Appendix M

Western Burrowing Owl Conservation Strategy

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M.1 Introduction

This appendix is provided as a supplement to the summary of the western burrowing owl conservation strategy in Chapter 5. The conservation strategy presented below has been constructed to offset impacts to western burrowing owl discussed in Chapter 4. Additional items relevant to the western burrowing owl conservation strategy are: 1) Condition 16 in Chapter 6, 2) monitoring commitments in Chapter 7, and 3) the western burrowing owl conservation fee in Chapter 9.

M.2 Background

Nesting burrowing owls in the greater San Francisco Bay area and the South Bay area in particular, are a dwindling resource. In the early 1990s there were an estimated 150–170 breeding pairs in the San Francisco Bay area (DeSante and Ruhlen 1995; DeSante et al. 1997). It was estimated that these numbers represented a 53% decline from the previous census period of 1986–1990 (DeSante et al. 1997) and more recent numbers indicate that, if anything, the downward trend is increasing. In those estimates it was assumed that 75% of the San Francisco Bay Area burrowing owl population occurred in Santa Clara County and nearly all of those owls were congregated around the southern edge of the San Francisco Bay (DeSante et al. 1997). Surveys in the early 1990s revealed that about a third (43–47 pairs) of Santa Clara County breeding pairs occurred inside what is now the Santa Clara Valley Habitat Plan study area (City of San José 2000).

The Plan proposes to undertake an aggressive suite of measures aimed at reversing the declining trend of the burrowing owl population in Santa Clara County. The conservation goal of the Plan, as implemented by these measures, is to establish a burrowing owl population in the expanded study area that is first stable, then increasing over time, while accounting for normal fluctuations in population levels. The general approach will be to increase the numbers, distribution, and connectivity of burrowing owl colonies in the expanded study area so that the potential for conservation success is high. This will be accomplished by using a phased conservation approach, initially focusing efforts

on areas within immediate flight distance while gathering data to inform future efforts. Later phases, triggered as more resources are available and hopefully in response to initial successes, will focus on lands further out to allow for growth in both numbers and range. Initial techniques will include utilizing data gathering and analysis to inform management decisions, testing proposed management techniques and analytical approaches with scientific studies, acquisition (both permanent and temporary) of existing and potential breeding and foraging areas, management of burrowing owl habitat and, as a last resort, population augmentation techniques. These measures will be applied in four burrowing owl conservation regions, as described below.

M.2.1 Burrowing Owl Conservation Regions

Opportunities to conduct meaningful burrowing owl conservation inside the Habitat Plan study area are limited because the most effective conservation measures must take place in near proximity to the remaining burrowing owl occurrences. Since those occurrences are clustered around the southern part of the Bay and northern San José, there is little unused land available and that which is not built on has high land values. As a result the conservation focus for burrowing owls was expanded to include the entire South Bay region, in addition to the Habitat Plan study area (see Chapter 1, **Figure 1-2**). This *expanded study area for burrowing owl conservation* was determined following examination of movement distances of burrowing owls in the South Bay Area. Movement distances have been inferred from encounters with burrowing owls that were banded at other locations in the South Bay Area. The longest recorded movement of a banded burrowing owl in the South Bay Area is 7.5 miles (12 km) (Harman and Barclay 2007; City of San José 2000), from the San José International Airport to NASA Ames/Moffett Federal Airfield. That distance is important because it indicates a reasonable measure of dispersal distance, either for natal dispersal (birth site to nesting site) or breeding dispersal (movement between nesting locations). Planning conservation within a documented movement distance is valid to support the goal to increase the burrowing owl population and expand the distribution of burrowing owls in the South Bay Area, and to proactively protect habitat that may support this expansion. For that reason, and due to the fact that most burrowing owl nest occurrences inside of the study area are on the northern edge of the study area (Barclay 2008), it was determined that conservation efforts for the burrowing owl should not be restricted to within the Habitat Plan boundary, as data indicates the owls that will be the initial focus of the conservation efforts are most likely to move to the north, outside of the general study area. As described in Chapter 1, take in the *expanded study area* will only be authorized for conservation action and not for other covered activities.

Conservation actions that will be employed to achieve the biological goals and objectives for burrowing owl will vary throughout the *expanded study area for burrowing owl conservation.* Generally, long-term management agreements will be put in place in the northern part of the study area and in the expanded study area. At least initially, limited habitat acquisition and reserve management will

occur along the southern edge of the study area and more limited conservation activities will occur in the two middle regions because of the current lack of nesting burrowing owl colonies in these areas. If conservation actions in the North San José/Baylands region prove successful, and the number of breeding burrowing owls increases substantially, it is reasonable to assume the nesting burrowing owl population will expand into suitable habitat in the South San José, Morgan Hill, and Gilroy regions. Management of foraging and overwintering habitat will also occur on lands already under protection, and in the Reserve System, especially those that are dominated by grassland land covers and are located below 200 feet in elevation.

The study area has been divided into four burrowing owl conservation regions to more easily prioritize conservation actions (**Figure 5-10**). These regions are described below in order of current conservation priority.

- North San José/Baylands
- Gilroy
- Morgan Hill
- South San José

North San José/Baylands Region

The North San José/Baylands region includes the City of San José, north and west of I-280/680, and extends around the southern margin of the San Francisco Bay to the Dumbarton Bridge (**Figure 5-10**). The remaining burrowing owl nesting colonies in the South Bay area are in this region. This region also has the greatest potential for population expansion because of its proximity to the remaining colonies. It is reasonable to assume that properly managed burrowing owl habitat in this region would be colonized (or recolonized) sooner than similar habitat in any other region.

Sites of importance for nesting burrowing owls within this region include the San José International Airport, San José/Santa Clara Water Pollution Control Plant, Mission College, the Shoreline Park and amphitheater area, Moffett Airfield, Santa Clara Valley Transportation Authority (VTA) Cerone Busyard, and the Don Edwards San Francisco Bay National Wildlife Refuge. With the exception of the VTA Cerone bus yard, none of these sites are under the jurisdiction of the Habitat Plan applicants. Based on documented movements of burrowing owls in the South Bay Area (Harman and Barclay 2007; City of San José 2000) it is reasonable to assume that burrowing owls from any of these locations could disperse to any one of the other locations. Conservation efforts in the North San José/Baylands region will be the highest priority of the Implementing Entity because of the existing colonies and it has the greatest potential for expansion of the population.

The conservation strategy within this region will be three-fold. First, the Implementing Entity will attempt to stabilize the existing colonies to the

maximum extent practicable. This will be done by acquiring land or, in circumstances where outright acquisition is not feasible but the location has significant value in the short term (i.e., San José International Airport, Shoreline Park, and Moffett Airfield), attempt to secure long-term management agreements to maintain nesting and foraging areas. Overall, the approach is to acquire and manage key lands where opportunities exist. Where acquisition is not possible, for whatever reason(s), the Plan recognizes that there may still be substantial benefit in maintaining existing breeding and foraging areas in the short term, until permanent protection can be established within the Reserve System. Therefore, use of permanent conservation easements, temporary conservation easements, or temporary management agreements on key lands may be the preferable option.

Maintaining and increasing breeding pairs in a highly altered environment such as exists around the Bay area will require active land management, so assuring long-term management is essential for the persistence of burrowing owls in the South Bay area. Lands acquired or protected as described above will be managed to protect and enhance the owl populations. However, for sites that cannot be acquired or when acquisition is not as desirable a strategy as short- or long-term management, other approaches will be utilized. For example, at many sites in this region, public lands are, or could be, managed to support burrowing owls. At some of these sites, however, no long-term management assurances currently exist. For these sites, the Implementing Entity can carry out this strategy by providing stable, long-term funding or staffing for effective and consistent management and monitoring. With enhanced management, sites that already support breeding pairs could be improved to support more pairs. Alternatively, there may be opportunities to obtain management rights in perpetuity, without acquisition of the underlying land.

The second component of the conservation strategy in this region will be to attempt to increase the burrowing owl population and number of colonies within the existing occupied area. This will be done by acquiring land or securing long-term management (preferably permanent for this phase) agreements on lands that will be enhanced to attract new burrowing owl pairs. Many sites in the region may not support burrowing owls consistently because vegetation or other factors (e.g., predators) render them unsuitable. With proper management, sites within the dispersal distance of breeding locations will be managed to attract new breeding pairs.

Public lands where long-term, enhanced management may be secured to meet the Implementing Entity's population goals in this region are:

- San José International Airport (including the VHF Omnidirectional Range [VOR] communications parcel adjacent to U.S. 101)
- San José/Santa Clara Water Pollution Control Plant, including buffer lands
- Alviso
- SCVWD levees (e.g., Pond A4)
- VTA Cerone Bus Yard

- Closed landfills within San José and other cities that primarily support annual grassland. If managed properly, these areas could provide foraging habitat for burrowing owls. In some cases, California ground squirrels have recolonized these sites, providing nesting opportunities for burrowing owls as well.

Some private land may also be suitable for long-term management agreements to help meet Plan goals.

The final component of the strategy in this region is long term and will consist of attempting to extend the burrowing owl range beyond the existing localized area. It is intended that this range expansion will lead to an increase in the overall number of burrowing owls and colonies. The primary mechanism to accomplish this goal will be to acquire, either in fee title or through permanent conservation easements, temporary conservation easements, or management agreements, areas outside of currently occupied nesting habitat to accommodate the population expansion. These areas will then be enhanced to provide suitable burrowing owl habitat. Suitable sites for habitat enhancement may include, but are not limited to:

- Moffett Federal Airfield (National Aeronautic and Space Administration)
- Don Edwards Bay National Wildlife Refuge (USFWS)
- City of Sunnyvale Baylands
- City of Palo Alto Baylands
- City of Mountain View Shoreline Park
- Golf courses (e.g., in Santa Clara along Tasman Road)—many golf courses in the South Bay Area provide foraging and, at times, nesting habitat for burrowing owls. This often occurs around the edges of a golf course, in areas outside of the fairways, where there is more natural vegetation (i.e., the "rough").
- Various private lands in the City of Fremont—Warm Springs District
- Various closed landfills
- Various Bay front lands in the cities of Milpitas and Fremont.

Please note that although burrowing owl conservation actions in the sites listed above could contribute to the burrowing owl conservation strategy, not all of the locations listed above will be eligible to be counted toward the Habitat Plan's Reserve System acquisition commitments, since protection and management in perpetuity cannot be guaranteed for most of these sites. However, the conservation strategy for this species explicitly recognizes that there can be substantial interim benefit in protecting and managing these areas for the longest period possible, in order to provide time to allow the Reserve System to be assembled and for the expansion of the burrowing owl range within the Habitat Plan Reserve System.

Gilroy Region

This region includes the valley floor in the southern tip of the study area surrounding the City of Gilroy (**Figure 5-10**) to the Pajaro River. This region has a moderate-high potential for nesting burrowing owls because of burrowing owl occurrences near the Pajaro River. The primary conservation actions in this region will be to attract burrowing owls into the region from neighboring San Benito County, where nesting burrowing owls have been documented in low numbers during surveys in 2008 and 2009 (Barclay 2008). This will occur through acquisition of or management agreements on potential burrowing owl nesting habitat (or occupied nesting habitat if a colony is discovered) and enhancement through improved management. Currently, most of the land along the San Benito County line is managed intensively for row crops, which is generally not suitable for nesting owls although the edges of fields and uncultivated areas can provide foraging habitat.

There have been no documented nesting burrowing owls within this region since the early 1990s. Lands in this region are within the expected dispersal distance of burrowing owls nesting in northern San Benito County (Barclay 2008), so with proper management the potential exists for burrowing owls to colonize reserve lands protected in this region. Land to be acquired for burrowing owls in this region is located along the Pajaro River and lower Llagas Creek corridors. Land acquisition and management in these areas will also support the biological goals and objectives for other covered species. Land acquisition targets along the Pajaro River are described for Conservation Analysis Zones Uvas-6, Llagas-4, and Pacheco-8. Agricultural lands acquired will be restored to grassland.

There may also be opportunities to implement or improve management on public lands in the Gilroy region to attract and maintain burrowing owls. These cost-effective measures may be appropriate at the South County Water Treatment Plant in Gilroy, or other sites.

Morgan Hill Region

This region includes the valley floor between the northern boundary of the City of Gilroy and the southern boundary of the City of San José (**Figure 5-10**). The region extends west and east to the toe of the surrounding hills. While there seems to be an abundance of burrowing owl habitat in this part of the study area no burrowing owl nests have been observed in this region since 2002 (DeSante et al. 2007; Townsend and Lenihan 2007; Barclay 2008). Before 2002 reports of nesting owls in this region were sporadic. As a result, this region has only a moderate potential to provide expansion for the burrowing owl population from the South Bay.

During the Plan term, the primary purpose of burrowing owl conservation in this region will be to provide connectivity between populations in the North San José/Baylands Region and the Gilroy Region. Although it is outside the scope of

the Habitat Plan, it is hoped that burrowing owls will eventually return to this area in significant numbers. Potential nesting habitat will be acquired and enhanced in this region to attract burrowing owls and be consistent with the land acquisition goals stated for Conservation Analysis Zone Llagas-3 (**Figure 5-5**). This land acquisition will benefit many covered species. When a parcel is acquired for the Reserve System that has burrowing owl habitat present, the management plan for that parcel will specify management actions that enhance the burrowing owl habitat.

South San José Region

The South San José region includes the remainder of the City of San José south and east of I-280/680 (**Figure 5-10**). This region extends to the southern urban edge of San José and into the eastern hills. It is unknown what population levels were in this region historically, and there are currently very limited conservation opportunities in this part of the study area due to the urban environment, poor connectivity to populations that could provide colonizers and the low numbers of nesting burrowing owls in the recent past (Barclay 2008; California Natural Diversity Database 2009). Typically the number of burrowing owls in this region ranges from 0–2 adult burrowing owls. During surveys conducted from 2008–2009, one nesting pair was observed (on vacant land next to Meadowfair Park).

Expected impacts to occupied nesting burrowing owl habitat will be low or absent from this region because few nesting owls remain. Based on past survey results the loss of habitat within 0.5-mile of the nest location adjacent to Meadowfair Park will be considered an impact to occupied burrowing owl nesting habitat.

The primary goal of burrowing owl conservation in the South San José Region is to provide stepping-stone connectivity between the North San José/Baylands region, and the Morgan Hill Region, in the Santa Clara Valley to the south. The functionality of any connectivity through this area is constrained because it is mostly a highly urbanized environment. Due to the limited amount of suitable habitat and the isolation of existing habitat patches the Implementing Entity will not only pursue land acquisition in this region to secure conservation but will also attempt to reach permanent or temporary long-term management agreements with public or private landowners to retain suitable habitat for burrowing owls.

M.2.2 Population Performance

As part of the process to determine a viable conservation plan for burrowing owls in the Plan, it was decided to utilize a count-based population viability analysis (PVA) to determine the probability of persistence of three burrowing owl nest colonies in the South Bay (**Appendix N**). This analysis was completed on the three largest remaining burrowing owl colonies in the South Bay Area: Moffett

Airfield, San José International Airport, and Shoreline at Mountain View using survey data of adult burrowing owls from the 11-year period, 1999–2009. These sites were chosen because they are the primary remaining population clusters and because data was available for the period of time recommended for the analysis (i.e., at least 10 years). The intent of the analysis was to quantify population size, trend, growth rate, and variance in the three burrowing owl colonies and to evaluate the probability of persistence of these colonies (individually and combined) during that 11-year period. Using those data, a predictive model was generated to estimate the risk of future extinction based on the behavior of the data during the 11-year period. It is assumed that changes in population performance at these three colonies are representative of changes in the South Bay burrowing owl nesting population as a whole. Therefore, the population performance at these three sites can be used as an index for population performance for burrowing owls in the Habitat Plan study area.

All three colonies showed declining population trends during the 11-year period from 1999–2009. The colonies at San José International Airport and Moffett showed very similar magnitudes and variance of decline, while Shoreline showed an even greater magnitude and variance of decline. The PVA model predicts similar probabilities of extirpation for the colonies at San José International Airport and Moffett Airfield, while Shoreline reflects an even higher probability.

The standard that was used to represent effective extirpation is the probability of reaching a quasi-extinction threshold of two adult owls. Quasi-extinction in this case is defined as the point at which the breeding colony becomes essentially non-functional (2 adults). San José International Airport and Moffett showed similar probabilities of quasi-extinction, with an unacceptably high chance of extinction (95%) by Year 22. Shoreline showed a probability of reaching the quasi-extinction threshold of two adults, with an unacceptably high chance of extinction (95%) by Year 10. This is likely due to the smaller size of this colony. The probability of quasi-extinction for the combined populations was set at six adults for all three colonies (representing two adults at each colony). The combined sites had an unacceptably high chance of extinction (95%) by Year 18. See **Appendix N** for more details on the methods and results of this analysis.

Population Size

In order to develop a burrowing owl population size goal for the Habitat Plan, the annual population size of adult owls was artificially increased in a statistical model to determine the rate at which the numbers of adult burrowing owls at the three baseline colonies (San José International Airport, Moffett and Shoreline) would need to increase and over what period of time to change the PVA probability of extinction trend from a negative growth rate to a positive growth rate. It was determined that if currently measured population characteristics held true (i.e., growth rate and variance were constant) changing the overall number of adult burrowing owls in this type of model did not change the probability of persistence significantly (**Appendix N**). Instead, changing the growth rate from negative to positive required an incremental, annual, steady increase in the

number of adult burrowing owls over a number of years. Therefore, for the purposes of this Plan, growth rate is a more correct predictor of persistence than an ultimate population size.

The most recent survey year that was considered in the PVA was 2009. During that year there were 51 adult burrowing owls observed at the three nest colonies under study. This analysis focuses on the number of adult burrowing owls rather than breeding pairs or juveniles (for a complete discussion of this see **Appendix N**). In order to change the population trend at the three colonies from negative to positive, within a 10-year time period there would have to be an increase of three adult owls per year combined at the three sites. Based on the data set used in the PVA, quasi-extinction at the three PVA colonies would occur in 18. By setting population growth goals that would change the growth rate from negative to positive by Year 15, the strategy aims to avoid a situation where the South Bay burrowing owl population gets too low to recover. A period of at least 10 years is also needed to allow time for collection of data at occupied nest sites in the Permit Area and integration of that data into the PVA model.

M.3 Biological Goals and Objectives

The Implementing Entity will maintain or increase the size of the breeding and overwintering burrowing owl population and increase the distribution of breeding and overwintering burrowing owls in the study area and the expanded burrowing owl conservation area (**Figure 5-10**). This will be accomplished by targeting protection of grassland or barren land with less than 25% slope in tracts that meet minimum species spatial requirements. All of these lands will be located on the valley floor or in the Diablo Range.

In addition to protecting new sites, the Implementing Entity will enhance grassland or barren land with existing protections and flat or moderate slopes (<25%). In order to increase the chance that the sites will be used by owls, areas will be targeted within 2 miles of an established breeding site in the study area (i.e., San José International Airport, Reid Hill View Airport, City of San José WPCP bufferlands). Acquisition, enhancement, and restoration conservation actions identified for grasslands (see Section 5.3.3 *Grassland Conservation and Management*), valley oak woodlands (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*), seasonal wetlands (see Section 5.3.7 *Wetland and Pond Conservation and Management*), and agriculture and cultivated cropland (see Section 5.3.8 *Agriculture and Cultivated Cropland Conservation and Management*) are intended to benefit western burrowing owl through breeding and foraging habitat conservation and management.

The PVA demonstrates that the overall number of adult burrowing owls in the South Bay Area is less important than the trend in population numbers and the variability in the number of owls from year to year. An unsurprising conclusion is that a growing or stable population is more likely to persist than a widely fluctuating population. The primary goal is to manage burrowing owls and their

habitat to ensure the South Bay population persists over time and eventually increases.

An adaptive management approach for determining what types of conservation actions will be employed and where conservation funds will be spent is critical since management activities are likely to change often, due to rapidly changing circumstances, both negative and positive. Depending on a number of factors, the priorities for conservation monies may shift (see *Setting Conservation Priorities*, below). Priorities may also shift through the adaptive management process if additional colonies are discovered during the permit term.

When considering the recovery of the burrowing owl in the Habitat Plan study area and in the *expanded study area for burrowing owl conservation*, the ultimate regional goal is to have a stable burrowing owl population that has a high potential for recovery. In practical terms, we define this goal as being met by achieving a positive growth rate by Year 15 of the Plan using annual data for the San José International Airport, Moffett and Shoreline colonies. Colonies at the VTA Cerone site, the buffer lands and other nesting locations will be monitored and added to the data set as they are discovered or established and are determined to be stable enough to not artificially skew the results. Year 15 was chosen to allow adequate time for the conservation actions to have a measureable effect and to provide a buffer on the 10-year goal discussed above. In addition, if counts of adult burrowing owls begin in year one of implementation, those data cannot reliably be used in a PVA until Year 10 of implementation. Setting the goal of achieving a positive growth rate by Year 15 allows for the inclusion of sites that are under the authority of the Habitat Plan to be incorporated into a PVA analysis, and apply an adaptive management approach if it is discovered that positive results are not being reached at Year 10.

The most likely way to achieve the Year 15 positive growth rate will through an average increase in the number of adult burrowing owls at San José International Airport, Moffett, and Shoreline each year during the Year 15 time period. These three sites are the focus because there was enough data (recommended 10 years) at each site to perform a PVA. Continuing to track the number of adult burrowing owls at each of these locations will give the Implementing Entity the most accurate assessment of how the burrowing owl population is performing and whether the goals for the number of adult burrowing owls is being met each year. Additional data will be collected annually at VTA Cerone, the buffer lands, and any other nest sites found during Plan implementation, but that data will not be useful for assessment using a PVA until Year 10 of Plan implementation.

Unfortunately, none of these three sites are in the Plan Permit Area and, as a result, positive actions by the Implementing Entity are less likely to be actionable. While there are activities aimed at influencing management of these sites, most of the conservation activities by the Implementing Entity will, by necessity, take place elsewhere.

In order to achieve Plan goals during the permit term the Implementing Entity will carry out the following generalized conservation actions:

1. attempt to protect existing colonies through fee title acquisition, purchase of a conservation easement, or other long-term management agreements (San José International Airport, Moffett Airfield, Shoreline and others, known or unknown), ensuring proper burrowing owl management on those sites
2. attempt to protect foraging habitat, through fee title acquisition, purchase of conservation easements or other long-term management agreements (San José International Airport, Moffett, Shoreline and others, known or unknown), ensuring that nest sites remain viable over the long term
3. acquire or protect with conservation easements or, on a temporary basis, through management agreements, currently unoccupied areas that have potential nesting habitat and are within the expected dispersal distance of nesting burrowing owls
4. consider acquisition and management of locations within study area but outside of the 7.5-mile dispersal distance in anticipation that these lands will be needed in the future for nesting, foraging, and connectivity between colonies as the burrowing owl population expands beyond its current distribution
5. carry out data collection, analysis and controlled experiments to ensure the most appropriate techniques will be used and are being used
6. manage habitat areas that may support burrowing owls
7. If the conservation strategy is implemented as planned but the number of adult burrowing owls fails to meet the annual increase of at least three adult owls each year at the annual survey sites described in Section 7.3.3 Species *Level Actions* subheading *Western Burrowing Owl (Group 1)* the Implementing Entity will propose more active conservation methods to the Wildlife Agencies, such as population augmentation to provide a boost to local population numbers. Active methods utilized will be supported by data gained from pilot studies. Any changes to the conservation strategy must be approved by the Wildlife Agencies prior to implementation.

The specific burrowing owl conservation plan is comprised of conservation actions that are grouped into three "tiers" of priority. Each tier is discussed in detail below but generally consists of:

- **Tier 1 conservation actions** are designed to stabilize the existing population by protecting and/or managing occupied burrowing owl nesting habitat. Tier 1 actions may indirectly increase the numbers of owls in extant colonies. Tier 1 conservation actions will take place initially in the North San José/Baylands Region where owls currently occur. Tier 1 conservation actions will occur immediately.
- **Tier 2 conservation actions** are designed to facilitate growth and expansion of existing colonies, the number of colonies, and the range of the species in the study area by protecting and managing potential burrowing owl nesting habitat in all portions of the Plan area. Tier 2 conservation actions will also

take place immediately and initially in the North San José/Baylands Region where owls currently occur.

- **Tier 3 conservation actions** consist of more experimental and active methodologies such as population augmentation and owl relocation within the Plan area to increase owl numbers and expand distribution. Tier 3 actions will be implemented in response to population performance at the three index sites (Shoreline Park in Mountain View, San José International Airport, and Moffett Federal Airfield) but these actions could occur in any of the burrowing owl conservation regions. These actions will be coordinated with the Wildlife Agencies and will only be implemented upon their approval.

Funds collected for burrowing owl conservation actions come from three sources; 1) Habitat Plan base development fees, 2) burrowing owl conservation fees, and 3) burrowing owl habitat viability fees. It is anticipated that funds will be obtained from other sources, such as non-profits and t the State and Federal government, to augment specific conservation actions, including research efforts. Habitat Plan base development fees will assist with all three tiers of conservation. Burrowing owl conservation fees and burrowing owl habitat viability fees will could be used to complete conservation actions in all three tiers as well, but if the population trend is downward, fees from these two categories would shift as described below. The types of conservation actions that those funds will be used for will depend on the conservation need at the time the accumulated funds are spent, and may include activities in all tiers. However, in the short-term, funds collected from burrowing owl conservation and habitat viability fees will be used for two purposes, protection and management of occupied burrowing owl habitat (Tier 1), and data collection and experimentation, particularly to investigate implementation of more active Tier 3 activities, such as population augmentation.

Through the course of the permit term these three tiers of conservation actions may occur in any of the four burrowing owl conservation regions. Initially, Tier 1 conservation actions will only occur in the North San José/Baylands region because occupied burrowing owl nesting habitat currently only occurs in this region. Should burrowing owls begin to nest consistently in other regions of the study area, Tier 1 conservation actions may occur in those areas as well. Tier 2 conservation activities will occur throughout the study area, in all four burrowing owl conservation regions because potential burrowing owl nesting habitat occurs in all four regions. Initially, Tier 3 conservation activities will only occur in the North San José/Baylands region since this is where existing nest colonies occur, and there is the greatest potential for effective implementation of these measures, should they become necessary. Tier 3 conservation actions may also occur in the Gilroy region later in the permit term if nesting burrowing owls establish there on their own.

M.3.1 Setting Conservation Priorities

The Implementing Entity will determine how burrowing owl conservation funding will be allocated. Acquisition in fee title or conservation easement will always be the preferred strategy. However, given the unique circumstances for the burrowing owl, the conservation strategy for the burrowing owl includes more flexibility than is provided for the conservation strategy for other covered species. The default assumption is that funds generated from burrowing owl conservation fees or habitat viability fees will be used to acquire and manage occupied burrowing owl habitat in the South Bay Area through fee title, conservation easements, or management agreements. Other funding sources may also be used for this purpose, but monies from the burrowing owl conservation fee and habitat viability fee will be earmarked for this purpose. The selection criteria for how those parcels will be chosen are discussed below. Burrowing owl conservation fees and habitat viability fees will be used wholly to acquire and manage occupied burrowing owl habitat, as long as the PVA population curve indicates a positive growth. During at least the first 10 years, this will be assumed to be occurring as long as there is sufficient annual increase (at least 3 per year cumulatively) in the number of adult burrowing owls at the annual survey sites. Over time, additional colonies may be added to this cumulative index as well and fund use prioritization will be based on the numbers predicted by the PVA model necessary to achieve positive growth.

If the cumulative annual growth rate is below the three owl threshold at the annual survey sites, or after more colonies are added to the model, below whatever number of owls is predicted by the model to achieve positive growth, then 50% of the revenue generated from the burrowing owl conservation fee and the habitat viability fee will be shifted from Tier 1 and 2 conservation actions to Tier 3 conservation actions. The decision about funding allocation for Tier 1 and 2 conservation actions versus Tier 3 conservation actions will be made following the annual survey that begins during the second full year of Plan Implementation. The numbers of adult burrowing owls annually at the three index sites will be compared to the number of adult burrowing owls observed at the three sites during the first full year of implementation. Following the assessment during year two, the change in the number of adult burrowing owls at the three sites will be documented annually and the trend recorded. If the goal of an increase of at least three adult burrowing owls at the three annual survey sites is not being met, then the money collected from burrowing owl conservation fees and habitat viability fees will be split 50/50, between Tier 1 and 2 vs. Tier 3 conservation actions.

M.3.2 Burrowing Owl Conservation Priorities

Tier 1 Conservation Actions

1. Protect and manage occupied burrowing owl habitat as it is defined above and shown in **Figure 5-11**. An assessment survey of where occupied nesting

habitat occurs will be conducted during year one of Plan implementation and then every year thereafter. The protection of burrowing owl habitat will be tracked in the same manner as other land cover types, discussed in Section 8.6.1, to ensure that impacts are occurring in rough step with habitat goals based on the necessary population increase to allow for recovery.

2. Increase survival rates at existing nest colonies through one or more management actions including, but not limited to:
    a. protection of nests by controlling access and maintaining fencing,
    b. predator control,
    c. habitat management to increase prey availability,
    d. cessation of inappropriate rodent control on-site and/or implementation of activities that would enhance burrowing mammals.
3. Where feasible, fund management activities to the three index sites (San José International Airport, Moffett and Shoreline) to benefit burrowing owls.

Tier 2 Conservation Actions

Tier 2 Conservation Actions will be initiated during the first year of implementation. In many cases these actions will require several years to complete (e.g., #1, #6, #7) and they will be initiated upon Plan implementation.

1. During the first three years of implementation survey all undeveloped parcels within 7.5-miles of documented nest colonies in the North San José/Baylands Region and complete an opportunities and constraints assessment of each, relative to the potential of the parcel to function as a burrowing owl reserve in the future. Assign parcels a high, medium, or low priority for burrowing owl conservation.
    a. High: parcel with documented nesting burrowing owls in the previous three years and grassland or barren land cover, which can be managed (vegetation height) to be favorable to burrowing owls and is currently occupied by ground squirrels or has other suitable nesting burrows.
    b. Medium: parcel with no history of burrowing owl occupancy but with grassland or barren land cover, which can be managed (vegetation height) to be favorable to burrowing owls and is currently occupied by ground squirrels or has other suitable nesting burrows.
    c. Low: parcel with grassland or barren land cover type that can be managed (vegetation height) to be favorable to burrowing owl but lacks ground squirrels or other suitable nesting burrows.
2. Protect and/or manage potential or occupied burrowing owl nesting habitat as described above and shown in **Figure 5-11**.
3. Obtain data from annual burrowing owl surveys at Moffett, San José International Airport, and Shoreline to inform where burrowing owl conservation fee funds will be spent.

4. Conduct two meetings annually of burrowing owl survey partners. The first meeting will be in January, prior to the burrowing owl nesting season to coordinate with surveyors and ensure that all appropriate locations are surveyed. The second meeting would be in September, following the burrowing owl nesting season, to gather data from surveyors and discuss changes in survey protocols.
5. Conduct annual surveys at all burrowing owl nest colonies in the South Bay Area (see discussion below under *Survey Effort*).
6. Once every three years, conduct a more thorough survey of the burrowing owl nesting population in the study area to determine changes in the nesting population.

Tier 3 Conservation Actions

1. Implement a program to increase reproductive success of burrowing owls in the South Bay Area. General success criteria for the program will be defined in close coordination with the Wildlife Agencies and set prior to its implementation, during the pilot studies described in Tier 2, and based on the success or failure of the program, interim checkpoints will be established to determined if/when the program should cease.
2. Study the feasibility of population augmentation activities including:
    a. Initiate a pilot reintroduction program and study the success of the effort and the feasibility of replicating the effort elsewhere. Potential locations for a pilot study include, but are not limited to:
        1) San José International Airport VOR site (radio tower),
        2) fenced portion of San José/Santa Clara Water Pollution Control Plan Buffer Lands,
        3) fenced portion of Don Edwards National Wildlife Refuge,
        4) existing burrowing owl mitigation area in the City of Santa Clara at the end of Great America Parkway.
    b. Initiate a pilot study to determine other methods to increase reproduction of local burrowing owls. These methods may include but are not limited to:
        1) protect nest sites to reduce predation on eggs and young,
        2) supplemental feeding of nesting females and young,
        3) forced re-nesting or double-clutching (the young from the first nest would then be used to augment other nest sites in the study area),
        4) foster nestlings to maximize brood size.

If studies have not been completed to justify the use of one or more of these techniques, then funds shifted to Tier 3 will be used first to plan and complete those studies.

Current PVA population data indicates an unacceptably high risk of extirpation of the local burrowing owl population. Due to this existing condition, 50% of the funds will be aimed at Tier 3 activities. Since there are no studies currently completed or underway, those funds will be used to plan and carry out studies before implementing any proposed techniques.

M.4 Habitat Acquisition, and Enhancement

M.4.1 Nesting Habitat

Assumptions for Calculating Amount of Conservation Needed

1. In order for the local burrowing owl population to be stable or increasing an additional 3 owls (1.5 breeding pair) will need to be recruited into the population each year.
2. A breeding location (nest) requires at a minimum that there are 140 acres of foraging habitat surrounding the nest site. If an additional 1.5 breeding pairs are recruited into the local population each year an additional 210 acres (1.5*140=210) would need to be managed each year to support that expansion.
3. Owls from multiple nest sites use the same foraging habitat (i.e., breeding territories overlap). The total estimate of land that needs to be acquired and/or managed for burrowing owl population growth has been reduced by 20% to account for this overlap in foraging habitat.
4. Utilizing survey data from 2009 the number of adult burrowing owls for Shoreline (6), Moffett Airfield (26), and San José International Airport (19) was 51 adult burrowing owls. An additional 19 burrowing owls were observed during surveys in 2008 in other parts of the Habitat Plan study area. This total of 70 adult burrowing owls in the South Bay area is a good estimate of the baseline number of adult burrowing owl in the South Bay area. Of those 70 owls, 38 (or 54%) were inside of the Habitat Plan study area.
5. It is assumed that even though 54% of the burrowing owl population currently resides inside the Habitat Plan study area the IE would be responsible for an estimated 70% of the population going forward. This additional commitment would be an acknowledgement of habitat lost in the north San José area in the past and demonstrate a commitment to recovering the species in the South Bay in the future.
6. If 3 burrowing owls (1.5 breeding pair) are recruited to the population each year, a total of 220 (70 baseline +150 new) would be attained over the 50-year permit term. Based on a commitment to support 70% of the South Bay burrowing owl population, 154 adult burrowing owls would be supported by the IE by the end of the permit term. Therefore adding

116 owls (154 total – 38 baseline) would be the responsibility of the Implementing Entity. Those additional 116 adult burrowing owls (58 breeding pair) would require 140 acres of foraging habitat per pair, for a total of 8,120 acres.

7. As noted above that 8,120 acres would be reduced to give credit for additional conservation actions (15%) and to account for overlapping foraging habitat between breeding pairs (20%). This would result in total land management commitment of 5,278 acres [8,120 acres – 1,624acres (20%) –1,218 (15%) = 5,278].

The opportunities for burrowing owl conservation are discussed for each burrowing owl conservation region in Chapter 5. Since the North San José/Baylands region is the most important for burrowing owl conservation and has the most conservation opportunities, 70% (3,695 acres) of the total land management should occur in that region. Not all of these land management agreements would occur inside the study area but it is assumed that some will also occur inside of the *expanded study area for burrowing owl conservation*. Further, 15% (792 acres) of the total land managed would occur in the Gilroy region. The remaining 15% should remain flexible and could occur in any of the regions, but we recommend that 5% (264 acres) occur in the South San José region and 10% (528 acres) occur in the Morgan Hill region.

M.4.2 Overwintering Habitat

There are 133,631 acres of burrowing owl overwintering modeled habitat within the study area. A total of 33,140 acres (25%) of overwintering modeled habitat are located in Type 1, 2, or 3 open space with 12,662 acres (9%) of that habitat permanently protected as Type 1 open space. The Plan proposes to acquire a minimum of 23,000 acres of that modeled overwintering habitat for the Reserve System. Modeled overwintering habitat for western burrowing owl will be permanently preserved, managed, and enhanced throughout the Reserve System in all major watersheds in the study area. In addition, 4,322 acres of overwintering modeled habitat for western burrowing owl will be added to the Reserve System from existing open space. Incorporation of County Park lands into the Reserve System (**Table 5-5** and **Figure 5-4**) will benefit the species by providing opportunities for habitat enhancement and long-term monitoring. All of these acquisitions and additions will increase the proportion of protected overwintering modeled habitat in the study area to about 30% in Type 1 open space and 42% in Type 1, 2, or 3 open space (**Table 5-19**).

Nearly all annual grassland and ruderal habitats on the valley floor, particularly in urban or rural residential areas, provide suitable nesting and foraging habitat for western burrowing owl. Only a few of these sites are occupied by breeding owls on a consistent basis, therefore it was modeled as overwintering habitat, rather than breeding habitat. Should the population increase there is the potential for these small pockets of habitat to support breeding pairs. To increase the amount of western burrowing owl breeding, foraging, and wintering habitat in

the study area, 27,322 acres of burrowing owl overwintering modeled habitat will be protected through fee title acquisition or easement. Land acquisition will be focused on protecting breeding habitat, as it is more limiting than overwintering habitat within the study area. The Implementing Entity will target burrowing owl breeding habitat within 2-miles of the San José International Airport, Reid Hill View Airport, or City of San José WPCP bufferlands (LAND-G7).

The Implementing Entity will continue to pursue acquisition of all or part of the City of San José WPCP bufferlands for protection as a western burrowing owl Reserve. Due to competing interests at this location it is unclear how much will eventually be protected and managed for burrowing owls. The Implementing Entity will protect 27,322 acres of low elevation grassland valleys in the Diablo Range that currently support California ground squirrels, have supported California ground squirrels since 1997, or are adjacent to lands with existing California ground squirrel colonies (LAND-G8). Low elevation valleys within the Reserve System that are located on the valley floor or in the Diablo Range will be managed to benefit nesting and wintering burrowing owls. Some of this land is on the south side of the South County Airport. There are additional locations on the southern edges of the City of San José that could support burrowing owls in the future. Conservation easements will be obtained on 300 acres of occupied or suitable burrowing owl breeding sites (LAND-G6, LAND-G7). In addition several acres will be acquired in the southern part of the study area in the Pescadero watershed and along the Pajaro River that can be converted to annual grassland and managed for western burrowing owls. Nearly all land acquisition in areas dominated by annual grassland has the potential to benefit overwintering owls. Most of that land acquisition will occur along Coyote Ridge, west of Chesbro Reservoir, west and east of Calero Reservoir, and between Henry W. Coe State Park and the San Benito County line. This land acquisition has been primarily targeted for other covered species but will have incidental conservation benefit for western burrowing owls, especially during the winter months.

M.4.3 Reserve Land Selection Criteria

Land that is acquired through fee title purchase or easement to meet biological goals and objectives for burrowing owl breeding and overwintering habitat in the habitat Plan study area will be selected using the reserve design principles in Chapter 5. All lands or easements will be acquired from willing sellers using the process defined in Chapter 8.

In addition, lands acquired and/or managed for burrowing owl breeding habitat will meet the following criteria.

Location Criteria

1. The Implementing Entity will preferentially select a reserve parcel that is inside of the Habitat Plan study area over a parcel that is inside of the expanded study area for burrowing owl conservation.
2. If impacts occur in occupied burrowing owl nesting habitat then conservation parcels must be within 7.5-mile of a documented nest location.
3. The Implementing Entity will preferentially select parcels that are closer to documented nest locations over those that are farther away.
4. Parcels that do not meet criteria #s 2 and 3 may be considered on a case-by-case basis to allow the Implementing Entity to take advantage of unusual opportunities. In order to be considered, the properties must be reasonably foreseeable as significant components in the final reserve design.

Habitat Criteria

All sites acquired or managed through conservation easements or other long-term agreements must have the following:

1. Documented nesting burrowing owls on the parcel in at least one of the previous three years. Parcels that are currently occupied should be selected first, followed by parcels that have been occupied in the previous three years. If a parcel has not been occupied during the previous three years but there is historical information that suggests that it is important to burrowing owls it may be considered.
2. Be surrounded by at least 140 acres of foraging habitat within 0.5-mile of a nest site (including the parcel where nesting was documented). If there is no potential for foraging habitat to be protected through future acquisition , conservation easement, or long-term management agreement, the nest site should not be acquired unless long-term viability of the site can be in some other way demonstrated.
3. Currently supports ground squirrels or is located adjacent to another parcel with ground squirrels.
4. Currently support grassland, ruderal, or other vegetation types that can be managed or modified to enhance the site to increase the habitat quality for burrowing owls.

Parcel Criteria

All parcels considered for inclusion in the Reserve System and managed as burrowing owl habitat will meet the following criteria:

1. Parcel size is not a limiting factor on burrowing owl occupancy, however larger parcels will be favored over smaller parcels to maximize the benefits

on conservation funding that will be generated under the Habitat Plan. Larger parcels will support more burrowing owls over the long term and provide both nest sites and foraging habitat. Further, larger parcels allow for more options for important management practices (e.g., grazing with sheep is more practicable on a larger parcel than on a smaller one).

2. Adjacent land uses should not constrain necessary management (e.g., seasonal mowing, winter disking, grazing, or other methods of vegetation removal). Fencing around the parcel must be feasible to control human and animal access. Control of non-native predators (e.g., feral cats, foxes) must also be feasible on the site.

3. Ground squirrel management will not occur on the parcel (see above), so adjacent land uses should be such that ground squirrel control will not be needed (e.g., levees, dams, ranchlands where ground squirrels are not desired).

M.5 Management Techniques and Tools

The general principles for grassland management will be followed in all grassland or barren areas (Section 5.3.3, *Grassland Conservation and Management*). Management techniques may include any or all of those outlined in Section 5.3.3 *Grassland Conservation and Management*, and those that will be most beneficial to burrowing owls are grazing and mowing.

Enhancement of sites supporting nesting or overwintering will include maintaining a maximum Effective Height of 5-inches (Green and Anthony 1989). There are two time periods when this is important, before February 1st, so the grasses at the site will be short when owls are selecting nest sites, and following the growing season (dependent on rainfall), so grasses will remain short until the next growing season. Further, all nesting and overwintering locations that are in the Reserve System will have restrictions on California ground squirrel control (GRASS-5). On sites where owls are not currently nesting but where attracting owls is consistent with management goals, but where California ground squirrels are not present, artificial burrows will be installed to make breeding and wintering sites available immediately for burrowing owls (GRASS-9) (Barclay 2008). Artificial burrows will be used as a temporary measure to encourage use by burrowing owls while long-term measures such as ground squirrel population enhancement are being developed.

Grazing can be used to reduce the biomass or effective height of nonnative invasive species and to maintain structural heterogeneity within the natural community. Grazing is beneficial to burrowing owls because it keeps the vegetation short. Short vegetation is necessary for a site to serve as functional nesting habitat for burrowing owls. Most of the grazing in the study area will be by livestock (GRASS-6). In some urban areas grazing with goats or sheep may be a better approach.

In some instances, mowing is a reasonable alternative to grazing, and mowing in selected areas is often an option when grazing is infeasible (e.g., urban sites) (GRASS-8). Mowing can also be safer and easier to implement on small isolated parcels, which suits burrowing owls better than any other covered species. In either case the goal of vegetation management will be to reduce the overall height and effective height of vegetation on burrowing owl habitat to optimal conditions for the species (GRASS-8). Deep ripping will not be performed in the Reserve System or management areas for the burrowing owl because it often destroys burrows and increases soil erosion. Using light disking outside of the nesting season may be used in select cases. The use of light disking will be evaluated on a case-by-case basis and will be used only when other forms of vegetation removal are not practical.

The Implementing Entity will allow and encourage colonization by California ground squirrels in grasslands and barren lands within the Reserve System, excluding engineered levees and dams. This expansion of colonies will be monitored and only allowed in areas where conflicts with covered activities will be minimized (GRASS-5). To facilitate this expansion of California ground squirrel colonies the Implementing Entity will cease using rodenticides within the Reserve System and when possible outside of the Reserve System except when needed to protect the integrity of structures such as levees and dams (reservoirs or stock ponds) or to prevent nuisance (as defined in the Fish and Game Code Sections 4150 and 4152) populations on adjacent private lands (GRASS-5). This may include relocating ground squirrels from areas where they are less desirable (dams, levees, golf courses, etc.) into parts of the Reserve System where they are needed.

M.6 Threats and Uncertainties

Burrowing owls have been reluctant to disperse very far from the natal burrows within Santa Clara County (J. Barclay pers. comm.). A conservation strategy that depends on individual owls dispersing from known breeding sites (e.g., San José International Airport) to newly protected sites is uncertain. Further, the success of the burrowing owl population at San José International Airport is not guaranteed over the long term. Should the breeding population at San José International Airport be reduced significantly in the future there will be far fewer burrowing owls to recolonize these newly protected areas.

The second most vigorous burrowing owl breeding population in the study area is at the San José WPCP bufferlands. Management of this area has varied in the recent past and there is no long-term guarantee that the burrowing owl population will persist at this site.

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