescue, red brome, and wild oat. Open, sandy areas within coast live oak woodland can support special-status species such as Monterey spineflower and sand gilia. Coast live oak woodland is widespread throughout the FONR property, and was observed at or surrounding all sites surveyed except sites 1, 2, and 5, which are completely dominated by annual grassland and disturbed habitat types.

Central Maritime Chaparral

Central maritime chaparral habitat within the FONR is dominated by hard-leaved shrubs such as shaggy bark manzanita, sandmat manzanita, and Monterey manzanita. Other shrubs that are common throughout this habitat types include coyote brush and California sagebrush. In areas where soils maintain a higher moisture content, poison oak can also be a dominant species in the maritime chaparral. The central maritime chaparral on FONR is often mixed with coast live oak trees and several annual grass species including rip-gut brome, red brome, and rattail fescue. Central maritime chaparral was observed at sites 4, 12, and 13.

Coastal Scrub

Coastal scrub occurs near the coast on sandy soils and on inland hills with shallow top soils. Within the FONR, this habitat type is characterized by sparse to dense cover of soft-leaved, low stature shrubs about three to seven feet in height, such as coyote brush, California sagebrush, sticky monkey flower (*Mimulus aurantiacus*), poison oak, mock heather (*Ericameria ericoides*), and black sage (*Salvia mellifera*). The herbaceous layer in the coastal scrub is sparse where shrub cover is dense but is more developed in areas where there is less shrub cover. Species typically occurring in this layer include Monterey spineflower, sand mat, and everlasting (*Gnaphalium* sp.). Coastal scrub was observed at sites 4, 6, 7, 8, 9, 11B, and 12.

Annual Grasslands

The annual grassland habitat is characterized by a dense cover of rip-gut brome with other non-native annual grasses such as wild oat, soft chess, Italian ryegrass (*Lolium multiflorum*), and rattail fescue. Other species that are common in the annual grassland habitat include sky lupine (*Lupinus nanus*), a native species, and weedy forbs (non-native plants that are not woody and are not grasses), such as filaree (*Erodium* sp.) and cat's ears (*Hypochaeris* sp.). Cat's ears is a non-native, invasive species of particular concern to the UC staff managing the FONR. Shrubs species, such as coyote brush, California sagebrush, and coffee berry (*Rhamnus californica*), occur scattered throughout the annual grassland. Annual grassland was present in patches within sites 3, 4, 6, and 12; while this habitat dominated sites 1, 2 and 5.

Disturbed/Developed

The disturbed habitat is characterized by the roadways and staging areas currently and historically in use on the FONR property. Most disturbed areas are dominated by bare ground and non-native grasses, such as wild oat, rip-gut brome, and red brome. All of the sites surveyed contained disturbed/developed habitat in the forms of trails and/or roads.

A3.2.2 Plant Species Composition

The habitat inventory resulted in the collection of plant species identification and percent cover data within 279 quadrats. Plant species were categorized as either "native," "non-native," or "non-native, invasive." "Native" refers to a plant species that normally lives and thrives in a particular ecosystem. "Non-native" refers to a plant species that has been introduced to California as a direct or indirect result of human activity. The "non-native, invasive" category refers to plant species that 1) are not native to, yet can spread into, ecosystems, 2) can displace native species, hybridize with native species, alter biological communities, or alter ecosystem processes, and 3) are included on the Cal-IPC list and identified as being of particular concern to the FONR. These species are mostly comprised of annual grasses. This concern is based on the observation that non-native, invasive species generally compete for space and nutrients directly with and more effectively than native plants, including the protected Monterey spineflower and sand gilia. Consequently, significant growth of non-native, invasive species has the potential to diminish or eliminate the native population within a given area. Non-native, non-invasive species, in contrast, are of less concern because they are able to co-exist with native plants with minimal impact on the native population.

Ground cover was categorized as "bare ground," "leaf litter," or as one of the three plant categories defined above. "Leaf litter" refers to an area where the ground is covered by a layer of leaves and other debris that has accumulated from the surrounding vegetation. "Bare ground" refers to an area with no vegetation present.

Overall, non-native, invasive species comprised 36% of the vegetative cover within the 279 quadrats and native species comprised 24%. The remaining ground cover consisted of non-native non-invasive species, bare ground, well/cement or leaf litter. There were significant differences, however, in the plant populations observed in the quadrats along the centerline of the roadways as opposed to those along the edge of the roadway.

Figures A3.5 and A3.6 illustrate the results of the habitat surveys for the center quadrats and the edge quadrats, respectively. Native species comprised 10% of the vegetative cover within the center quadrats, while non-native, non-invasive species, bare ground and leaf litter comprised 6%, 32% and 9%, respectively. Non-native, invasive species comprised 42% of the vegetative cover within the center quadrats. A new category was observed during this annual study. Since the wells had been installed, the space occupied by the cement well pads now figured into the groundcover. In a few locations the well site is at the terminus of the road and thus fell within the center quadrats. A category of "Well / Cement" was included to represent this minimal (1%) occurrence. Within the edge quadrats, native species composed 38% of the cover. Leaf litter (17%), bare ground (12%), and non-native, non-invasive species (3%) in total comprised 32% of the edge quadrat areas. Non-native, invasive species comprised 30% of the ground cover in the edge quadrats in comparison to the 42% value in the center quadrats.

Table A3.4 provides a summary of the vegetative cover estimates for each of the non-native, invasive species observed during the habitat survey. Eight of the 66 non-native, invasive species (*Avena fatua, Briza maxima, Bromus diandrus, Bromus hordeaceus, Bromus madritensis ssp. rubens, Centaurea melitensis, Hypochaeris sp., and Vulpia myorus)* of particular concern to FONR [see Appendix D of the 2005 Rare Plant Survey Report (CH2M Hill, 2005)] were observed in the quadrat surveys. The presence of these species in the center quadrats ranged from only one of the quadrats (Maltese star-thistle) to 130 quadrats (rattail fescue). In the edge quadrats, Maltese star-thistle was not observed but rattail fescue was found in 104 quadrats. Where present, the average percentage cover for any given species in a center quadrat ranged from <1% (Maltese star-thistle) to 32% (rat tail fescue) and from 0% (Maltese star-thistle) to 53% (rattlesnake grass) for the edge quadrats. Rattlesnake grass and rattail fescue were the highest average percentage cover within quadrats with at least one observation of a non-native invasive species. Both of these species were equal to or greater than 20% in both center and edge quadrats. The average percentage cover within quadrats with at least one observation of a non-native invasive species did not exceed 10% for sheep sorrel, cat's ears, rip-gut brome, red stem filaree, or soft chess. The average percent cover of red brome exceeded this value only slightly (12.5% in both the edge and center quadrats).

No iceplant or pampas grass was observed within any of the sites. Poison hemlock and Cut-leaved plantain were detected at a few of the transect plots in 2006 but were not detected at any location in 2007. The total average percent for the majority of these non-native invasive species increased from 2006 to 2007. Unlike the numbers presented in Table A3.4, total average percent is the average percent of each species over all plots including those where the species was not observed. Rattail fescue experienced the most significant increase from a total average 14% in 2006 to 23% in 2007. Rip-gut brome, wild oat, and soft chess decreased from 2006 to 2007 but only by 0.5%, 2% and 2%, respectively.

A4.0 Conclusions

As illustrated in Figure A3.5, non-native, invasive species were the dominant characteristic of the center quadrats and covered, on average, 42% of each center quadrat. Bare ground was the second most widespread category with an average coverage of 32% of the center plots. Native species averaged 10% coverage in the center plots. Leaf litter, non-native non-invasive, and well/cement covered the center quadrats by 9%, 6% and 1%, respectively.

Within the edge quadrats, native species were dominant, with an average percentage of cover of 38%. Non-native, invasive species were the second most dominant species with 30%. Leaf litter represented 17%, bare ground represented 12%, on average, of the edge quadrats and non-native, non-invasive species made up the last three percent.

These results could be expected due to the history of disturbance along the centerline of each site and are consistent with the use of these roadways on a routine basis. The dominance of the native species along the edge plots may suggest that non-native, invasive species have not made significant population gains within the undisturbed habitat since these roadways were constructed. Because GPS was used to map each plot, data can be taken in the same plots over time to determine whether the percent cover of non-native, invasive species increases in the future within the adjacent, primarily native, habitat.

Monterey spineflower populations were observed in more locations than sand gilia populations (54 locations versus 12 locations of sand gilia). Populations of Monterey spineflower were often observed in areas with sparse to moderately abundant non-native annual grass cover, suggesting that this species may be somewhat more tolerant of annual grass cover than sand gilia.

A5.0 Comparisons 2006-2007

Sand gilia populations decreased significantly from last year (37 locations in 2006 compared to 12 locations in 2007), which is most likely a result from the lack of rainfall received in the spring. According to the National Weather Service Climatological Station for Monterey, the Spring (March, April and May) rainfall total for 2006 was 12.63", while the rainfall total for Spring of 2007 was only 2.31". The number of individuals observed also decreased significantly (962 individuals in 2006 compared to 335

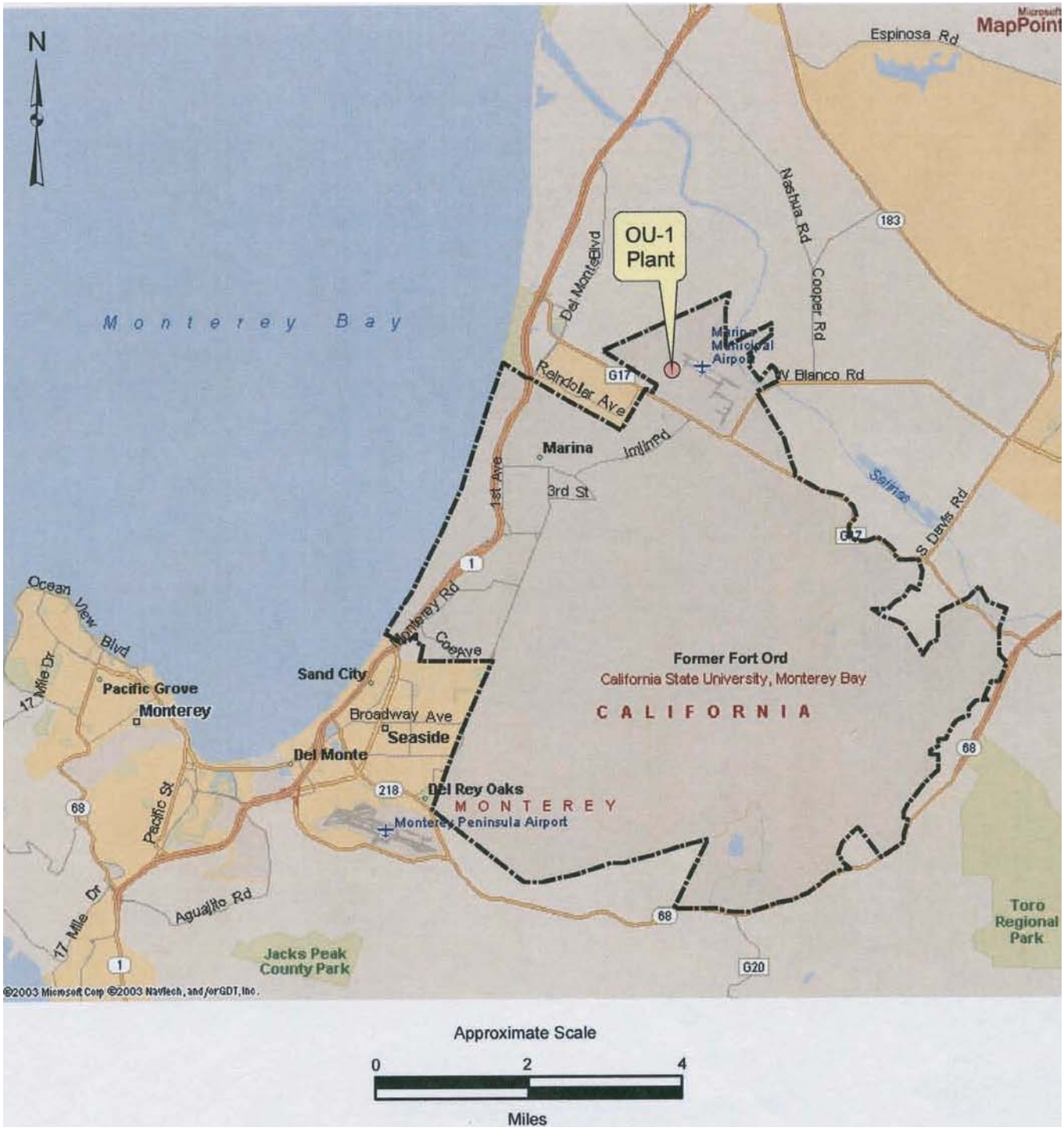
individuals in 2007), which is also an expected result with the lack of significant rainfall. Monterey spineflower populations remained about the same compared to last year. Both years generally had the same number of populations (56 populations in 2006 and 54 in 2007) and densities (the majority of the populations ranged from sparse to very sparse densities in 2006 and 2007).

In 2007, twenty additional quadrats were surveyed for the habitat inventory than in 2006. Given the large number of quadrats sampled (279); this 8% increase in the sample size should only slightly affect the comparison of the annual results. In an overall comparison of the percent cover of non-native, invasive species, the total average percentage of groundcover in the quadrats increased in 2007 (from 22% to 36%). The total average percent cover of native species decreased significantly in 2007 from 40% to 24%. The following is a list of all the categories, the total average percentage covers from 2006 and 2007 and the difference between the two years.

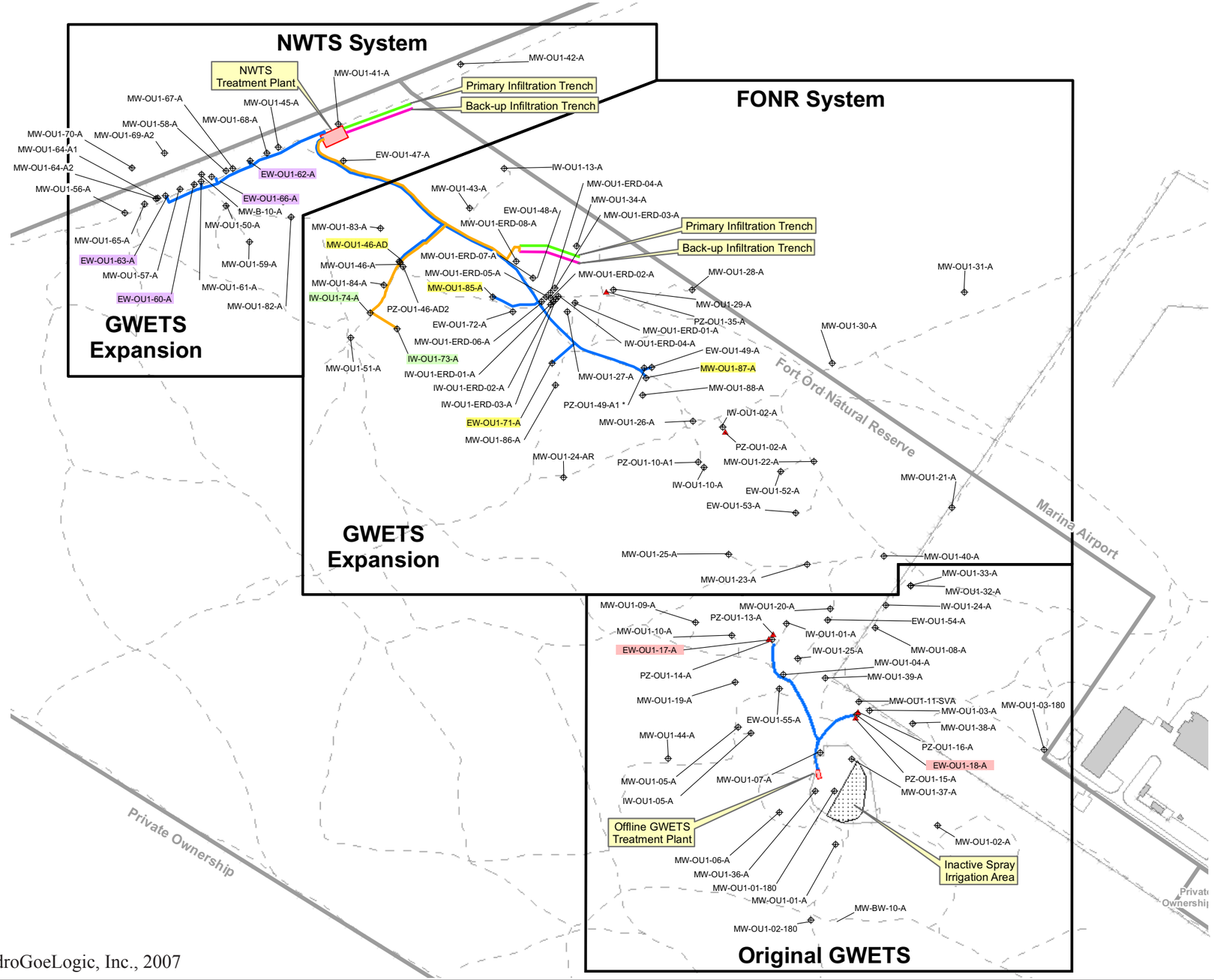
Category	**2006 Total Average**	**2007 Total Average**	**Change in Percentage**
Native	40%	24%	-16
Non-native Non-invasive	10%	5%	-5
Non-native Invasive	22%	36%	+14
Bare Ground	27%	22%	-5
Leaf Litter	<1%	13%	+12
Well / Cement	0	<1%	<+1

A6.0 References

CH2M Hill, 2005. 2005 Monterey Spineflower and Sand Gilia Survey Results, Fort Ord Operable Unit 1, Former Fort Ord, California. Prepared for HGL. December 2005.



N	Project Vicinity Map	Figure A1.1

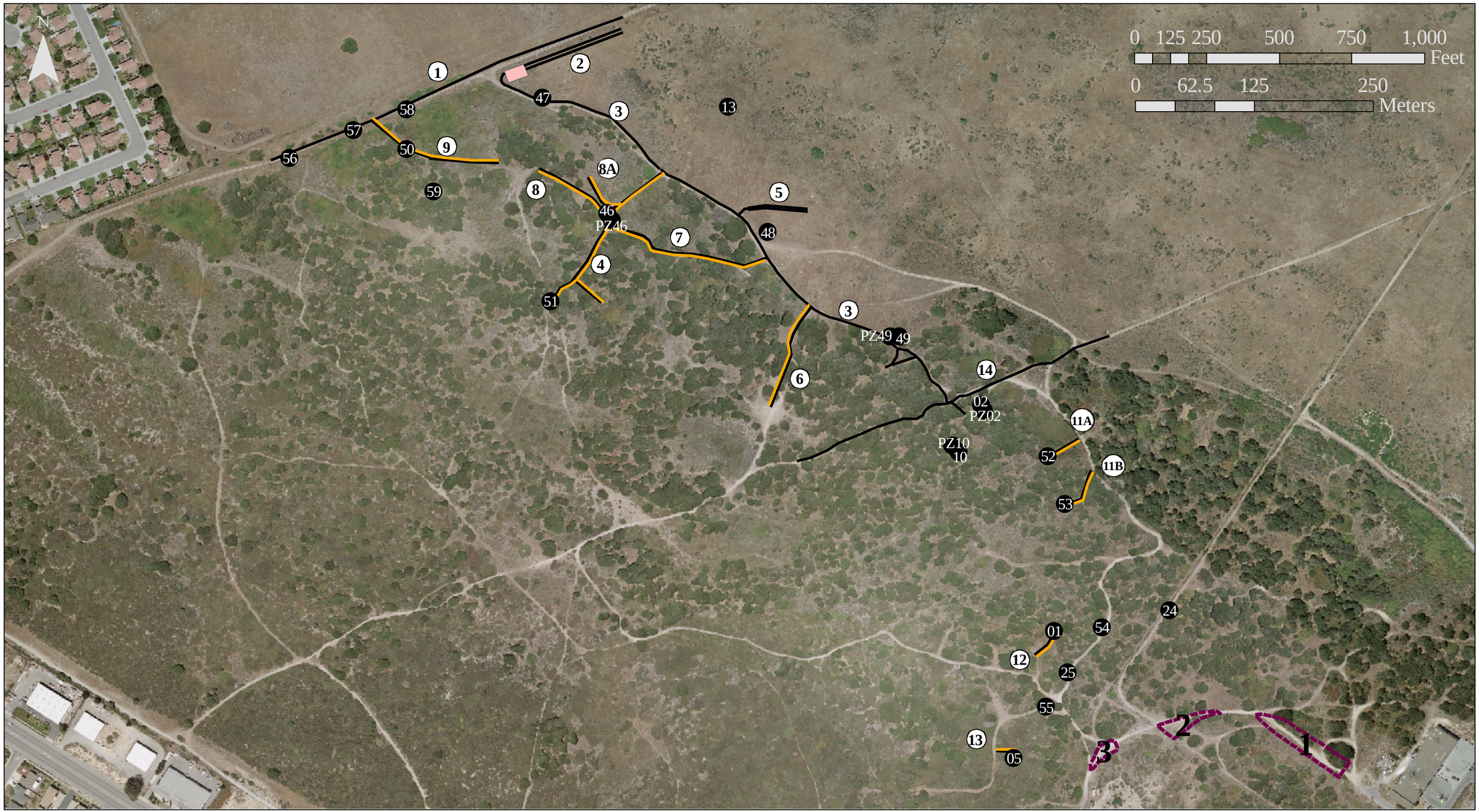


Source: HydroGoeLogic, Inc., 2007

N

Project Facilities

Figure
A1.2



2007 Rare Plant Survey Sites

2007 Rare Plant and Habitat Inventory Survey Sites

Staging Areas

Well Locations Requiring Surveys

Figure A1.3
FONR Sites, Well Locations and Staging Areas Surveyed

N

0 50 100 200 300 Feet

0 25 50 100 Meters

SB-OU1-60-A
MW-OU1-41-A
1
2
MW-OU1-45-A
MW-OU1-68-A
EW-OU1-62-A
SB-OU1-2004-I
EW-OU1-47-A
IW-OU1-13-A
MW-OU1-67-A
MW-OU1-58-A
62
MW-B-10-A
15
63
EW-OU1-60-A
EW-OU1-66-A
MW-OU1-57-A
MW-OU1-61-A
3
32
29
34
33
HP-OU1-23
7
MW-OU1-64-A2
EW-OU1-63-A
61
MW-OU1-65-A
MW-OU1-64-A1
MW-OU1-50-A
66
65
SB-OU1-2004-J
16
64
9
30
MW-OU1-43-A
31
17
MW-OU1-56-A
MW-OU1-82-A
14
56
MW-OU1-83-A
55
MW-OU1-59-A
8A
SB-OU1-2004-K
8
57
MW-OU1-46-AD
MW-OU1-46-A
PZ-OU1-46-AD2
MW-OU1-84-A
7
58
4
MW-OU1-85-A
59
60
EW-OU1-72-A
10
IW-OU1-74-A

White labels correspond with special-status plant population ID's from Tables A3.1 and A3.2.

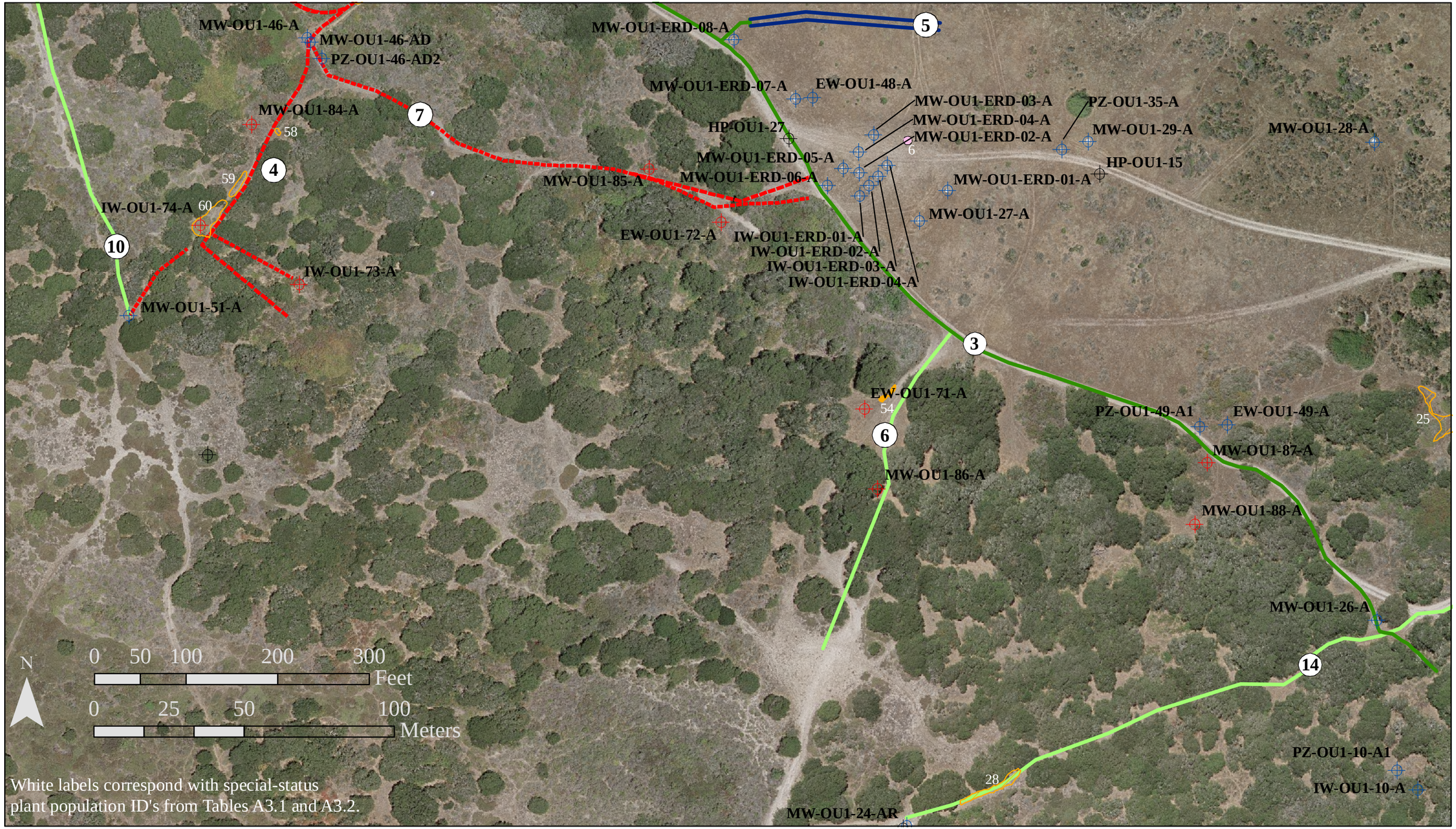
Monterey Spineflower Patches
- Very Sparse
- Sparse
- Medium-Low
- Medium

- Sand Gilia Patches
- Monterey Spineflower Points
- Sand Gilia Points
- Well or Piezometer
- Abandoned Boring or Well
- Well Installed After Completion of Rare Plant Survey Events
- Treatment Plant
- Potential Access Routes-Summer 06 Drilling
- Potential Access Routes
- Proposed New Infiltration Trench
- Proposed Treated Water Pipeline Route
- Access Routes Constructed in 2004
- Hydraulic Control Pilot Project Infiltration Trench (Constructed May-June 2006)

DD&A

Figure A3.1

Access Routes With 2007 Rare Plant Survey Results - Northern OU1 FONR Area



Monterey Spineflower Patches

- Very Sparse
- Sparse
- Medium-Low
- Medium

- Sand Gilia Patches
- Monterey Spineflower Points
- Sand Gilia Points
- Well or Piezometer
- Abandoned Boring or Well

- Well Installed After Completion of Rare Plant Survey Events
- Treatment Plant
- Potential Access Routes-Summer 06 Drilling
- Potential Access Routes
- Proposed New Infiltration Trench

- Proposed Treated Water Pipeline Route
- Access Routes Constructed in 2004
- Hydraulic Control Pilot Project Infiltration Trench (Constructed May-June 2006)

Figure A3.2

Access Routes With 2007 Rare Plant Survey Results - Northeastern OU1 FONR Area

N

0 50 100 200 300 Feet

0 25 50 100 Meters

EW-OU1-71-A

54

6

MW-OU1-86-A

PZ-OU1-49-A1

EW-OU1-49-A

MW-OU1-87-A

3

MW-OU1-88-A

HP-OU1-17

MW-OU1-30-A

26

14

25

MW-OU1-26-A

IW-OU1-02-A

PZ-OU1-02-A1

11A

PZ-OU1-10-A1

IW-OU1-10-A

MW-OU1-22-A

EW-OU1-52-A

11B

28

MW-OU1-24-AR

MW-OU1-24-A

27

EW-OU1-53-A

52

24

51

53

13

White labels correspond with special-status plant population ID's from Tables A3.1 and A3.2.

Monterey Spineflower Patches

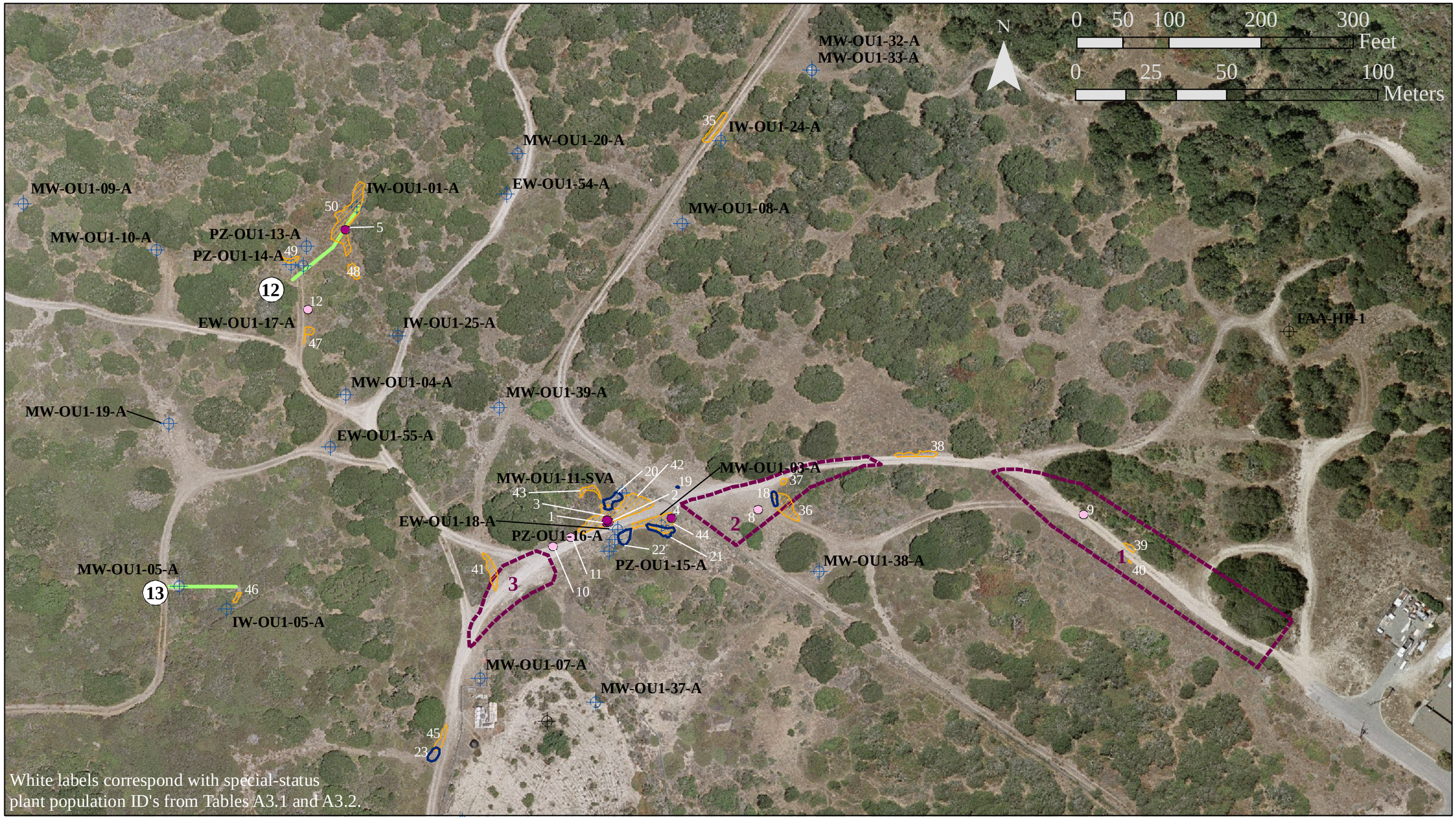
- Very Sparse
- Sparse
- Medium-Low
- Medium

- Sand Gilia Patches
- Monterey Spineflower Points
- Sand Gilia Points
- Well or Piezometer
- Abandoned Boring or Well
- Well Installed After Completion of Rare Plant Survey Events
- Treatment Plant
- Potential Access Routes-Summer 06 Drilling
- Potential Access Routes
- Proposed New Infiltration Trench
- Proposed Treated Water Pipeline Route
- Access Routes Constructed in 2004
- Hydraulic Control Pilot Project Infiltration Trench (Constructed May-June 2006)

DD&A

Figure A3.3

Access Routes With 2007 Rare Plant Survey Results - Southeastern OU1 FONR Area



Monterey Spineflower Patches

- Very Sparse
- Sparse
- Medium-Low
- Medium

- Sand Gilia Patches
- Monterey Spineflower Points
- Sand Gilia Points
- Well or Piezometer
- Abandoned Boring or Well
- Well Installed After Completion of Rare Plant Survey
- Treatment Plant
- Staging Areas 2004
- Potential Access Routes-Summer 06 Drilling
- Potential Access Routes
- Proposed New Infiltration Trench
- Proposed Treated Water Pipeline Route
- Access Routes Constructed in 2004
- Hydraulic Control Pilot Project Infiltration Trench (Constructed May-June 2006)

Figure A3.4

Access Routes With 2007 Rare Plant Survey Results - Southern OU1 FONR Area

Figure A3.5 Average Percent Cover within Center Quadrats

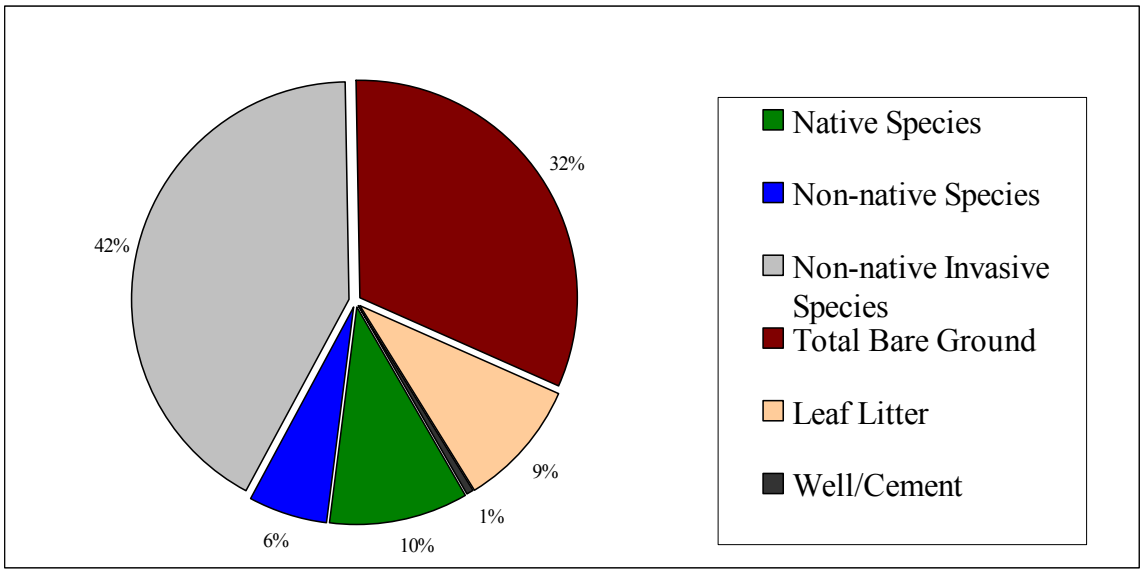


Figure A3.6 Average Percent Cover within Edge Quadrats

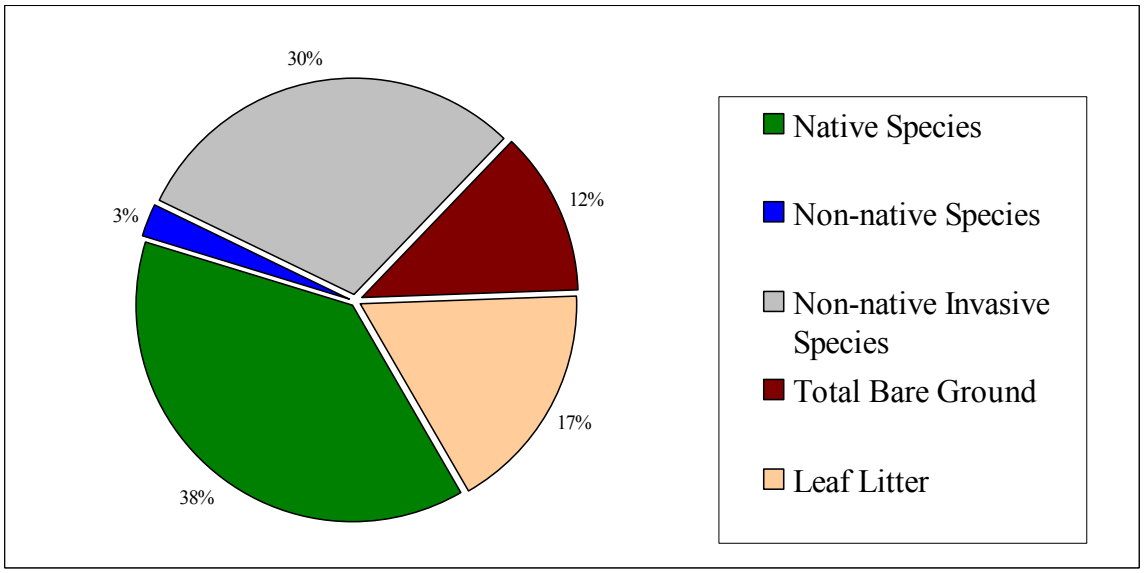


Table A3.1 Sand Gilia Populations Identified During 2007 Survey

FONR Location	Population #	Number of Individuals	GIS Feature Type	Survey Date	Figure Number
SITE 11B	24	16	Polygon	4/19/2007	A3.3
SITE 12	5	3	Point	4/19/2007	A3.4
Between STAGING AREA 2 and 3	1	1	Point	4/19/2007	A3.4
Between STAGING AREA 2 and 3	2	1	Point	4/19/2007	A3.4
Between STAGING AREA 2 and 3	3	1	Point	4/19/2007	A3.4
Next to west edge of STAGING AREA 2	4	3	Point	4/19/2007	A3.4
STAGING AREA 2	18	36	Polygon	4/19/2007	A3.4
Between STAGING AREA 2 and 3	19	12	Polygon	4/19/2007	A3.4
Between STAGING AREA 2 and 3	20	37	Polygon	4/19/2007	A3.4
Between STAGING AREA 2 and 3	21	100	Polygon	4/19/2007	A3.4
Between STAGING AREA 2 and 3	22	75	Polygon	4/19/2007	A3.4
SW of STAGING AREA 3	23	50	Polygon	4/19/2007	A3.4

Table A3.2 Monterey Spineflower Populations Identified During 2007 Survey

FONR Location	Population #	Number of Individuals or Percent Cover	Cover Class	Survey Date	Figure Number
SITE 1	62	5 %	Sparse	4/19/2007	A3.1
SITE 1	63	1%	Very Sparse	4/19/2007	A3.1
SITE 1	64	1%	Very Sparse	4/19/2007	A3.1
SITE 1	65	5%	Sparse	4/19/2007	A3.1
SITE 1	66	10%	Sparse	4/19/2007	A3.1
SITE 1	15	4	Point	4/19/2007	A3.1
SITE 1	16	1	Point	4/19/2007	A3.1
SITE 1	17	1	Point	4/19/2007	A3.1
SITE 3	29	5%	Sparse	4/23/2007	A3.1
SITE 3	30	5%	Sparse	4/23/2007	A3.1
SITE 3	31	5%	Sparse	4/23/2007	A3.1
SITE 3	32	2%	Very Sparse	4/23/2007	A3.1
SITE 3	33	1%	Very Sparse	4/23/2007	A3.1
SITE 3	34	1%	Very Sparse	4/23/2007	A3.1
SITE 3	7	1	Point	4/23/2007	A3.1
SITE 4	58	10%	Sparse	4/19/2007	A3.1
SITE 4	59	2%	Very Sparse	4/19/2007	A3.1
SITE 4	60	3%	Very Sparse	4/19/2007	A3.1
SITE 6	54	50%	Medium	4/19/2007	A3.2
SITE 8A	55	10%	Sparse	4/19/2007	A3.1
SITE 8A	56	2%	Very Sparse	4/19/2007	A3.1
SITE 8	57	1%	Very Sparse	4/19/2007	A3.1
SITE 9	61	25%	Medium-Low	4/19/2007	A3.1
SITE 9	14	2	Point	4/19/2007	A3.1
SITE 11B	51	1%	Very Sparse	4/19/2007	A3.3
SITE 11B	52	1%	Very Sparse	4/19/2007	A3.3
SITE 11B	53	1%	Very Sparse	4/19/2007	A3.3
SITE 11B	13	2	Point	4/19/2007	A3.3
SITE 12	47	5%	Sparse	4/19/2007	A3.4
SITE 12	48	10%	Sparse	4/19/2007	A3.4
SITE 12	49	5%	Sparse	4/19/2007	A3.4
SITE 12	50	5%	Sparse	4/19/2007	A3.4
SITE 12	12	1	Point	4/19/2007	A3.4
SITE 13	46	15%	Sparse	4/19/2007	A3.4
SITE 14	25	20%	Sparse	4/23/2007	A3.3
SITE 14	26	10%	Sparse	4/23/2007	A3.3
SITE 14	27	20%	Sparse	4/23/2007	A3.3
SITE 14	28	5%	Sparse	4/23/2007	A3.3
STAGING AREA 1	39	1%	Very Sparse	4/19/2007	A3.4
STAGING AREA 1	40	5%	Sparse	4/19/2007	A3.4
STAGING AREA 1	9	3	Point	4/19/2007	A3.4
STAGING AREA 2	36	5%	Sparse	4/19/2007	A3.4

FONR Location	Population #	Number of Individuals or Percent Cover	Cover Class	Survey Date	Figure Number
Next to east edge STAGING AREA 2	38	3%	Very Sparse	4/19/2007	A3.4
Between STAGING AREA 2 and 3	42	5%	Sparse	4/19/2007	A3.4
Between STAGING AREA 2 and 3	43	15%	Sparse	4/19/2007	A3.4
Next to west edge STAGING AREA 2	44	10%	Sparse	4/19/2007	A3.4
STAGING AREA 2	8	1	Point	4/19/2007	A3.4
STAGING AREA 2	37	10%	Sparse	4/19/2007	A3.4
STAGING AREA 3	41	5%	Sparse	4/19/2007	A3.4
Next to east edge STAGING AREA 3	10	3	Point	4/19/2007	A3.4
NE of STAGING AREA 3	11	1	Point	4/19/2007	A3.4
South of STAGING AREA 3	45	3%	Very Sparse	4/19/2007	A3.4
WELL IW-OU1-24-A	35	10%	Sparse	4/23/2007	A3.4
FONR STAGING AREA	6	1	Point	4/24/2007	A3.2

Table A3.3 Habitat Types Observed in Survey Areas

Survey Area	Coast Live Oak Woodland	Central Maritime Chaparral	Coastal Scrub	Annual Grassland	Disturbed / Developed
1				X	X
2				X	X
3	X			X	X
4	X	X	X	X	X
5				X	X
6	X		X	X	X
7	X		X		X
8	X		X		X
9	X		X		X
11A	X				X
11B	X		X		X
12	X	X	X	X	X
13	X	X			X
14	X				X

Table A3.4 Non-Native, Invasive Species Results

Species; Invasive List Status (CDFA/Cal-IPC/FONR)	Center Quadrat	Edge Quadrat
Red brome (*Bromus madritensis ssp. rubens*); (--/High/Concern)		
Number of Plots Present/Percentage of Total Plots	89/63%	100/73%
Range of Percent Cover	1-30%	1-35%
Average Percent Cover within Plots Present	12.5%	12.5%
Rip-gut brome (*Bromus diandrus*); (--/Moderate/Concern)		
Number of Plots Present/Percentage of Total Plots	16/11%	41/30%
Range of Percent Cover	5-35%	1-45%
Average Percent Cover within Plots Present	7.5%	6.5%
Wild oat (*Avena fatua*); (--/Moderate/Concern)		
Number of Plots Present/Percentage of Total Plots	9/6%	18/13%
Range of Percent Cover	5-20%	1-25%
Average Percent Cover within Plots Present	6.5%	5%
Sheep sorrel (*Rumex acetosella*) (--/Moderate/--)		
Number of Plots Present/Percentage of Total Plots	16/11%	13/9.5%
Range of Percent Cover	1-10%	1-10%
Average Percent Cover within Plots Present	3%	3%
Maltese star-thistle (*Centaurea melitensis)* (--/Moderate/Concern)		
Number of Plots Present/Percentage of Total Plots	1/0.3%	0/0%
Range of Percent Cover	1%	N/A
Average Percent Cover within Plots Present	1%	N/A
Red stem filaree (*Erodium cicutarium*) (--/Moderate/--)		
Number of Plots Present/Percentage of Total Plots	17/12%	4/3%
Range of Percent Cover	1-10%	1-5%
Average Percent Cover within Plots Present	2%	3.25%
Rattail fescue (*Vulpia myuros*); (--/Moderate/Concern)		
Number of Plots Present/Percentage of Total Plots	130/92%	104/76%
Range of Percent Cover	2-70%	5-70%
Average Percent Cover within Plots Present	32%	20%
Rattlesnake grass (*Briza maxima*); (--/Limited/Concern)		
Number of Plots Present/Percentage of Total Plots	8/6%	4/3%
Range of Percent Cover	1-60%	10-70%
Average Percent Cover within Plots Present	24%	53%
Soft chess (*Bromus hordeaceus*); (--/Limited/Concern)		
Number of Plots Present/Percentage of Total Plots	33/23%	24/17.5%
Range of Percent Cover	1-10%	1-20%
Average Percent Cover within Plots Present	4%	3.6%
Cat's ears (*Hypochaeris* sp.); (--/Limited to Moderate/Concern)		
Number of Plots Present/Percentage of Total Plots	53/37%	19/14%
Range of Percent Cover	1-20%	1-10%
Average Percent Cover within Plots Present	2%	2%