



**Sunnyvale Baylands Park and Landfill
Biological Constraints and
Opportunities Analysis**

Project # 3619-01

Prepared for:

City of Sunnyvale

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Executive Summary

On 17 December 2013, City of Sunnyvale staff presented to the City Council a feasibility study for establishing a community farm for children (i.e., Animal Assisted Happiness [AAH]) and alternative recreational uses at the Sunnyvale Landfill (Landfill). The City Council considered the feasibility of the different land uses and gave authorization to evaluate further the technical feasibility of constructing low intensity use park enhancements at the Landfill. In addition, because the City determined that the Landfill was not a feasible location for AAH, the City Council directed staff to explore the active use area of Sunnyvale Baylands Park (Baylands Park or Park) as a possible location for that facility.

This report provides a summary of the biological resources at Baylands Park and the Landfill, focusing on sensitive biological resources, and identifies a recommended general location for the AAH facility based on minimizing impacts to sensitive biological resources. Further, this report provides suggestions for potential opportunities related to habitat and species preservation/protection and habitat enhancement at Baylands Park and the Landfill.

Baylands Park

Seven biotic habitat types are present in the active use portion of Baylands Park, including five non-sensitive upland habitats (California annual grassland, landscaped, ornamental woodland, barren, and developed) and two sensitive wetland habitats (freshwater marsh and seasonal wetland) that are likely to be considered waters of the U.S./State. The grasslands at the Park support one sensitive plant species, Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*), a California Rare Plant Rank (CRPR) 1B.2 species. In addition, the federally endangered salt marsh harvest mouse (*Reithrodontomys raviventris*) and the salt marsh wandering shrew (*Sorex vagrans halicoetes*), a California species of special concern, may be present in the seasonal wetlands and adjacent annual grasslands. Bryant's savannah sparrows (*Passerculus sandwichensis alaudinus*) and burrowing owls (*Athene cunicularia*), both California species of special concern, may nest in the grasslands at the Park, and up to one pair of loggerhead shrikes (*Lanius ludovicianus*), a California species of special concern, may nest in the ornamental woodlands and forage in the adjacent grasslands. Similarly, up to one pair of white-tailed kites (*Elanus leucurus*), a State fully protected species, may nest in the woodlands in the active use portion of the Park and forage in the grasslands and seasonal wetlands. In addition, large numbers of migratory birds use trees and shrubs in certain portions of the Park as foraging and resting habitat during spring and fall migration.

Locating the AAH facility in the northwestern portion of Baylands Park, in the area dominated by ornamental woodlands and landscaped habitats, would avoid impacts on seasonal wetlands, freshwater marsh, the salt marsh harvest mouse, and salt marsh wandering shrew and would minimize (and possibly avoid altogether) impacts on the burrowing owl and Congdon's tarplant. Although moderate migratory bird use of the Test Garden has been noted, migratory bird activity is highest in other portions of the Park, and therefore use of

this recommended location for the AAH would not substantially reduce the value of the Park to migratory birds.

Baylands Park and the Landfill (see below) represents some of the last suitable burrowing owl habitat in the City, and the only City owned or managed properties currently occupied by burrowing owls on a regular basis. The City of Sunnyvale has long recognized the importance of having burrowing owls on City-owned/managed properties and has historically monitored their activity and implemented measures to protect burrowing owl habitats. Although implementation of these measures have helped avoid direct impacts (i.e., injury or mortality) on burrowing owls during implementation of Park maintenance activities, burrowing owls have not been recorded nesting at the Baylands Park since 2004 (Chromczak 2014). Due to the lack of successful breeding at the Baylands Park and the generally downward trend in the number of observations of burrowing owls on the site, it is our opinion that implementation of additional habitat management measures are necessary to provide for the long-term occupation of Baylands Park by the burrowing owl.

Due to the high levels of human disturbance, grasslands in the active use portion of the Park do not represent high-quality habitat for the burrowing owl, and owls are unlikely to breed successfully in this area. However, the adjacent Baylands Preserve, where human access is restricted, is much more likely to support successfully breeding owls if appropriate habitat management measures are applied. Recommendations for habitat enhancement measures that should be continued or newly implemented in this area include the following:

- Install additional artificial burrow complexes
- Implement non-native predator control measures.
- Continue to manage vegetation height to ≤ 6 inches at occupied owl burrows. In addition, begin managing vegetation height at historically occupied burrows and artificial burrows.

Landfill

Three biotic habitats were identified on the Landfill: California annual grassland, ornamental woodland, and barren. No wetlands or other sensitive habitats are present, and no sensitive plant species are expected to occur on the site. Three special-status bird species could potentially nest at the Landfill. Burrowing owls overwinter on the Landfill and were formerly known to breed in the grasslands on West Hill. In addition, up to one or two pairs each of loggerhead shrikes and white-tailed kites may nest in the ornamental woodlands and forage in the adjacent grasslands. Further, there is some potential (albeit low) for the western pond turtle (*Actinemys marmorata*), a California species of special concern, to nest on the northern face of West Hill, adjacent to the Lockheed Channel.

Construction of low intensity use park enhancements (e.g., shade structures, benches, drinking fountains, and trails) at the Landfill are not expected to result in significant impacts under the California Environmental Quality Act (CEQA) on any sensitive or regulated habitats as no such habitats were identified within the project boundary. However, construction of such enhancements could result in a significant impact on the

western pond turtle and burrowing owl. The implementation of preconstruction surveys for western pond turtles and relocation of any individual turtles from construction areas would be sufficient to reduce impacts on this species to a less-than-significant level under CEQA. Similarly, pre-construction surveys for burrowing owls, and implementation of avoidance measures, would avoid or minimize impacts on individual burrowing owls. Although complete avoidance of impacts on habitat for this species is not feasible, as it could occur throughout the annual grasslands on the site, we recommend focusing park enhancements primarily on West Hill and South Hill to avoid concentrating human activity in areas that provide high-quality opportunities for burrowing owl habitat enhancement. Further, because the California Department of Fish and Wildlife typically recommends maintaining a 250-foot non-disturbance buffer around active burrowing owl nests to prevent their disturbance, we recommend siting any park enhancements on East Hill and Recycle Hill 250 feet or more from the proposed burrowing owl enhancement areas to the maximum extent feasible to minimize disturbance of active owl burrows.

Similar to the Baylands Park, the Landfill represents some of the last suitable burrowing owl habitat in the City, and the only City owned or managed properties currently occupied by burrowing owls on a regular basis. Although the City has historically monitored burrowing owl activity at the Landfill and implemented measures to protect burrowing owl habitat, burrowing owls have not been recorded nesting at the Landfill since 1999 (Chromczak 2014). Due to the lack of successful breeding and the generally downward trend in the number of observations of burrowing owls on the site, it is our opinion that implementation of additional habitat management measures are necessary to provide for the long-term occupation of the Landfill by the burrowing owl.

Given the relatively high level of recreational use that occurs on the West Hill and South Hill, we recommend that burrowing owl habitat enhancement efforts be concentrated on Recycle Hill and East Hill, where less recreational activity occurs. Recommendations for habitat enhancement measures that should be continued or newly implemented in these areas are as follows:

- Continue to manage vegetation height to ≤ 6 inches at occupied owl burrows and continue to leave islands of taller, denser vegetation to support prey populations. In addition, begin managing vegetation height at historically occupied burrows and artificial burrows.
- Improve the burrowing owl prey base by planting native perennials in uplands and by constructing rock/brush piles.
- Install additional artificial burrow mounds.
- Implement non-native predator control measures.

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Section 1.0 Introduction

On 17 December 2013, City of Sunnyvale staff presented to the City Council a feasibility study for establishing a community farm for children (i.e., Animal Assisted Happiness [AAH]) and alternative recreational uses at the Sunnyvale Landfill (Landfill). The study analyzed four different uses, each with different levels of feasibility and intensity. The study focused on key elements including infrastructure requirements, access, parking, compatibility with the Landfill, constructability, and cost. The City Council considered the feasibility of the different land uses and gave authorization to evaluate further the technical feasibility of constructing low intensity use park enhancements such as shade structures, benches, drinking fountains, and trails at the Landfill. In addition, because the City determined that the Landfill was not a feasible location for AAH, the City Council directed staff to explore the active use portion of the Sunnyvale Baylands Park (hereafter Baylands Park or Park) as a possible location for that facility.

This report provides a summary of the biological resources at Baylands Park and the Landfill based on a review of prior studies conducted in the vicinity, including the *Burrowing Owl Habitat Monitoring and Census* (Chromczak 2014); resource agency data and reports; other relevant scientific literature; technical databases; regional planning documents; observations by H. T. Harvey & Associates staff; and unpublished records of animal observations in the vicinity (e.g., bird reports to the South-Bay-Birds List-Serve [2014] and eBird [Cornell Laboratory of Ornithology 2014]). In addition, H. T. Harvey & Associates wildlife ecologist Ginger Bolen, Ph.D., and plant ecologist Maya Goklany, M.S., conducted a reconnaissance-level survey of Baylands Park and the Landfill to map the dominant biotic communities present and put into context the information generated during the background review.

This report also provides a summary of the sensitive biological resources present on, and adjacent to, Baylands Park and the Landfill, including special-status species and regulated habitats, and identifies the potential constraints to constructing an AAH facility and park enhancements due to the presence of such resources, focusing on relevant environmental statutes and regulations. Further, this report provides suggestions for potential opportunities related to habitat and species preservation/protection and habitat enhancement at Baylands Park and the Landfill.

Section 2.0 Sunnyvale Baylands Park

2.1 Project Description

AAH enriches the lives of children experiencing health or family challenges. As a non-profit organization, AAH helps children with severe, chronic, or otherwise disabling health issues or who have family challenges, such as homelessness, split families, or domestic violence situations. AAH's vision is to bring a "Million Smiles" to all these children and family members. Animals housed at the facility include ponies, donkeys, pigs, goats, rabbits, guinea pigs, and chickens among others. AAH's facility and operations (Photos 1 and 2) are currently located in Gilroy, California; however, AAH would like to expand to a larger facility that is more centrally located to its visitors. The City is considering the feasibility of locating the facility at Baylands Park. The long-term, full build-out plan envisioned for the facility includes the following components:

- Animal pens with attached pastureland
- Feed/Equipment/Vehicle storage shed
- Barn/Tack room
- Office
- Caretaker residence
- Perimeter fencing
- Interior fencing

The design assumptions considered during evaluation of the potential biological constraints and opportunities associated with construction and operation of the AAH facility at Baylands Park were based on those described in the *Final Report for Establishing a Community Animal Farm and Alternative Recreational Uses at the Sunnyvale Landfill* (Geosyntec Consultants 2013; Appendix A) and include the following:

- Ten animal pens with dimensions of 10 feet (ft) x 10 ft x 8 ft, with an average 0.2-acre (ac) of pastureland attached to each pen. Each pen would also include a 10 ft x 20 ft interaction area in front of the pen.
- One 30 ft x 80 ft x 15 ft feed/equipment/vehicle storage shed. Alternatively, two 30 ft x 40 ft x 15 ft structures would be acceptable.
- One 80 ft x 120 ft riding arena with fence
- One 24 ft x 48 ft four-stall barn and tack room
- One 12 ft x 24 ft mobile office
- One ~800 square ft modular home for caretaker



Photo 1. AAH facilities in Gilroy, CA



Photo 2. AAH facilities in Gilroy, CA

- 6-ft high, black vinyl coated chain-link fence around perimeter of the facility
- 4-ft high interior fencing (material dependent on animal)

2.2 Existing Conditions

Baylands Park is located in the southwest corner of San Francisco Bay. The active use area of Baylands Park (Figure 1) provides 72 ac of developed parkland offering passive and active recreation opportunities including playgrounds, pathways, a multi-purpose grass field, and picnic areas. A segment of the San Francisco Bay Trail, which will eventually provide pedestrian and bicycle access along the entire Bay shoreline, traverses the Park. To the north and east of the active use portion of the Park, 105 ac of Park land are protected as the Sunnyvale Baylands Wetlands Preserve (Baylands Preserve), which provides habitat for sensitive plants and wildlife. Baylands Park was once connected to San Francisco Bay through sloughs and tidal flows, but flood control levees have since blocked off the tidal flows and the wetlands now receive all their water from winter rains. Because so little of San Francisco Bay's wetlands remain, the Baylands Preserve is an invaluable resource for Sunnyvale and for the entire Bay Area. Baylands Park is bordered to the north by the approximately 60-ac Twin Creeks Sport Complex, to the west by Caribbean Drive, and to the south by State Route 237. Although Baylands Park, including the Baylands Preserve, is owned by the County of Santa Clara, it is operated and maintained by the City, which has a joint-use agreement with the County for this property.

2.2.1 Habitats

Reconnaissance-level surveys identified seven biotic habitats in the active use portion of Baylands Park: California annual grassland, landscaped, ornamental woodland, barren, developed, freshwater marsh, and seasonal wetland. The common plant and wildlife species found in these habitats are described below, and the distribution of habitat types within the Park is depicted in Figure 2; representative photos of each habitat type are also provided below.

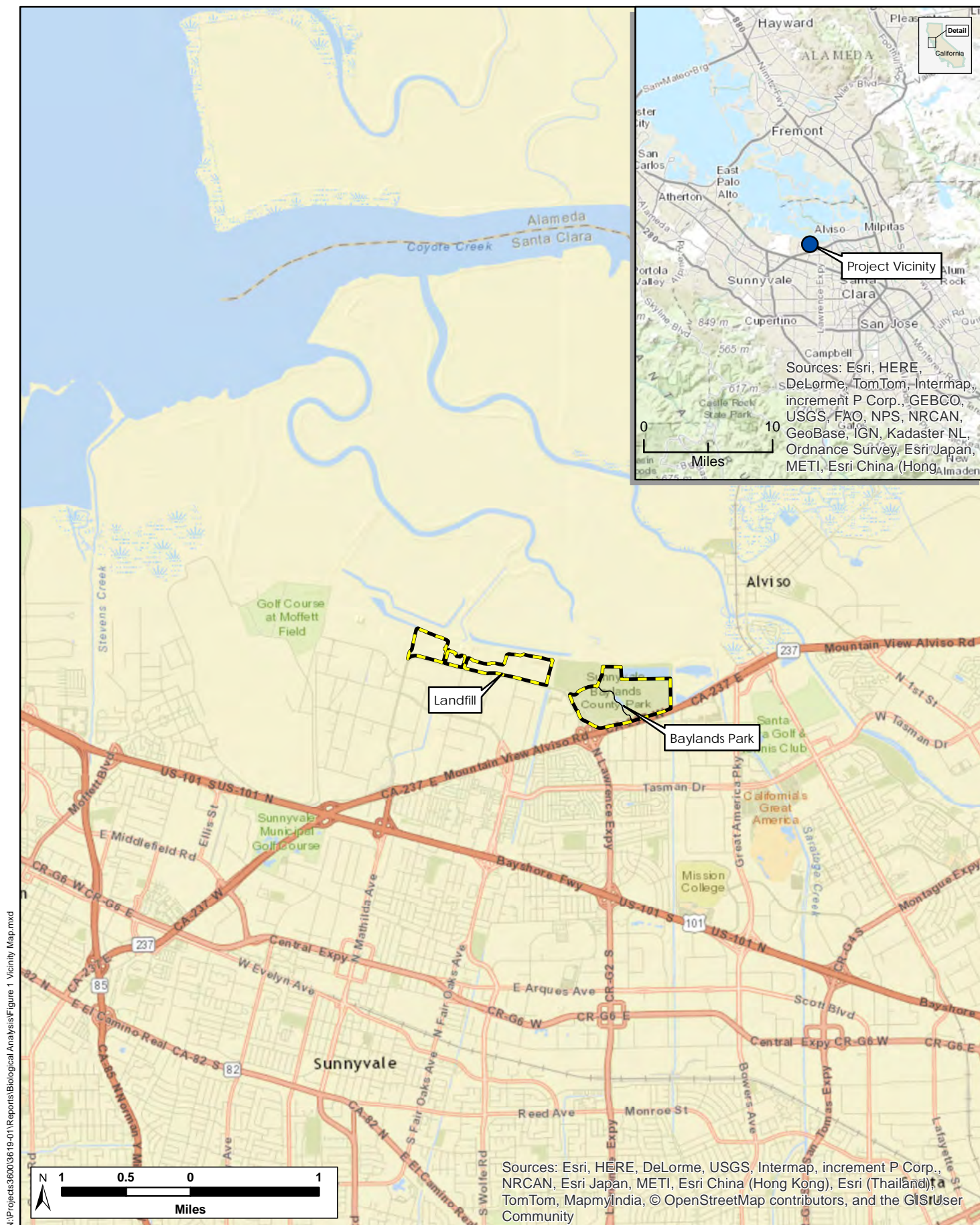
A complete list of wildlife species expected to occur at Baylands Park is provided as Appendix B. As indicated on this list, nine species of reptiles, four amphibians, 25 mammals, and 129 birds are known or expected to use Baylands Park.

California Annual Grassland

California annual grassland (Photo 3) occurs within the central and eastern portions of Baylands Park. This habitat type is highly dynamic, varying in species dominance seasonally due to



Photo 3. California annual grassland





N:\Projects\3600\3619-01\Reports\Biological Analysis\Figure 2 Habitat Map.mxd

the ephemeral nature of annual species, which germinate, grow rapidly, and disperse seeds within an average period of 2–3 months. The quality of annual grassland habitat related to the level of anthropogenic disturbance (i.e., disturbance resulting from the presence of humans), which largely determines the diversity and native abundance of the grassland. Typically, grasslands with less disturbance (e.g., because of mowing, trampling, discing, etc.) support more natives and higher diversity than more disturbed grasslands that support less natives and lower diversity. Plants commonly observed throughout the grasslands at Baylands Park include native species such as salt grass (*Distichlis spicata*); however, numerous non-native species, such as Italian ryegrass (*Lolium perenne*), soft chess (*Bromus hordeaceus*), wild oats (*Avena* spp.), barley (*Hordeum* spp.), and curly dock (*Rumex crispus*), are also present. Thus, grasslands at the Park are considered to be of moderate quality in terms of their ability to support native species and overall species diversity..

Although grasslands within the active use portion of Baylands Park are contiguous with the larger Baylands Preserve to the east, the relatively limited extent of the grassland habitat on the site and the high levels of disturbance associated with the active use portion of the Park preclude the presence of some animal species that are associated with more expansive annual grasslands in the broader region, such as grasshopper sparrows (*Ammodramus savannarum*). Nevertheless, the grasslands support some ground-nesting grassland birds such as the western meadowlark (*Sturnella neglecta*), and the location of the grasslands within a matrix of upland and aquatic habitats, including ornamental woodlands, freshwater wetlands, and coastal brackish marsh, increases the grasslands' value to animal species. Bird species that nest in nearby habitats and forage within the grassland areas during the nesting season include insect-eating birds, such as the western scrub-jay (*Apelocoma californica*), barn swallow (*Hirundo rustica*), cliff swallow (*Petrochelidon pyrrhonota*), and northern mockingbird (*Mimus polyglottos*), as well as seed-eating species such as the mourning dove (*Zenaida macroura*) and California towhee (*Melospiza crissalis*). Numerous additional avian species forage in grassland habitats on the site during winter and migration.

Rodent species present in the grassland habitat include the California ground squirrel (*Spermophilus beecheyi*), California vole (*Microtus californicus*), valley pocket gopher (*Thomomys bottae*), and deer mouse (*Peromyscus maniculatus*). Diurnal raptors such as red-tailed hawks (*Buteo jamaicensis*), northern harriers (*Circus cyaneus*), white-tailed kites (*Elanus leucurus*), and American kestrels (*Falco sparverius*) forage for these small mammals over the grasslands during the day, and nocturnal raptors, such as barn owls (*Tyto alba*), forage for them at night. Reptiles, including the western fence lizard (*Sceloporus occidentalis*), southern alligator lizard (*Elgaria multicarinata*), western skink (*Eumeces skiltonianus*), western terrestrial garter snake (*Thamnophis elegans*), and gopher snake (*Pituophis catenifer*), also frequent this habitat.



Photo 4. Landscaped lawn

Landscaped

Landscaped areas within Baylands Park are heavily managed. A large, centrally located lawn composed of turf grasses (Photo 4) is watered through the dry season and frequently mowed. In the northwestern portion of the site, the City's Recycled Water Test Garden (Photo 5) supports a variety of non-native trees, shrubs, and forbs that are irrigated with recycled water.

Landscaped habitats primarily support common, urban-adapted animal species, including several introduced species such as European starlings (*Sturnus vulgaris*) and rock doves (*Columba livia*). Native species that are able to utilize these habitats include western fence lizards, American robins (*Turdus migratorius*), brewer's blackbirds (*Euphagus cyanocephalus*), mourning doves, house finches (*Haemorrhous mexicanus*), black-tailed hares (*Lepus californicus*), and striped skunks (*Mephitis mephitis*). Landscaped habitats are used sparingly by less urban adapted species, largely because of the uniform, open nature of



Photo 5. Landscaped garden

most landscaping and the regular disturbance that occurs due to landscape maintenance and use. However, animals living in adjacent habitats and migratory birds often exploit foraging opportunities offered by landscaped habitats; for example, moderate numbers and diversity of migrant birds have been recorded in the Test Garden, and Canada geese (*Branta canadensis*), and occasional scarcer goose species, forage on the extensive lawn areas (South-Bay-Birds List-Serve 2014). Common butterflies, such as cabbage whites (*Pieris rapae*) and painted ladies (*Vanessa cardui*), as well as honeybees (*Apis mellifera*) and other common invertebrate species, use flowering landscape plants for foraging.

Ornamental Woodland

Ornamental woodland (i.e., woodland planted for landscaping purposes) is scattered throughout the active use portion of Baylands Park. In the northern portion of the site, the ornamental woodland is dominated by Monterey pine (*Pinus radiata*) trees interspersed with a few scattered coast live oaks (*Quercus agrifolia*). In the southern and central portions of the Park, ornamental woodlands are dominated by Fremont cottonwood (*Populus fremontii*) trees and various species of nonnative eucalyptus (*Eucalyptus* spp.) trees (Photo 6). In irrigated areas, the woodland understory is composed of turf grasses that are regularly mowed, whereas the understory in non-irrigated areas is dominated by non-native annual grasses.



Photo 6. Eucalyptus woodland

Ornamental woodlands in Baylands Park are host to an array of common invertebrate species. In addition, several species of birds may nest and forage in the landscaped trees on the site, including bushtits (*Psaltiriparus*

minimus), Anna's hummingbirds (*Calypte anna*), American crows (*Corvus brachyrhynchos*), northern mockingbirds, and lesser goldfinches (*Spinus psaltria*). A wide variety of migratory birds, including warblers, flycatchers, vireos, and thrushes, have been recorded foraging in the ornamental woodlands at Baylands Park, especially in fall (South-Bay-Birds List-Serve 2014; see section 2.2.4 below). Ornamental trees also provide habitat for the larger common raptors, such as red-shouldered hawks (*Buteo lineatus*), great horned owls (*Bubo virginianus*), and red-tailed hawks (*Buteo jamaicensis*); a pair of red-tailed hawks were observed foraging over the adjacent seasonal wetlands during the reconnaissance survey. Due to the territorial nature of these large raptors identified above, no more than one or two pairs of these species would be expected to breed here. The trees could also be used as roost sites by small numbers of common roosting bats, such as the California myotis (*Myotis californicus*). Other mammals, including house mice (*Mus musculus*), striped skunks, and raccoons (*Procyon lotor*), also forage in this area.

Barren

Barren habitat (Photo 7) is present in the northern portion of the active use area of Baylands Park and is managed to limit establishment of vegetation to improve the safety and usability of the ropes course at this location. The area is mulched with wood chips, which extend into the understory of the adjacent ornamental woodland. This habitat provides few resources to animal species. Although some bird species associated with adjacent habitats likely forage in the mulch to some extent, use of this habitat by animals is expected to be limited.



Photo 7. Barren

Developed

Developed areas (Photo 8) are scattered throughout the active use portion of Baylands Park and include hardscape such as roads and parking lots, as well as various structures, including shelters, play areas, and barbeques.



Photo 8. Park shelter and play area

Developed habitats typically support a suite of relatively common animal species that are tolerant of human disturbance. Birds, such as the black phoebe (*Sayornis nigricans*) and house finch, may nest on structures throughout the Park, and birds that nest within the ornamental woodlands, such as the western scrub-jay and European starling, may forage in picnic areas. Common mammals such as the California mouse (*Peromyscus californicus*) and striped skunk forage in developed areas, and reptiles such as the western fence lizard and gopher snake that inhabit adjacent grassland and woodland areas also forage in developed areas.

Freshwater Marsh

Freshwater marsh (Photo 9) occurs in a depressional swale in the southern portion of the active use area of Baylands Park. This wetland is fed by artificial hydrology, and is watered throughout the dry season, allowing it to support hydrophytic plant species (i.e., species that prefer perennially inundated soils) such as cattails (*Typha* sp.), smartweed (*Persicaria* sp.), and tall flatsedge (*Cyperus eragrostis*).

Freshwater marshes can provide habitat for numerous animal species. However, the freshwater marsh habitat at Baylands Park is extremely limited in extent (i.e., 0.29 ac), is highly disturbed, and provides very little habitat for marsh-specialist species. Common amphibians such as the native Sierran chorus frog (*Pseudacris sierrae*) and western toad, as well as the non-native bullfrog (*Lithobates catesbeianus*), may occur in the small area of freshwater marsh vegetation in the Park. Terrestrial species that occur in adjacent habitats, such as house finches, bushtits, and sparrows, use the marsh vegetation as cover and forage here to some extent as well.



Photo 9. Freshwater marsh

Seasonal Wetland

Seasonal wetlands (Photo 10) are found in low-lying areas in the north-central portion of the active use area of Baylands Park. Small culverts (approximately 0.5 ft in diameter) hydrologically connect these wetlands to the Baylands Preserve beneath the walking path along the eastern side of the Park. The seasonal wetlands are dominated by hydrophytic (i.e., water-loving) species such as salt grass and pickleweed (*Sarcocornia pacifica*). Additional species commonly observed in this habitat type include alkali heath (*Frankenia salina*), annual rabbitsfoot grass (*Polypogon monspeliensis*), and birdsfoot trefoil (*Lotus corniculatus*).

This seasonal habitat is wet only during the wettest months of the year. During inundated periods, Sierran chorus frogs and western toads may breed here, and garter snakes forage on these species. Waterbirds such as mallards (*Anas platyrhynchos*) and Canada geese forage in these wetlands when they contain water, and great blue herons (*Ardea herodias*) and great egrets (*Ardea alba*) forage on small mammals at the edge of this habitat. Once the area dries out, blackbirds and other species foraging in the adjacent grasslands will move into this area as well.



Photo 10. Seasonal wetland

2.2.2 Sensitive and Regulated Habitats

Throughout California, the quality and quantity of aquatic and wetland habitat types has dramatically declined because of the construction of dams, dikes, and levees as well as water diversions, the filling of aquatic and wetland habitat for development, and the overall degradation of general water quality caused by inputs of runoff from agricultural and urban development and other sources. As a result of their ecological importance and the declines in these habitats that have occurred, aquatic and wetland habitat types are afforded protection under applicable federal, state, or local regulations, and are generally subject to regulation, protection, or consideration by the U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), California Department of Fish and Wildlife (CDFW), and/or the U.S. Fish and Wildlife Service (USFWS). The CDFW also ranks certain rare or threatened plant communities, such as wetlands, meadows, and riparian forest and scrub, as ‘threatened’ or ‘very threatened’. These communities are tracked in the California Natural Diversity Database (CNDDDB).

Wetlands and Other Waters of the U.S.

Areas meeting the regulatory definition of “waters of the U.S.” (jurisdictional waters) are subject to the jurisdiction of the USACE under provisions of Section 404 of the 1972 Clean Water Act (Federal Water Pollution Control Act) and Section 10 of the 1899 Rivers and Harbors Act (described below). These waters may include all waters used, or potentially used, for interstate commerce, including all waters subject to the ebb and flow of the tide, all interstate waters, all other waters (intrastate lakes, rivers, streams, mudflats, sandflats, playa lakes, natural ponds, etc.), all impoundments of waters otherwise defined as waters of the U.S., tributaries of waters otherwise defined as waters of the U.S., the territorial seas, and wetlands (termed Special Aquatic Sites) adjacent to waters of the U.S. (33 CFR, Part 328, Section 328.3). Wetlands on non-agricultural lands are identified using the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). Areas typically not considered to be jurisdictional waters include non-tidal drainage and irrigation ditches excavated on dry land, artificially irrigated areas, artificial lakes or ponds used for irrigation or stock watering, small artificial water bodies such as swimming pools, and water-filled depressions (33 CFR, Part 328).

Project applicability. The freshwater marsh and seasonal wetlands within Baylands Park are likely to be considered waters of the U.S. under the Clean Water Act.

Waters of the State (Porter-Cologne Water Quality Control Act)

The RWQCB is responsible for protecting surface, ground, and coastal waters within its boundaries, pursuant to the Porter-Cologne Water Quality Control Act (Porter-Cologne Act) of the California Water Code. The RWQCB also has jurisdiction under Section 401 of the Clean Water Act for activities that could result in a discharge of dredged or fill material to a water body. Whenever a proposed project requires a Clean Water Act Section 404 permit from the USACE for discharge into waters of the U.S. the RWQCB must issue a project-specific Section 401 Water Quality Certification (under the Clean Water Act) and/or Waste Discharge Requirement (Porter-Cologne Act) for the project.

Project applicability. At Baylands Park, the boundaries of waters of the State are expected to be the same as the boundaries of waters of the U.S. Therefore, the RWQCB is expected to take jurisdiction over the freshwater marsh and seasonal wetlands.

Section 1600 of the California Fish and Game Code

The California Fish and Game Code includes regulations governing the use of, or impacts on, many of the State's fish, wildlife, and sensitive habitats. The CDFW exerts jurisdiction over the bed and banks of rivers, lakes, and streams according to provisions of §§1601–1603 of the Fish and Game Code.

Project applicability. It is our opinion that the depressional swale in the southern portion of Baylands Park should not be regulated by the CDFW under Section 1600 because the feature is not a stream, does not flow, and does not support aquatic life such as fish. Therefore, we do not think that a Section 1600 Streambed Alteration Agreement (SAA) from the CDFW should be required for fill of this feature, should construction of the AAH require such fill. However, the CDFW does occasionally take jurisdiction over ditches and canals, and it would be up to the discretion of the CDFW as to whether it takes jurisdiction over the depressional swale.

McAteer-Petris Act

The McAteer-Petris Act is the key legal provision under California state law to preserve San Francisco Bay from indiscriminate filling. The Act established the San Francisco Bay Conservation and Development Commission (BCDC), which is responsible for enforcing the McAteer-Petris Act. BCDC has jurisdiction over the open water, marshes and mudflats of greater San Francisco Bay, the first 100 ft inland from the shoreline around San Francisco Bay, the portion of the Suisun Marsh below the 10-ft contour line, portions of most creeks, rivers, sloughs, and other tributaries that flow into San Francisco Bay, and salt ponds, duck hunting preserves, game refuges, and other managed wetlands that have been diked off from San Francisco Bay. BCDC's approval must be obtained before conducting any of the following activities within BCDC's jurisdiction: placement of solid material, building or repairing docks, pile-supported or cantilevered structures, disposal of material, mooring a vessel for a long period in San Francisco Bay or in certain tributaries that flow into the Bay, dredging or extracting material from the Bay bottom, substantially changing the use of any structure or area, construction, remodeling, or repairing a structure, and subdivision of property or grading of land.

Project applicability. No features on Baylands Park are tidal, or are located within the 100-ft shoreline band. Therefore, it is our opinion that activities within Baylands Park would not be regulated by BCDC.

CDFW Natural Communities of Special Concern

CDFW natural communities of special concern are those that are of limited distribution statewide or within a county or region. These communities may or may not contain special-status species or their habitat. Most

types of wetlands and riparian communities are considered special-status natural communities because of their limited distribution in California. Impacts on CDFW sensitive plant communities, or any such community identified in local or regional plans, policies, and regulations, must be considered and evaluated under the California Environmental Quality Act (CEQA; California Code of Regulations: Title 14, Div. 6, Chap. 3, Appendix G).

Project applicability. Baylands Park does not support any sensitive habitat types tracked by the CNDDB that can occur in the general vicinity, such as Northern Coastal Salt Marsh or Sycamore Alluvial Woodland.

2.2.3 Special-status Species

A number of plants and animals are considered “special-status species” because they are protected by State or federal laws such as the Federal Endangered Species Act (FESA) or the California Endangered Species Act (CESA), or because they have been listed as rare species by the CDFW or the California Native Plant Society (CNPS). Such species may constrain project activities due to regulation (e.g., by the USFWS or National Marine Fisheries Service [NMFS] under FESA or the CDFW under CESA) or because impacts on these species may be considered significant under CEQA, thereby requiring mitigation.

Special-status Plants

A list of 67 plants designated as special-status and potentially occurring in the Sunnyvale area was compiled using CNPS lists and CNDDB (2014) records, and reviewed for each species’ potential to occur on the site. Analysis of the documented habitat requirements and occurrence records associated with all of the species considered allowed us to reject 66 of these species as not occurring within Baylands Park. A list of all species considered but rejected, and the reason for rejection, is included as Appendix C. Figure 3 depicts CNDDB-mapped locations of special-status plants in the vicinity of Baylands Park.

No plant species that are listed under the FESA or the CESA are known or expected to occur in Baylands Park, and therefore no listed plants would be affected by construction of the AAH. However, Congdon’s tarplant (*Centromadia parryi* ssp. *congdonii*) is known to occur on the site (CNDDB 2014). Congdon’s tarplant is a California Rare Plant Rank (CRPR) 1B.2 species, meaning that it is considered “fairly threatened in California”. It occurs in weedy, periodically disturbed grassland areas in the Park; the areas of highest-quality habitat for Congdon’s tarplant are depicted on Figure 5.

Special-status Animals

Information concerning threatened, endangered, and other special-status animal species that may occur in Baylands Park and the surrounding vicinity was collected from several sources and reviewed as described above. The specific habitat requirements and the locations of known occurrences of each special-status species were the principal criteria used to determine which species potentially occur at the Park. The legal status and potential for occurrence of each species known to occur or potentially occurring in the general

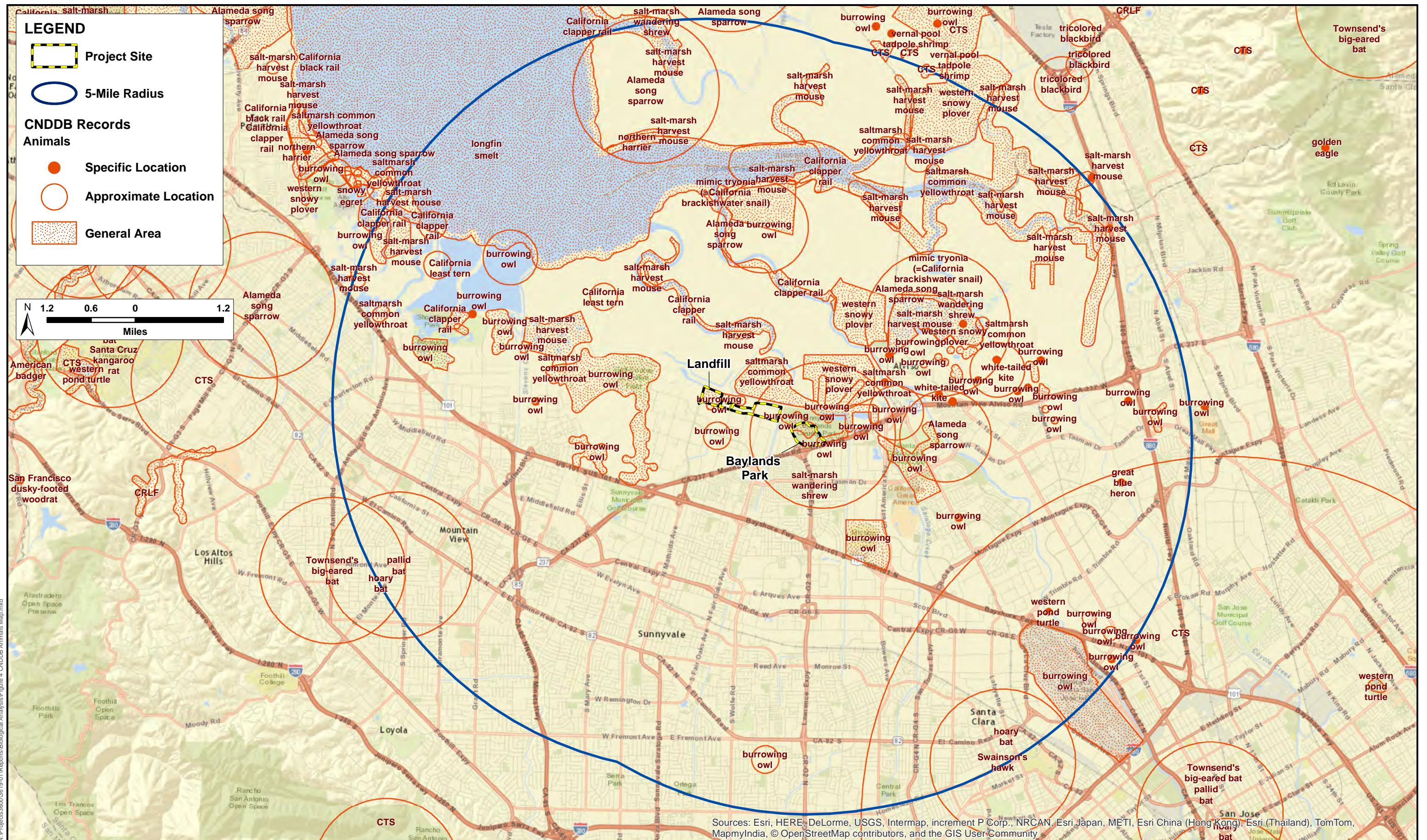
vicinity of the site are given in Appendix D, and Figure 4 depicts CNDDB-mapped locations of special-status animals in the vicinity.

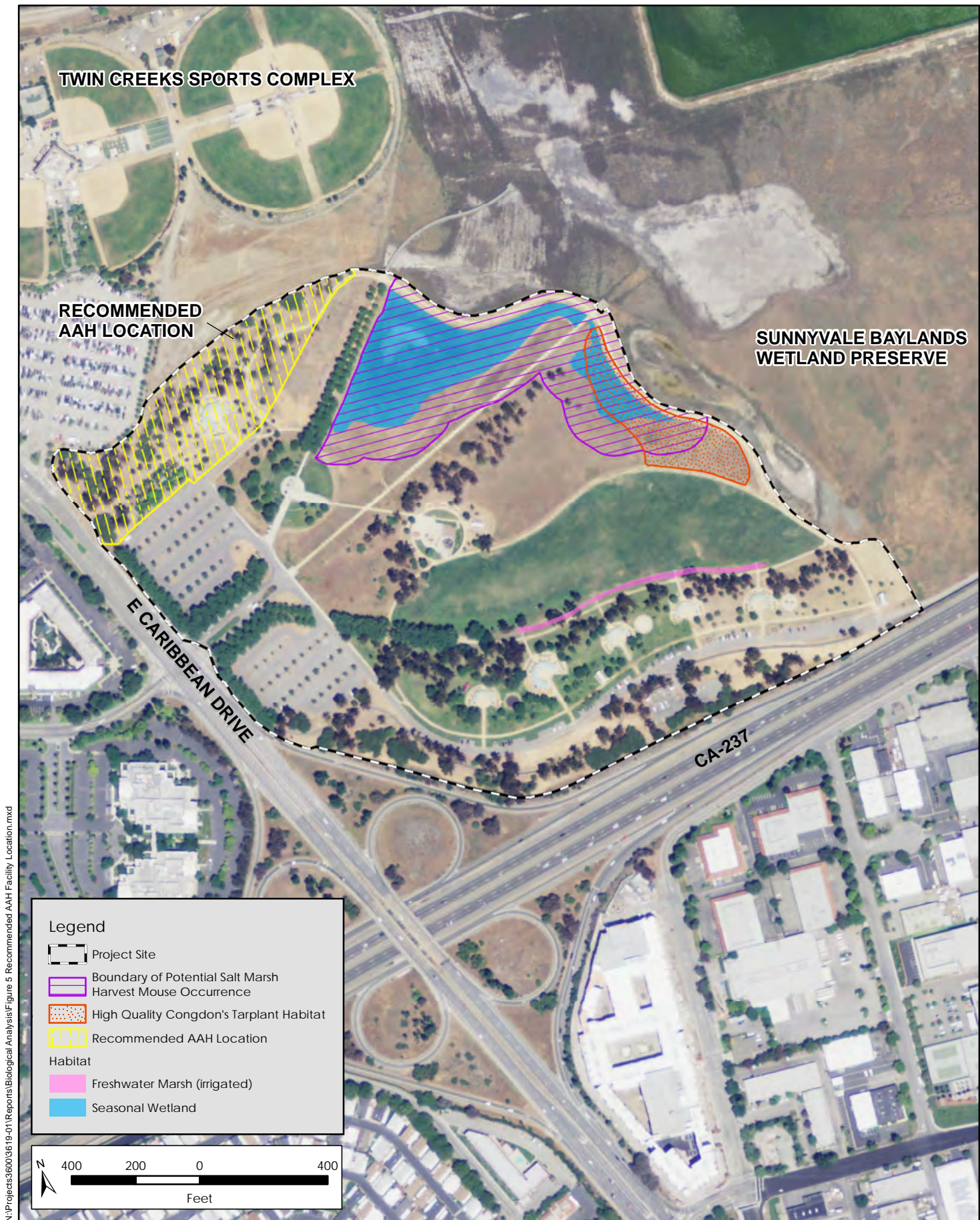
One species that is listed as endangered under both the FESA and CESA, the salt marsh harvest mouse (*Reithrodontomys raviventris*), could potentially occur in the seasonal wetlands and adjacent annual grasslands at the Park. As part of the studies performed when the Park was initially constructed, protocol-level trapping surveys for the salt marsh harvest mouse were completed within the Baylands Park seasonal wetland area, including the Baylands Preserve. No salt marsh harvest mice were captured, but a dead salt marsh harvest mouse was found along the levee in the far western portion of the Baylands Preserve (Western Ecological Services Company 1987 as cited in WRA 2013). It is unclear if the mouse originated from within the site, or was carried there by an animal that preyed on it. Nevertheless, the wetlands at the Park contain pickleweed, which provides habitat for the salt marsh harvest mouse, and the species has been recorded approximately 1.4 mi to the north in Guadalupe Slough (CNDDB 2014). Thus, there is some potential for the species to be present at the Park. Additional information on this species can be found in Appendix D.

In addition, four species that are California species of special concern could potentially occur at Baylands Park. Burrowing owls (*Athene cunicularia*) were formerly known to nest in the grasslands in the active use portion of Baylands Park, but have not been recorded on the site in recent years. Similarly, they have not been recorded nesting on the adjacent Baylands Preserve in recent years, although they continue to overwinter on the site (Chromczak 2014, CNDDB 2014). Bryant's savannah sparrow (*Passerculus sandwichensis alaudinus*) may nest in the seasonal wetlands and grasslands at the Park, and up to one pair of loggerhead shrikes (*Lanius ludovicianus*) may nest in the ornamental woodlands and forage in the adjacent grasslands. Similarly, up to one pair of white-tailed kites, a State fully protected species, may nest in the woodlands at the Park and forage in the grasslands and seasonal wetlands. The salt marsh wandering shrew (*Sorex vagrans halicoetes*) could potentially occur in the seasonal wetlands and adjacent annual grasslands at the Park, in the same habitats as those described for the salt marsh harvest mouse above.

2.2.4 Other Important Biological Resources

In addition to the special-status birds described above, a number of other bird species nest in and adjacent to Baylands Park. Further, because of the Park's location adjacent to the Bay, because it is one of the last open spaces in the area, and because of the abundance of mature trees, large numbers of migratory birds use the Park in the fall and spring. Migratory bird use is particularly high during fall, making it an important migratory stopover site for birds. In turn, these birds attract a number of local birders, and numerous reports of birds from this location appear on the South-Bay-Birds List-Serve (2014) and eBird (Cornell Laboratory of Ornithology 2014).





N:\Projects\3600\3619-01\Reports\Biological Analysis\Figure 5 Recommended AAH Facility Location.mxd



H.T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 5: Biotic Constraints and Recommended AAH Location

Sunnyvale Baylands Park and Landfill Biological Constraints and Opportunities Analysis (3619-01)
January 2015

2.3 Potential Biological Constraints

Biological constraints to development typically take the form of sensitive and/or regulated habitats such as wetlands; special-status species; particularly large trees; or particularly large, important, or exemplary occurrences of more common plant or animal species or vegetation communities. Potential constraints to the siting of an AAH facility in the active use portion of Baylands Park, as described in Section 2.1, Project Description, are discussed below, and in the context of the sensitive biological resources discussed previously, and areas having these constraints are depicted in Figure 5.

2.3.1 Sensitive and Regulated Habitats

Waters of the U.S. (Clean Water Act)

As described above, the freshwater marsh and seasonal wetlands within Baylands Park are likely to be considered waters of the U.S. Should the City decide to locate the AAH facility within the portion of Baylands Park where either of these habitat types occur (Figure 2), a delineation of jurisdictional wetlands and other waters of the U.S. would need to be performed to determine the precise locations and boundaries of USACE jurisdiction. A report summarizing the delineation results would then need to be submitted to the USACE, which would subsequently visit the site to verify the jurisdictional boundaries before issuing a jurisdictional determination. Subsequently, a Section 404 permit application would need to be completed.

The type of Section 404 permit that would be required for construction of the AAH facility would depend largely on the amount of fill to be placed within jurisdictional areas. In general, activities that would result in less than 0.5 ac of fill would qualify for a Nationwide Permit (NWP), a type of general permit that presents the most streamlined Section 404 permitting scenario. Fill amounts between 0.5 ac and 1 ac can generally qualify for a Letter of Permission (LOP), a streamlined version of an Individual Permit. Fill amounts greater than 1 ac require an Individual Permit, which is the most time-consuming Section 404 permitting process, requiring a robust alternatives analysis adhering to the guidelines set forth under Section 404(b)(1) of the Clean Water Act. This analysis would need to be conducted to demonstrate to the USACE that the chosen project alternative represents the least environmentally damaging practicable alternative.

The Section 404 permitting process also requires compliance with Section 7 of the FESA. If the project has any potential to impact the salt marsh harvest mouse, consultation with the USFWS would be necessary. USACE permitting using a NWP typically takes approximately 6-9 months in the absence of FESA consultation issues, whereas an LOP or Individual Permit may take 9-18 months for processing. However, as described in Section 2.3.2 below, endangered species consultation is expected to be necessary if the AAH facility is built within the seasonal wetlands at the Park, and such consultation would drive the permitting schedule.

Impacts on jurisdictional wetlands and other waters would likely be considered significant under CEQA, necessitating mitigation measures to reduce these impacts to less-than-significant levels. Fill of wetlands

would thus necessitate mitigation in the form of restoration or creation of wetland habitat on or off site, or the purchase of mitigation credits at a USACE/RWQCB-approved mitigation bank. Impacts on waters of the U.S./State may require mitigation at a ratio up to 3:1 (mitigation:impact) for permanent impacts and 1.5:1 to 2:1 for temporary impacts, depending on the quality of habitat impacted, the type of mitigation proposed, and the location of the proposed mitigation site. For impacts on habitats regulated by multiple laws/agencies, mitigation provided for one agency typically serves as mitigation for the other agencies (assuming similar mitigation ratios/requirements). Credits for non-tidal wetlands, such as those present at Baylands Park, in a mitigation bank may cost \$500,000/ac or more.

Recommendation. Owing to the time needed to obtain a 404 permit, the cost of mitigation, and the availability of areas outside of USACE jurisdiction that could serve the needs of the AAH, we recommend that impacts to USACE-jurisdictional waters of the U.S. be avoided.

Waters of the State (Porter-Cologne Water Quality Control Act)

In Baylands Park, the boundaries of waters of the State are expected to be the same as the boundaries of waters of the U.S., and the RWQCB is expected to take jurisdiction over the freshwater marsh and seasonal wetlands. Should the City decide to locate the AAH facility in the portion of the Baylands Park where either of these habitat types occur (Figure 2), an application for 401 certification of the USACE's permit would be prepared and submitted to the RWQCB simultaneously with the application to the USACE. Permit processing time and mitigation requirements are expected to be similar to those described above for the USACE. The USACE cannot issue its 404 permit until the RWQCB issues its 401 certification.

Recommendation. As noted for waters of the U.S. above, we recommend that impacts to RWQCB-jurisdictional waters of the state be avoided.

2.3.2 Special-status Species

Special-status plants and animals may constrain the location where the AAH facility can be constructed due to regulations (e.g., by the USFWS under FESA or the CDFW under CESA) governing impacts on habitat for these species or because impacts on these species may be considered significant under CEQA, thereby requiring avoidance and/or compensatory mitigation.

Species Listed under the Federal Endangered Species Act

The FESA protects listed wildlife species from harm or “take”. Section 9 of FESA prohibits the take of any fish or wildlife species listed as endangered and most species listed as threatened, and defines take to mean “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct,” with “harm” further defined to mean “any act that kills or injures the species, including significant habitat modification.” An activity can be defined as “take” even if it is unintentional or accidental. FESA also includes mechanisms for allowing exceptions to the Section 9 take prohibitions. For non-federalized projects, Section 10 allows for issuance of permits authorizing limited take of covered species

incidental to carrying out otherwise lawful activities with approval of a habitat conservation plan. Otherwise, consultations under Section 7 are required for federalized projects that may affect listed species, which similarly provides for permits to allow for limited, incidental take of listed species.

As described above, the federally endangered salt marsh harvest mouse may be present at Baylands Park. Habitat impacts could occur if seasonal wetlands or adjacent annual grasslands are impacted during construction of the AAH facility; Figure 5 shows the area within which the salt marsh harvest mouse could potentially occur, based on the locations of the seasonal wetlands and the suitability of grassland habitat around these wetlands for use by the species. If work were to take place in the salt marsh harvest mouse habitat, project activities may result in the injury or mortality of salt marsh harvest mice as a result of crushing by equipment, vehicle traffic, and worker foot traffic. Individual mice that vacate the area because of increased levels of noise and disturbance may be exposed to increased competition from conspecifics already occupying the area to which they were displaced and increased levels of predation because of unfamiliarity with the new area or lack of sufficient cover. Removal of vegetation may expose individual mice to predation.

Due to the rarity of this species, impacts on the salt marsh harvest mouse are potentially significant under CEQA, and take authorization would be required from the USFWS if take were to occur. Under Section 7 of the FESA, federal agencies must ensure that their actions will not jeopardize the continued existence of a listed species or result in adverse modification of critical habitat for a listed species. As a result, if the seasonal wetlands were impacted and a 404 permit from the USACE were needed, the USACE would need to consult with the USFWS regarding potential impacts on the salt marsh harvest mouse during the 404 permitting process. The City's consultant would prepare a Biological Assessment (BA) describing potential effects of project activities on this species; this BA would be submitted to the USACE along with the 404 permit application. The USACE would then forward the BA to the USFWS. Over a period of 9-12 months or more, the USFWS would coordinate with the City and the USACE regarding potential impacts, avoidance/minimization measures, and compensatory mitigation before issuing a Biological Opinion (BO) describing the effects from the agencies' perspective and providing approval for the project to "take" the salt marsh harvest mouse.

To offset any permanent or temporary habitat impacts on salt marsh harvest mouse habitat, CEQA mitigation measures and the USFWS may require restoration or creation of wetland habitat (typically at a 3:1 ratio) on or off site, or the purchase of mitigation credits at a USFWS-approved mitigation bank. It is possible (subject to agency approval) that mitigation of impacts to tidal wetlands and waters described in Section 2.3.1 above may also serve as mitigation for impacts on the salt marsh harvest mouse, if the mitigation provides suitable habitat for this species. Mitigation measures would also include the hand removal of any vegetation within harvest mouse habitat that will be disturbed by project activities, under the supervision of a qualified biologist.

Recommendation. Owing to the considerable time needed to obtain a 404 permit and undergo FESA consultation, the cost of salt marsh harvest mouse mitigation, and the availability of areas outside of potential

salt marsh harvest mouse habitat that could serve the needs of the AAH, we recommend that impacts to the seasonal wetlands and adjacent grasslands providing potential habitat for this species be avoided.

Species Listed under the California Endangered Species Act

The CESA (Fish and Game Code of California, Chapter 1.5, Sections 2050-2116) prohibits the take of any plant or animal State-listed or proposed for listing as rare (plants only), threatened, or endangered. In accordance with the CESA, the CDFW has jurisdiction over State-listed species. The CDFW regulates activities that may result in “take” of individuals listed under the Act (i.e., “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill”). Habitat degradation or modification is not expressly included in the definition of “take” under the Fish and Game Code. The CDFW, however, has interpreted “take” to include the “killing of a member of a species which is the proximate result of habitat modification.” CESA also allows exceptions for take that occur incidental to otherwise lawful activities; the requirements for obtaining incidental take permits (ITPs) are outlined in Section 2081 of the Fish and Game Code. Approval requires minimization and full mitigation of projected impacts. The CESA dictates the procedures followed to evaluate potential impacts to species listed under CESA, identify necessary mitigation measures, and form the basis for approving incidental take permits, if required.

The salt marsh harvest mouse, discussed above under FESA-listed species, is listed as endangered under both FESA and CESA. However, the CDFW cannot issue an ITP for take of this species, as the salt marsh harvest mouse is considered fully protected in California. Section 3511 of Fish and Game Code states that such species may not be taken or possessed at any time, and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock. Therefore, the CDFW would require that avoidance measures be implemented to avoid take of individuals.

Recommendation. Because individual salt marsh harvest mice cannot be taken for AAH construction or operation under state law, impacts on the potential salt marsh harvest mouse habitat indicated in Figure 5 should be avoided.

Other Special-status Species

No permits are needed for potential impacts on Congdon’s tarplant, or on habitat of California species of special concern (i.e., the loggerhead shrike, burrowing owl, Bryant’s savannah sparrow, and salt marsh wandering shrew) or the fully protected white-tailed kite. However, injury or mortality of individual native birds, or on their active nests, must be avoided because they are protected by state and federal laws (see Section 2.3.3). The loss of one pair of loggerhead shrikes, Bryant’s savannah sparrows, or white-tailed kites would be considered less-than-significant under CEQA given the low proportion of these species’ regional populations that would be affected. However, populations of the burrowing owl and Congdon’s tarplant, a CRBP 1B.2 species, are relatively limited locally and regionally. Thus, if individuals were to be lost or active burrowing owl nests disturbed due to construction of AAH facilities on Baylands Park, or if substantial

impacts on burrowing owl habitat were to occur, such impacts would be considered significant under CEQA. Further, impacts on individual salt marsh wandering shrews would be potentially significant under CEQA owing to the small regional populations of this species. Mitigation measures for impacts on the salt marsh wandering shrew would be the same as those for the salt marsh harvest mouse.

Mitigation measures for impacts on the Congdon's tarplant would include preconstruction surveys during the blooming period to determine whether the species is present in the area to be disturbed and avoidance of Congdon's tarplant to the extent feasible. If a large population were to be impacted, compensatory mitigation in the form of establishment and/or management of populations may be necessary to reduce impacts to less-than-significant levels under CEQA.

If work were to occur in occupied burrowing owl habitat, individual burrowing owls (especially young or adults in burrows) may be killed or injured during construction activities from destruction of burrows by equipment. More likely, project activities occurring in close proximity to active burrows may disturb owls to the point of abandoning their burrows, including active nests, eggs, and young. To avoid impacting nesting owls, measures such as preconstruction surveys, avoidance of breeding-season (1 February through 31 August) activities within buffers (up to 250 ft for burrowing owls), and eviction of individuals during the nonbreeding season would likely be required to avoid such impacts. If impacts to nesting habitat or extensive impacts to foraging habitat on Baylands Park were to occur, habitat mitigation in the form of habitat management and preservation focused on this species may be necessary to reduce impacts to less-than-significant levels under CEQA.

Recommendation. Because burrowing owls are not currently nesting in Baylands Park, there is a low probability that nesting owls will constrain the siting of the AAH, either by necessitating a buffer or necessitating habitat mitigation. Due to the abundance and height of trees, as well as the level of human activity, in the area indicated on Figure 5 as being recommended for AAH siting, it is our opinion that use of that area by burrowing owls (e.g., foraging or wintering owls) is low enough that siting the AAH in that area would not result in a significant impact under CEQA.

We recommend that areas providing the highest-quality habitat for Congdon's tarplant, as shown on Figure 5, be avoided.

2.3.3 Other Important Biological Resources

The federal Migratory Bird Treaty Act (MBTA; 16 U.S.C., §703, Supp. I, 1989) prohibits killing, possessing, or trading of migratory birds except in accordance with regulations prescribed by the Secretary of the Interior. The trustee agency that addresses issues related to the MBTA is the USFWS. Migratory birds protected under this law include all native birds and certain game birds (e.g., turkeys and pheasants). This act encompasses whole birds, parts of birds, and bird nests and eggs. The MBTA protects active nests from destruction and all nests of species protected by the MBTA, whether active or not, cannot be possessed. An active nest under the MBTA, as described by the Department of the Interior in its 16 April 2003 Migratory Bird Permit

Memorandum, is one having eggs or young. Nest starts, prior to egg laying, are not protected from destruction.

In addition, all native bird species that occur in the project area are protected by the State Fish and Game Code. Certain sections of the Fish and Game Code describe regulations pertaining to certain wildlife species. For example, Fish and Game Code §§3503, 2513, and 3800 (and other sections and subsections) protect native birds, including their nests and eggs, from all forms of take. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered “take” by the CDFW. Raptors (i.e., eagles, falcons, hawks, and owls) and their nests are specifically protected in California under Fish and Game Code §3503.5. Section 3503.5 states that it is “unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto.”

With the exception of burrowing owls, which may seek shelter in burrows rather than flying away from construction-related disturbance, birds that are capable of flight (adults and fledged juveniles) are unlikely to be killed or injured as a result of AAH construction or operation. As a result, the primary way in which AAH-related activities could violate the MBTA or California Fish and Game Code is through the destruction, removal, or disturbance of active nests. In addition to the special-status birds described in Section 2.2.3, a number of bird species nest in and adjacent to Baylands Park. Thus, AAH construction activities during the breeding season could result in the direct destruction of nests or in disturbance that results in the abandonment of active nests. For all species except the burrowing owl, discussed above, the proportion of the regional population that could be impacted would be so low that impacts would be considered less than significant under CEQA, in our opinion.

Recommendation. We recommend that the project take measures to avoid impacts on nesting birds to comply with the MBTA and California Fish and Game Code, especially given public awareness (e.g., by birders) of the locations of active nests and activities that could result in impacts on nesting birds at this very public location. Such measures would include avoidance of construction during the breeding season (1 February to 31 August), or implementation of preconstruction surveys and disturbance-free buffers (likely 300 ft for raptor nests and 100 ft for non-raptor nests) around active nests. Nesting deterrence can be implemented to minimize the potential for constraints due to nesting birds.

2.4 Potential Biological Opportunities

2.4.1 Recommended AAH Facility Locations

The following is a brief discussion of areas where an AAH facility could be located while minimizing impacts on sensitive habitats and species.

Construction of an AAH facility at Baylands Park could potentially result in significant impacts under CEQA on two regulated habitats (i.e., seasonal wetland and freshwater marsh) and three special-status species (i.e.,

salt marsh harvest mouse, burrowing owl, and Congdon's tarplant), depending on where the facility is located within the Park. Further, because the salt marsh harvest mouse is considered fully protected in California, the CDFW would require that avoidance measures be implemented to avoid take of individuals of this species. It is our opinion that avoidance of impacts on the salt marsh harvest mouse could be achieved by maintaining a 100-ft buffer around seasonal wetland habitat at the Park. Further, impacts on the burrowing owl and Congdon's tarplant could be avoided or minimized through the avoidance of impacts on California annual grassland habitat, particularly the habitat where Congdon's tarplant habitat quality is highest (Figure 4). Therefore, we recommend that the AAH facility be located in the northwestern portion of Baylands Park, in the area dominated by ornamental woodlands and landscaped habitats (Figure 5). Location of the AAH facility in this location would avoid impacts on seasonal wetlands, freshwater marsh, and the salt marsh harvest mouse and would minimize (and possibly avoid altogether) impacts on the burrowing owl and Congdon's tarplant. Although moderate migratory bird use of the Test Garden has been noted, migratory bird activity is highest in other portions of the Park, and therefore use of our recommended location for the AAH would not substantially reduce the value of the Park to migratory birds. (Note that the recycled water test garden is in this area and would have to be removed. It is not currently used for study and has served its purpose by studies completed in the previous 20 years of its existence.)

Even if the AAH is located in the area recommended on Figure 5, the operation of the facility could result in indirect impacts on sensitive species and habitats in the Park. To minimize such impacts, we recommend the following measures:

- Make sure that animals in the AAH cannot escape into the Park.
- Restrict new lighting to the minimum necessary for public safety, have all lights pointed downward, and shield lights to minimize spillover of light into other areas of the Park.
- Avoid having runoff from the AAH (especially runoff containing animal waste) enter the seasonal wetlands.
- Monitor effects of AAH use on Park habitats outside the AAH, and if degradation of habitat occurs (e.g., from trampling), implement measures such as increased signage, education, or fencing to avoid having AAH users degrade sensitive habitats.

2.4.2 Burrowing Owl

Baylands Park, including Baylands Preserve, represents some of the last suitable burrowing owl habitat in the City of Sunnyvale, yet numbers of owls have declined here (as in the rest of the South Bay) in recent years, and burrowing owls no longer breed regularly in the active use portion of the Park or Baylands Preserve. Due to the high levels of human disturbance, grasslands in the active use portion of the Park do not represent high-quality habitat for the burrowing owl, and owls are unlikely to breed successfully on the site. Therefore, we do not recommend implementing any habitat management or enhancement measures for the owl at this location. Existing management is sufficient to provide suitable foraging habitat for owls, such as in the California annual grassland. The City's management of burrowing owl habitat is guided by the general

recommendations provided in the CDFW's Staff Report on Burrowing Owl Mitigation (CDFW 2012) for avoiding impacts on, and conserving habitat for, burrowing owls, as well as more site-specific recommendations provided by Debra Chromczak, the City's consulting biologist. However, the adjacent Baylands Preserve, where human access is restricted, is much more likely to support successfully breeding owls if appropriate habitat management measures are implemented. Measures that could be implemented at the Baylands Preserve to try to increase the number of owls using the Baylands Preserve, the numbers of owls using the site for breeding, and the breeding success rate of owls on the site are similar to those measures proposed by Chromczak (2014) for the Landfill and include the following:

- Manage vegetation height ≤ 6 inches at occupied owl burrows, historically occupied burrows, and around artificial burrows, but leave islands of taller, denser vegetation to support prey populations. Vegetation height should be controlled year round, but especially during the breeding season (1 February through 31 August).
- Improve the burrowing owl prey base by planting native perennials in uplands and by constructing rock/brush piles.
- Install additional artificial burrow complexes.
- Implement non-native predator control measures.

These measures are described in detail in the *Sunnyvale Burrowing Owl Habitat Suitability and Opportunities Report* (H. T. Harvey & Associates 2015), a separate report concerning proposed burrowing owl enhancements.

Section 3.0 Sunnyvale Landfill

3.1 Project Description

The closed Sunnyvale Landfill is an approximately 93-ac site located in the northern part of the City. It has been designated as a Class III Landfill and was used for disposal of non-hazardous residential, commercial, and industrial Municipal Solid Waste and construction debris until 1993. It is currently designated as a public facility but is maintained mostly as a closed landfill that provides open space for public recreation (e.g., hiking, jogging, bicycling, and birding). However, the site currently has a lower level of improvement or maintenance than typical City recreation facilities, and the trail and road system, installed in the early 1990s as part of the Landfill closure, has proved inadequate to handle the amount and type of existing use (City of Sunnyvale 2013). To address this issue, the City is considering the feasibility of installing low intensity use park-like enhancements such as shade structures, benches, water fountains, and trails, while minimizing the risk of erosion of the landfill cover by directing users away from steep slopes that are experiencing compaction and loss of vegetation. No park-like enhancements are planned for the East Hill of the Landfill, much of which is leased to a private firm for use as a concrete recycling facility.

3.2 Existing Conditions

Located in the southwest corner of San Francisco Bay (Figure 1), the Landfill is set amid a variety of upland and aquatic habitat types, and represents one of the largest areas of open space in Sunnyvale. It is especially valued for recreation because portions are adjacent to the Bay Trail, and walking, biking, and birding on the site are popular with the public. The Landfill is bordered to the north by the Sunnyvale Water Pollution Control Plant (WPCP), which includes the Main Plant, as well as two oxidation ponds (Pond 1 and Pond 2) and associated channels; the Cargill Channel; Moffett Channel; and Pond A4 (Figure 2). The Landfill is bordered by an undeveloped parcel to the west, the Sunnyvale East Channel and Twin Creeks Ball Park to the east, and Caribbean Drive to the south, and it is bisected by the Sunnyvale West Channel and Borregas Avenue.

The Landfill consists of four refuse hills referred to as the West Hill, Recycle Hill, South Hill, and East Hill (Figure 2). With the exception of a privately-operated concrete recycling facility located on leased land at the East Hill and the Household Hazardous Waste Event Site next to Recycle Hill, the Landfill is undeveloped. A number of environmental management systems lie adjacent to, on, or beneath the surface of the landfill. These include 79 landfill gas collection wells plus associated valves and piping, 12 gas condensate removal vaults and a condensate removal piping network, eight leachate extraction wells and (on the perimeter of the site) 21 gas migration detection probes and 13 actively monitored groundwater wells. All of these structures and systems require periodic access for monitoring, adjustment, maintenance, repair, and/or replacement. As the landfilled materials decompose and settle, repairs to the landfill surface itself are regularly needed to fill in

low spots to restore drainage/prevent ponding prevent erosion and maintain the state-required vegetative cover.

Habitat management at the Landfill is conducted by the Environmental Services Department and includes management of grasslands to enhance their value as habitat for burrowing owls. To reduce fire risk and allow staff access to the environmental management systems, the City uses goats and sheep for vegetation management at least once per year, usually during spring. Multi-acre sections of the Landfill are fenced off with 12-volt electric fencing to contain the goats and sheep as they graze and browse from one end of the landfill to the other. Many public access areas, including the informal trails, are temporarily blocked as the animals occupy these areas. Depending on the number of animals on site, which ranges from 200-800 at a time, they remain on site for two to three months. A benefit of this method of vegetation control is that grazing enhances the visibility, to the burrowing owls, of prey and predators. In addition, Landfill maintenance activities are scheduled to avoid active burrows and to avoid choice nesting sites in the breeding season. Further, leash laws are actively enforced as the presence of loose dogs discourages use of the Landfill as owl habitat.

3.2.1 Habitats

Reconnaissance-level surveys identified three biotic habitats on the Landfill: California annual grassland, ornamental woodland, and barren. These habitats are briefly described below, and their distribution within the Landfill is depicted in Figure 2; representative photos of each habitat type are also provided below. A complete list of wildlife species expected to occur at the Landfill is provided as Appendix B. As indicated on this list, nine species of reptiles, one amphibian, 23 mammals, and 92 birds are known or expected to use the Landfill (not including adjacent areas, such as the aquatic habitats outside the Landfill boundary).

California Annual Grassland

The majority of the Landfill is composed of California annual grassland (Photo 11). This habitat is of lower quality than the annual grasslands at Baylands Park due to the greater abundance of non-native species, including annual grasses such as wild oats, soft chess, (*Bromus diandrus*), and Spanish brome (*Bromus madritensis*), as well as yellow star thistle (*Centaurea solstitialis*) and Mediterranean hoary mustard (*Hirschfeldia incana*).

Animal use of the California annual grasslands on the Landfill is similar to that described for Baylands Park above.



Photo 11. California annual grassland

Ornamental Woodland



Photo 12. Ornamental woodland

Ornamental woodlands composed of non-native eucalyptus trees (Photo 12) line the center median and western side of Borregas Avenue north of Caribbean Drive, on the eastern border of Recycle Hill, adjacent to Borregas Avenue and the southwestern boundary of South Hill adjacent to West Caribbean Drive. Another group of eucalyptus trees is located on the triangular-shaped Landfill parcel (unfilled) just off the southwest corner of the West Hill, adjacent to the Yahoo parking structure. The understory is dominated by nonnative annual grasses. Because the woodlands on the site occur as narrow, linear strips and understory vegetation is limited to

those species found in the adjacent grassland, the habitat's value to woodland species is low, and the birds and mammals associated with low, dense woodland vegetation are absent. Nevertheless, the eucalyptus trees provide roosting and nesting habitat for raptors that forage in the adjacent grassland habitat, such as the Cooper's hawk (*Accipiter cooperii*) and red-tailed hawk. In addition, the eucalyptus flowers provide abundant nectar for birds, including the Anna's hummingbird (*Calypte anna*), and attract insects that in turn attract a variety of insect-eating birds.

Barren

Vegetation is absent from the barren habitat at the Landfill, which is composed of a gravel trail and road system (Photo 13) that was installed in the early 1990s, as well as the concrete recycling facility on the East Hill. Graveled, unvegetated areas do not provide high-quality wildlife habitat due to the lack of cover and the limited foraging opportunities; however, species that occur in the adjacent grassland habitat may forage within these areas.



Photo 13. Barren habitat

3.2.2 Sensitive and Regulated Habitats

Wetlands and Other Waters of the U.S./Waters of the State

Regulations pertaining to wetlands and other waters of the U.S./State were discussed under Section 2.2.2 above.

Project applicability. A delineation of waters of the U.S./State performed by H. T. Harvey & Associates (2014) for the WPCP Master Plan included the Landfill. No jurisdictional wetlands or other waters were detected on the Landfill itself (i.e., within the Landfill boundary depicted on Figure 2), although jurisdictional

areas are present immediately adjacent to the Landfill along its eastern, western, and northern boundaries, and along Sunnyvale West Channel.

McAteer-Petris Act

As described in Section 2.2.3 above, the BCDC is the California State agency responsible for enforcing the McAteer-Petris Act, and BCDC's approval must be obtained before conducting construction activities on areas within BCDC's jurisdiction.

Project applicability. No features on the Landfill itself are tidal, but the portion of the Sunnyvale West Channel that bisects the Landfill, and the portion of the Sunnyvale East Channel located just outside the eastern boundary of the Landfill, are tidal. As a result, the BCDC may claim jurisdiction over the portion of these channels adjacent to the Landfill as well as the landward area within 100 ft of the channels. If construction of park enhancements would involve work within 100 ft of these tidal channels, they would impact areas under BCDC's shoreline jurisdiction. Figure 6 depicts areas of anticipated BCDC jurisdiction on and adjacent to the Landfill.

CDFW Natural Communities of Special Concern

The Landfill does not support any sensitive habitat types tracked by the CNDDDB that can occur in the general vicinity, such as Northern Coastal Salt Marsh or Sycamore Alluvial Woodland. Special-status Species

Special-status Plants

A list of 67 plants designated as special-status and potentially occurring in the Sunnyvale area was compiled using CNPS lists and CNDDDB (2014) records, and reviewed for their potential to occur within the site. Analysis of the documented habitat requirements and occurrence records associated with all of the species considered allowed us to reject 66 of these species as not occurring within the Landfill. A list of all species considered but rejected, and the reason for rejection, is available in Appendix C. Figure 3 depicts CNDDDB-mapped locations of special-status plants in the vicinity of the Landfill.

No plant species that are listed under the FESA or the CESA are known or expected to occur on the Landfill, or to be affected indirectly (i.e., in nearby areas) by construction of park enhancements. However, the annual grasslands that dominate the Landfill provide marginally suitable habitat for the Congdon's tarplant, a CRPR 1B.2 species. In Central California, Congdon's tarplant is primarily restricted to very dense clay soils that are saline-alkali affected in low-lying grassland habitats. The single biggest factor determining its distribution is soil alkalinity, but the species also prefers moist settings and is commonly found associated with wetland indicator species on the fringes of wetlands in topographic depressions. Although the species is often associated with moderate levels of disturbance, it is a poor competitor and is easily outcompeted by grasses and forbs. Thus, the Landfill, which has free-draining soils, is primarily steep-sided, and has been planted with grasses and forbs, does not represent high, or even moderate, quality habitat for the species. Further, the



N:\Projects\3600\3619-01\Reports\Biological Analysis\Figure 6 Expected BCDC Jurisdiction.mxd

species was not observed on the site during surveys conducted in January 2013 and May 2014 by H. T. Harvey & Associates plant ecologist, Chris Gurney, M.S., for the Sunnyvale Water Pollution Control Plant wetland delineation (H. T. Harvey & Associates 2013). Thus, it is our opinion that Congdon's tarplant is unlikely to occur on the Landfill.

Special-status Animals

All special-status animals potentially occurring at the Landfill were reviewed. The legal status and potential for occurrence of special-status wildlife species known to occur or potentially occurring in the general vicinity of the site are given in Appendix D, and Figure 4 depicts CNDDDB-mapped locations of special-status animals in the vicinity.

No animal species that are listed under the FESA or the CESA are known or expected to occur at the Landfill or to be affected indirectly (i.e., in nearby areas) by construction of park enhancements. However, three special-status bird species could potentially nest at the Landfill. Burrowing owls overwinter on the Landfill and were formerly known to breed in the grasslands on West Hill. Although they have not successfully bred on the site since 1999 (Chromczak 2014), they could potentially breed on the Landfill under existing conditions. Up to one or two pairs each of loggerhead shrikes and white-tailed kites may nest in the ornamental woodlands and forage in the adjacent grasslands. In addition, the western pond turtle, a California species of special concern, has been documented within the Lockheed Channel and North Moffett Channel (TN & Associates, Inc. and Tetra Tech EC, Inc. 2006 as cited in EDAW 2007) immediately north of the Landfill's West Hill. Therefore, there is some potential (albeit low) for western pond turtles to nest on the northern face of West Hill, adjacent to the Lockheed Channel.

3.3 Potential Constraints

3.3.1 Sensitive and Regulated Habitats

Wetlands and Other Waters of the U.S./Waters of the State

No waters of the U.S./State are present on the Landfill. However, the RWQCB and the LEA (Local Enforcement Agency), which is the Santa Clara County Environmental Health Department, with oversight from CalRecycle, regulates activities on closed landfills. Therefore, approval from the RWQCB and the LEA may be needed for construction of park enhancements on the Landfill.

Recommendation. Impacts on the Landfill itself would not impact waters of the U.S./State. To avoid the need for USACE and RWQCB permitting involving impacts to these habitats, as well as the cost of mitigation of any impacts, we recommend ensuring that no fill of off-site wetlands and other waters of the U.S./State occur. Further, if any ground-disturbing activities will occur adjacent to off-site wetlands and other waters, we recommend that measures such as the use of silt fencing along the edges of the wetlands be implemented to ensure that no soil or other material is inadvertently mobilized into these sensitive habitats.

We recommend that the City contact the RWQCB and the LEA prior to implementing any recreational improvements on the Landfill to determine whether a permit related to the Landfill itself is needed.

McAteer-Petris Act

Areas under the jurisdiction of the BCDC were described in Section 3.2.2 above. Any activities on the Landfill within 100 ft of the Sunnyvale West Channel or the Sunnyvale East Channel are subject to BCDC's shoreline band jurisdiction (Figure 6). Therefore, a BCDC permit would be needed for construction of any park enhancements within 100 ft of these channels.

Any new Landfill activities (i.e., activities that are not currently ongoing as part of the existing Landfill management plan) within BCDC jurisdiction would require a permit from BCDC. Therefore, construction of park enhancements within the 100-ft shoreline band would require an "administrative permit". The BCDC permit process may take 6-9 months.

Conditions of BCDC permits vary considerably among activities, and would thus be negotiated with BCDC during the permitting process. Permit conditions often include measures to ensure project consistency with the San Francisco Bay Plan, including shoreline protection, sea level rise (SLR) considerations, and the establishment and maintenance of long-term public access and recreation for the Bay shoreline. In general, any construction within BCDC jurisdiction may need to accommodate SLR to obtain BCDC approval.

Recommendation. If the City wishes to construct any park improvements within the potential BCDC jurisdictional areas depicted on Figure 6, we recommend that the BCDC be contacted to determine whether those activities require a permit.

3.3.2 Special-status Species

Special-status plants and animals may constrain project activities due to regulation or because impacts on these species may be considered significant under CEQA, thereby requiring mitigation. Because none of the special-status species that could occur on the Landfill are formally listed under the FESA or CESA, no agency approval is needed for impacts on these species or their habitats. In addition, the loss of one or two pairs of loggerhead shrikes or white-tailed kites would be considered less-than-significant under CEQA given the low proportion of these species' regional populations that would be affected. However, populations of the burrowing owl are relatively limited locally and regionally. Thus, if individuals were to be lost or active nests disturbed as a result of project activities on the Landfill, or if substantial impacts to burrowing owl habitat were to occur, such impacts would be considered significant under CEQA. Mitigation measures for impacts on the burrowing owl would be as described in Section 2.3.2 above.

Due to the isolated nature of the small western pond turtle population in the site vicinity, the loss of individuals could reduce the viability of this local population to the extent that it would be extirpated. This impact would be considered significant under CEQA owing to the small regional populations of western

pond turtles. Mitigation measures for impacts on western pond turtles would include preconstruction surveys and biological monitoring for any installation of park improvements within 100 feet of the Lockheed Channel and lower Sunnyvale West Channel, as well as capture and relocation (with CDFW approval) of any western pond turtles that may be present in project work areas.

Recommendation. Although complete avoidance of impacts to habitat for this species is not feasible, as burrowing owls could occur throughout the annual grasslands on the site, we recommend siting park enhancements to avoid concentrating human activity in these high-quality burrowing owl habitat areas, as shown in Figure 7.

We also recommend that pre-construction surveys for western pond turtles be performed for any implementation of park improvements occurring within 200 feet of the Lockheed Channel and lower Sunnyvale West Channel.

3.3.3 Other Important Biological Resources

As described under Section 2.3.3 above, the MBTA prohibits killing, possessing, or trading of migratory birds except in accordance with regulations prescribed by the Secretary of the Interior. Further, all native bird species that occur on the Landfill are protected by the State Fish and Game Code.

In addition to the special-status birds described in Section 3.2.3, a number of bird species nest on and adjacent to the Landfill. Thus, construction of park enhancements during the breeding season could result in the direct destruction of nests or in disturbance that results in the abandonment of active nests. For non-special-status species, the proportion of the regional population that could potentially be impacted would be so low that impacts would be considered less than significant under CEQA, in our opinion.

Recommendation. We recommend that the project take measures to avoid impacts on nesting birds to comply with the MBTA and California Fish and Game Code, and to minimize potential impacts on burrowing owls, especially given public awareness (e.g., by birders) of the locations of nesting birds and burrowing owls, as well as activities that could result in impacts on nesting birds at this very public location. Such measures would include avoidance of construction during the breeding season (1 February to 31 August), or implementation of preconstruction surveys and disturbance-free buffers (likely 300 ft for raptor nests and 100 ft for non-raptor nests) around active nests. Nesting deterrence can be implemented to minimize the potential for constraints due to nesting birds.

3.4 Potential Opportunities

3.4.1 Park Enhancement Locations

The following is a brief discussion of areas where park enhancements could be located while minimizing impacts on sensitive habitats and species and ensuring compliance with the landfill closure plan.

Construction of park enhancements (e.g., shade structures, benches, drinking fountains, and trails) at the Landfill are not expected to result in significant impacts under CEQA on any regulated habitats as no regulated habitats were identified within the Project boundary. However, construction of such enhancements could result in a significant impact on two special-status species (i.e., western pond turtle and burrowing owl). The implementation of preconstruction surveys and relocation of any individual western pond turtles from construction areas would be sufficient to reduce impacts on this species to a less-than-significant level under CEQA. Similarly, pre-construction surveys for burrowing owls, and implementation of the avoidance measures described in Section 2.3.2, would avoid or minimize impacts on individual burrowing owls. Although, complete avoidance of impacts on habitat for this species is not feasible as it could occur throughout the annual grasslands on the site, we recommend focusing park enhancements on West Hill and South Hill to avoid concentrating human activity in areas that provide high quality opportunities for burrowing owl habitat enhancement (Figure 7). Further, because the CDFW typically recommends maintaining a 250-ft non-disturbance buffer around active burrowing owl nests to prevent their disturbance, we recommend siting any new park enhancements (e.g., trails, shade structures, or other features that would attract recreational users to an area) on East Hill and Recycle Hill 250 ft or more from the proposed burrowing owl enhancement areas (see Figure 7) to the maximum extent feasible to minimize disturbance of active owl burrows.

3.4.2 Burrowing Owl

The Landfill and Baylands Park represent some of the last burrowing owl habitat in the City of Sunnyvale, yet numbers of owls appear to have declined here (as in the rest of the South Bay) in recent years, and burrowing owls do not breed regularly on the Landfill. The City's burrowing owl contractor, Debra Chromczak, has identified a number of habitat management and enhancement measures that could be implemented on the Landfill to try to increase the number of owls using the Landfill, the number using the Landfill for breeding, and breeding success (Chromczak 2014). Ms. Chromczak designated four preferred enhancement areas on the Landfill, one each on West Hill and Recycle Hill, and two on East Hill. However, given the relatively high level of recreational use that occurs on the West Hill and South Hill, and per the recommendation of David Johnston of the CDFW, we recommend that burrowing owl habitat enhancement efforts be concentrated on Recycle Hill and East Hill, where less recreational activity occurs. Recommendations for habitat enhancement measures that should be continued or newly implemented in these areas are as follows:

- Install artificial burrow complexes
- Implement non-native predator control measures.
- Deter off-path human access.
- Continue to manage vegetation height to ≤ 6 inches at occupied owl burrows and leave islands of taller, denser vegetation to support prey populations. In addition, begin managing vegetation height at historically occupied burrows and artificial burrows. Vegetation height should be controlled year round, but especially during the breeding season (1 February through 31 August).

- Improve the burrowing owl prey base by planting native perennials in uplands and by using rock/brush piles.
- Focus management on areas with numerous ground squirrels, away from human/canine disturbance.
- Close off portions of Landfill around active burrows during nesting season.

These measures are described in detail in the *Sunnyvale Burrowing Owl Habitat Suitability and Opportunities Report* (H. T. Harvey & Associates 2015), concerning proposed burrowing owl enhancements.



H.T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 7: Recommended Park Enhancement Avoidance Areas

Sunnyvale Baylands Park and Landfill Biological
Constraints and Opportunities Analysis (3619-01)
January 2015

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Appendix A. Geosyntec Consultants 2013 Report

17 October 2013

Mr. Manuel Pineda, P.E.
Assistant Director of Public Works
City of Sunnyvale
Department of Public Works
456 West Olive Avenue
P.O. Box 3707
Sunnyvale CA 94088-3707

**Subject: Final Report for Establishing a Community Animal Farm and Alternative
Recreational Uses at the Sunnyvale Landfill
City of Sunnyvale, California**

Dear Mr. Pineda:

Geosyntec Consultants, Inc. and Crawford Consulting, Inc. appreciate the opportunity to assist the City of Sunnyvale in evaluating alternate land uses for the Sunnyvale Landfill. We have enjoyed the dynamics of the project, including interacting with City personnel and Animal Assisted Happiness (AAH).

As requested, we are providing five copies with CDs of our *Feasibility Report for Establishing a Community Animal Farm and Alternative Recreational Land Uses at the Sunnyvale Landfill*.

Should you have any questions regarding our report, please feel free to contact us at 510-836-3034 or 408-287-9934. We look forward to working with the City of Sunnyvale in the future.

Sincerely,

CRAWFORD CONSULTING, INC.

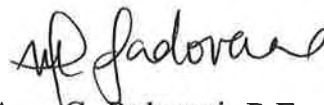


Sarah J. Thomson
Environmental Scientist

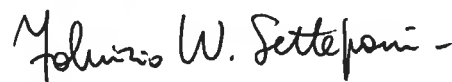


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FEASIBILITY REPORT FOR ESTABLISHING A COMMUNITY ANIMAL FARM AND ALTERNATIVE RECREATIONAL LAND USES AT THE SUNNYVALE LANDFILL

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Project Number: WG1786

17 October 2013

EXECUTIVE SUMMARY

This Feasibility Study (Study) provides the City of Sunnyvale (the City) with a guide for establishing recreational uses at the Sunnyvale Landfill. This guide includes analyses of possible recreational uses and their feasibility based on landfill constraints, regulations, constructability, public infrastructure improvements that would be needed, and conceptual costs.

The first use explored was the potential use of a portion of the landfill by the non-profit organization Animal Assisted Happiness (AAH). AAH provides therapeutic animal interaction services to children with special needs. AAH is a 501(c)(3) non-profit organization whose mission is to serve children with special needs and children with family challenges. AAH provides, free of charge, barnyard animal interaction services in an environment that is physically safe as well as emotionally safe, away from external stimulations and stress they encounter every day, and allowing the children to simply be themselves. AAH also provides unique volunteer opportunities for youth, and adults, that share their mission. With a vision of One Million Smiles, AAH has served nearly 10,000 smiles since 2009.

Recreational uses to be evaluated as part of the study were selected and developed by the City and the Geosyntec/Crawford Team as the study progressed. The recreational uses explored include a dual-purpose Sports Field (soccer and baseball) and a Bike Skills Park. Park Enhancements (including a Dog Park) for all the options were also explored. Order of magnitude cost estimates are also presented in the Study for each option.

The study also included, as part of community outreach by the City, two community meetings scheduled by the City during the course of the feasibility study. The first meeting was held during the early stages to engage the community in the study process and gather input on the range of possible uses to be analyzed during the study. The second meeting was held to present the draft findings of the study. City personnel and members from the Geosyntec/Crawford Team attended both community meetings.

The facility and feature layouts presented in this Study are not intended to represent a specific, recommended design, but rather, a starting point for consideration of what uses, features, and facilities would work within the constraints and opportunities afforded at the site. The exact locations of features and structures, and size and location of the footprints for the different facilities evaluated would be refined and adjusted based on the City's preferences during planning and design stages.

The four alternatives are technically feasible in a manner that could address post-closure land use regulations of CCR Title 27 Section 21190. Compared to the AAH, Bike Park, and Park Enhancements alternatives, the Baseball/Soccer Field option, or another sports field option, would likely require higher cost per user to design, permit, build, and maintain than if it were built on native ground. The four alternatives would have to address the American with Disabilities Act (ADA) for access and would need different levels of infrastructure improvements (e.g., roadway, sewer, electrical, potable water, bathrooms, etc.) to meet the needs of the users while also addressing the fact that the facilities would be constructed over closed municipal solid waste landfills while addressing existing wildlife habitat.

Furthermore, as presented in the Study, each recreational use affects how the existing environmental controls at the landfill (e.g., final cover, landfill gas control and extraction, surface water features, etc.) would be affected; these environmental controls protect the health of the public at large and would need to remain operational and need to be retrofitted for each proposed use. Impacts that need to be addressed may include parking/traffic (e.g., existing number of parking spaces is limited, increased number of vehicle trips on the adjacent roads which may affect the existing City facilities and neighbors, etc.) and environmental that can be addressed through the implementation of facility and operations management plans, settlement monitoring, storm water pollution and prevention plans, landfill gas monitoring, etc.

To move forward with any of the uses evaluated for this Study, the City would need to address the constraints reviewed in this study and would need to undertake a number of studies such as potential wildlife habitat impacts, traffic, parking, and other California Environmental Quality Act (CEQA) related work for design and permitting purposes to address the impact of the proposed improvements on the surrounding areas of Sunnyvale.

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1. INTRODUCTION

1.1 Purpose of Study

The main purpose of this Feasibility Study is to provide a guide for the City of Sunnyvale (the City) for establishing recreational uses at the Sunnyvale Landfill. This guide, as presented in this report, includes analyses of possible recreational uses and their feasibility based on landfill constraints, regulations, constructability, public infrastructure improvements that would be needed, and conceptual costs.

The first use explored was the potential use of a portion of the landfill by the non-profit organization Animal Assisted Happiness (AAH). AAH provides therapeutic animal interaction services to children with special needs. Animal Assisted Happiness (AAH) is a 501(c)(3) non-profit organization whose mission is to serve children with special needs and children with family challenges. AAH provides, free of charge, barnyard animal interaction services in an environment that is physically safe as well as emotionally safe, away from external stimulations and stress they encounter every day, and allowing the children to simply be themselves. AAH also provides unique volunteer opportunities for youth, and adults, that share their mission. With a vision of One Million Smiles, AAH has served nearly 10,000 smiles since 2009.

Recreational uses to be evaluated as part of the study were selected and developed by the City and the Geosyntec/Crawford Team as the study progressed.

1.2 Background

The City of Sunnyvale Landfill is a closed landfill on an approximately 93-acre site located in the northern part of the City and adjacent to tidal flats and former salt ponds in the southern margins of San Francisco Bay. The City of Sunnyvale is the property owner and operator of the landfill. Waste disposal activities reportedly began at the site in the 1920s, when the property was under different ownership. The site was permitted for operation as a sanitary landfill by state oversight agencies in the 1970s. The site has been designated as a Class III Landfill and was used for disposal of non-hazardous residential, commercial, and industrial Municipal Solid Waste (MSW) and construction debris until 1993.

The landfill is approximately 5,700 feet long and varies between 400 and 1,100 feet wide and consists of four refuse hills referred to as the West Hill, Recycle Hill, South Hill, and the East Hill. With the exception of a concrete recycling facility located on

the East Hill and the Household Hazardous Waste Event Site next to the Recycle Hill, the landfill is undeveloped and covered with grass and shrubs. The MSW landfill was closed in eight separate phases extending from approximately the mid-1980s through 1994, per California Code of Regulations (CCR) Title 14 and 23 requirements in effect at the time. A minimum 4-foot thick final cover system was constructed to prescriptive standards, and includes a minimum 1-foot thick low permeability soil layer. The final cover system was placed over all MSW disposal areas.

A surface water drainage system helps minimize the infiltration of rain water by conveyance of runoff along drainage ditches installed along the landfill access roads. Drain pipes and catch basins installed at low points carry drainage beyond the landfill footprint.

Vegetation is managed by using livestock to “mow” the vegetative cover, with a herd of hundreds of goats and sheep brought in, once or twice a year. Recycled water is used for dust control on the East Hill access road.

A landfill gas collection and control system and a landfill gas flare were installed in 1987. In 1997, a Power Generation Facility was constructed, to combust landfill gas and digester gas to provide electricity to the Water Pollution Control Plant (WPCP). Natural gas, in the form of air blended natural gas, was added to the fuel mix in 2002 to enable the Power Generation Facility to satisfy 100% of the WPCP’s electricity needs during normal operating conditions. The landfill is currently designated as a public facility and is maintained mostly as open space for public recreation (e.g., hiking, jogging bicycling, bird watching). A portion of the East Hill area is not open to the public and is leased to a private company for concrete recycling operations. Use of the East Hill is not to be considered in the proposed feasibility study.

Burrowing owls, a California Species of Special Concern, have used the landfill site for nesting and foraging habitat. The City monitors their activity at the site through the services of a wildlife consultant.

1.3 Scope of Services

The scope of services provided for this Study were as defined in Section 2.3 from our proposal to the City, dated 28 June 2013, and they included:

- Meeting and Coordination with the City,
- Participation in Outreach and Community Meetings,

- Analysis of Issues, Constraints and Opportunities for Site Development,
- Review of Goals and Policies to be Considered for the Study,
- Evaluation of Alternative Land Uses,
- Analysis of Constructability Issues for Each Alternative Land Use,
- Evaluation of Public Infrastructure Requirements,
- Evaluation of Transportation/Circulation Needs,
- Review of Environmental Regulations to be Addressed, and
- Preparation of a Final Report to the City.

A description of the services provided as part of each scope item is included in the corresponding Section from this report.

1.4 Assistance from the City

Throughout the duration of the study, assistance and guidance to our team was provided from several different City personnel involved in the project. The names listed below correspond to those employees whose input was obtained from, and incorporated into this final report.

- Manuel Pineda, P.E. – Assistant Director of Public Works
- Patricia Lord, M.P.A. – Senior Management Analyst
- Mark Bowers – Solid Waste Programs Division Manager
- William Theyskens, P.G., C.E.G., C.H.G. – Environmental Engineering Coordinator
- Scott Morton – Superintendent of Parks

2. OUTREACH AND COMMUNITY PARTICIPATION

2.1 General

This feasibility study included a community outreach process to help the City provide a plan that serves the community's needs. Two community meetings were scheduled by the City during the course of the feasibility study. The first meeting was held during the early stages of the feasibility study to engage the community in the study process and gather input on the range of possible uses to be analyzed during the study. The second meeting was held to present the draft findings of the study. The City provided public notice and announcements for both meetings. In addition to City personnel, members from the Geosyntec/Crawford Team attended both community meetings.

Copies of the meeting announcement fliers and public comment summaries prepared by the City for both community meetings are presented in Appendix A. Copies of the Microsoft PowerPoint presentations, which were prepared by the City and the Geosyntec/Crawford Team, are also presented in Appendix A.

2.2 Community Meeting #1 (15 August 2013)

The first community meeting was held at 7 p.m., Thursday, August 15, 2013, at the Sunnyvale Senior Center. The community was invited to attend the meeting to provide input on the possibility of using the Sunnyvale Landfill site for additional recreational uses such as therapeutic animal interaction services by Animal Assisted Happiness, sports fields, and fenced dog runs.

As recorded on the Public Comment Summary prepared by Patricia Lord of the City of Sunnyvale (see Appendix A), twenty-three community members (twenty signed in), three members of the consultant team, and five City staff members were present for the meeting.

Manuel Pineda, the Assistant Director of Public Works, led the meeting. After introducing the City and consultant team members present, Mr. Pineda provided an overview of the feasibility study with a Microsoft PowerPoint presentation (see Appendix A). The presentation included information on existing recreational uses of the Sunnyvale Landfill, the constraints related to building on a closed landfill, some of the options the City was considering, and the remaining steps and schedule for the study. Mr. Pineda then opened the meeting for public input. Community members provided input on the types of activities they enjoyed at the site, their concerns about

some existing conditions and uses, and their preferences for the types of activities that should be continued or added at the site. City and consultant team members responded to some questions about the site, the feasibility study, and the recreational uses being considered. Representatives from AAH present at the meeting also responded to some input and questions about their proposed lease of a portion of the landfill. Ms. Lord compiled public comments on a flip chart. A summary of the public input is provided on the Public Comment Summary.

2.3 Community Meeting #2 (12 September 2013)

The second community meeting was held at 6:30 p.m., September 12, 2013, at the Sunnyvale Senior Center. The community was invited to attend the meeting to join the discussion on the preliminary findings of the feasibility of using the site for additional recreational uses.

As recorded on the Public Comment Summary prepared by Ms. Lord (see Appendix A), approximately sixteen community members (thirteen signed in), three members of the consultant team, and five City staff members were present for this community meeting.

Mr. Pineda introduced the City and consultant team members present and provided a short overview of the project. Mark Wheeler of Crawford Consulting, Inc. then described the general features and layout of the four main study options selected by the City for evaluation in the study, using a Microsoft PowerPoint presentation to illustrate the option features and layout (see Appendix A). Mr. Pineda then opened the meeting for public input.

Community members asked questions and commented on the proposed study options. Community input was compiled and included on the Public Comment Summary by Ms. Lord (see Appendix A). Mr. Pineda then outlined the remaining steps and schedule for the study before closing the meeting.

3. ANALYSIS OF ISSUES, CONSTRAINTS AND OPPORTUNITIES

3.1 General

For the Analysis of Issues, Constraints and Opportunities, the City provided data on existing infrastructure and land uses, as well as landfill-specific requirements and constraints. This section presents our compilation and assessment of the information provided by the City.

3.2 Landfill Status and Regulatory Framework

3.2.1 Landfill Setting and Description

The City of Sunnyvale Landfill is a closed landfill on an approximately 93-acre site located in the northern part of the City and adjacent to tidal flats and former salt ponds in the southern margins of San Francisco Bay. The MSW landfill was closed in eight separate phases extending from approximately the mid-1980s through 1994, per CCR Title 14 and 23 requirements in effect at the time. A minimum 4-foot thick final cover system was constructed to prescriptive standards, and was placed over all MSW disposal areas.

The following description of the final cover system and landfill characteristics is from the 2012 updated Post-closure Maintenance Plan (SCS Engineers, 2012).

The final cover system consists of the following (bottom to top):

- *A 1- to 2-foot thick layer of foundation soil placed over refuse, compacted to 90 percent of maximum dry density.*
- *A minimum 1-foot thick layer of low-permeability clay soil, compacted to achieve a permeability of 1×10^{-6} centimeters per second (cm/sec) or less.*
- *A minimum 1-foot thick layer of free draining topsoil, vegetated with annual and perennial grasses.*

The final slopes were designed with a maximum slope of 2.75H:1V (Horizontal:Vertical) and a minimum grade of 4 percent. This design incorporated applicable drainage, slope stability, post-closure land use, and anticipated settlements. The landfill surface has settled since closure in 1994 and side slopes are now not as steep, ranging from 3H:1V to 4.5H:1V.

3.2.2 Regulatory Framework

Post-closure development or construction for recreational activities or other uses at the landfill would be subject to the requirements and constraints of:

- Waste Discharge Requirements Order No. R2-2004-0030
- Santa Clara County Deed Restriction
- Post Closure Monitoring and Maintenance Plan
- Title 27 Post-closure Land Use Regulations

3.2.2.1 Waste Discharge Requirements Order

Waste Discharge Requirements Order No. R2-2004-0030, issued by the Regional Water Quality Control Board (RWQCB) San Francisco Region in 2004, contains provisions, specifications, and prohibitions for the maintenance and monitoring of the landfill.

Any proposed material changes in site operations or features would need to be approved by the RWQCB. Per Provision 7 of the Order, a technical report would need to be submitted describing any proposed material changes to site development, redevelopment projects, site features, or site operations for the landfill. The report would need to address the key constraints of the Order for post-closure development and uses, which are:

- Maintaining the integrity of the landfill cap
- Preventing water quality impacts

The landfill cap must be maintained to prevent exposure or release of waste materials and to minimize infiltration of rainwater through the landfill cap into waste materials. The landfill cap must be graded and maintained to promote lateral runoff and prevent ponding and infiltration of water.

Excavation of waste or reconfiguration of waste units is prohibited without prior RWQCB approval. However, based on RWQCB approvals for post-closure development projects at other Bay Area landfills, it is likely that development activities that involved excavation through the landfill cap, excavation and relocation of wastes on or offsite, construction of footings or other foundations for structures, or re-grading would be approved provided the designs:

- Address reconstruction of the landfill cap to prescriptive standards,
- Include measures to prevent releases of waste materials during construction, and
- Provide for adequate surface drainage for the reconstructed or re-graded areas.

Any site developments, improvements, or activities that involved irrigation or other application of water to the landfill surface, including landscaping or water features, would need to be approved by the RWQCB. The irrigation systems and management plans for landscaped areas or plantings would need to be designed to minimize infiltration through the landfill cap, through monitoring and management of soil moisture conditions and irrigation rates, or by providing drainage features to capture and carry off excess irrigation. For landscaping, use of plants with low-water requirements would help minimize the amount of irrigation needed and thus minimize the potential for excess infiltration.

3.2.2.2 Santa Clara County Deed Restriction

Land use at the Sunnyvale Landfill is restricted by a deed restriction filed with the County of Santa Clara (Covenant to Restrict Use of Property, filed June 5 1995). Land use options for the landfill are restricted to the post-closure land uses described in the 1992 Sunnyvale Landfill Final Closure and Post-closure Maintenance Plan (3E Engineering, October 14, 1992). Those uses are described in the next section of this letter report.

The deed restriction includes provisions for variances or termination of the restrictions as they apply to all or any portions of the property. The owner, or an occupant of the property with the owner's consent, may apply to the RWQCB for a written variance or termination of provisions of the covenant. Unless terminated according to these provisions, the covenant will continue in effect in perpetuity.

3.2.2.3 Post-Closure Monitoring and Maintenance Plan

As described above, land use options for the landfill are restricted to the post-closure land uses described in the 1992 Sunnyvale Landfill Final Closure and Post-closure Maintenance Plan.

Summaries of the future uses of the landfill site are given in the Introduction of the Plan as follows:

- *The City wishes to allow a concrete crushing facility to remain permanently on East Hill after closure.*
- *The City also plans to develop a yard waste composting facility on the East Hill after closure.*
- *Closed portions of the landfill not in use by the concrete crushing facility or the City (South Hill, Recycle Hill, and West Hill) will be maintained as public open space and accessible to pedestrian traffic. These areas will not be irrigated, but are seeded with grasses for erosion control purposes. Given the arid climate of the area, these portions of the landfill will be green with live grasses during the winter and brown during the summer.*

More detailed descriptions of the planned uses of the property are given in the Post-closure Maintenance Plan section as follows.

Future uses of these facilities include a permanent household hazardous waste collection area in the current recycling yard, a yard waste composting facility and concrete recycling on the East Hill, and an adjacent municipal solid waste transfer station and recycling facility (SMaRT Station).

After closure is complete, the City plans to maintain other parts of the landfill as an open space area. Recreational uses of this facility include hiking, birdwatching, and jogging. Access to foot traffic will be provided through gates in the perimeter fencing. Trails will be built and maintained to prevent erosion. Vehicular access will not be permitted, aside from vehicles associated with inspection, maintenance, etc.

Thus, if vehicular access were needed for any new post-closure recreational activities or uses, that new use would need to be approved by the RWQCB, and incorporated into a revised Post-closure Maintenance Plan.

Provisions for planting of trees during the post-closure period are included in the Final Cover section (p. I-9):

The City may elect to provide additional landscape mounding above the impermeable liner to permit the planting of shallow-rooted trees during the post-closure period. This mounding will provide adequate depth for the development of the mature tree without compromising the impermeable liner.

Also, these mounds will be placed in locations which do not compromise the stability of the cover soil.

And although stated in the Introduction that open-space areas will not be irrigated the Vegetative Cover and Irrigation section (p. I-12) describes the irrigation system used at Recycle Hill:

An operating irrigation system exists on Recycle Hill. This irrigation system is to provide a pleasing entrance to the Transfer Station. The system was installed in 1988 but is only used sporadically. There was also an existing system on South Hill that was removed during the construction of the SMaRT Station entrance and roadway improvements.

Provisions for the vegetative cover are given as follows:

A vegetative cover will be established, using selected drought resistant grasses to provide a minimum 70% vegetative cover with rooting depth not to exceed the thickness of the topsoil layer. This is consistent with the intended post-closure land use of open space.

Irrigation is further discussed in the Post-closure Maintenance Plan section (p. II-6) as follows:

An irrigation system has been installed on the Recycle Hill, however it is not presently operated....No irrigation is planned at the landfill until a leachate generation study is performed and approved by the RWQCB and the California Integrated Waste Management Board (CIWMB).

A leachate generation study was later determined to be unnecessary. Any new plans for irrigation would need to be approved by the RWQCB.

An updated Post-closure Maintenance Plan was prepared in 2012 by SCS Engineers for the City of Sunnyvale, as required by oversight agencies with jurisdiction over post-closure maintenance activities at the City of Sunnyvale Landfill. The main purposes of the updated Plan were to provide “(1) detailed plans for continued inspection, maintenance and monitoring of the landfill; and (2) updated cost estimates for post-closure financial assurance demonstration.”

The updated Post-closure Maintenance Plan provides descriptions of current and planned landfill property uses, which are consistent with the uses described in the

original 1992 Sunnyvale Landfill Final Closure and Post-closure Maintenance Plan, and notes that RWQCB approval would be needed for any proposed changes in post-closure use.

Current uses are described as follows.

The West Hill, Recycle Hill, South Hill, and side slopes of the East Hill are maintained as non-irrigated open space and are vegetated with annual and perennial grasses. These areas are designated for public recreational uses such as hiking, birdwatching, photography and running.

Pedestrian trails have been maintained in the open space areas of the landfill. The City leases the top deck area of the East Hill to a concrete crushing/recycling company.

An area immediately north of Recycle Hill was formerly used by the City as a drop-off recycling center. This facility is gated and fenced and used for storage of materials used during the City's post-closure maintenance activities, and also leased to the County of Santa Clara for monthly Hazardous Materials drop-off events.

Planned uses are described as follows:

The above recreational and recycling site uses are expected to continue throughout the post-closure period. No significant changes in post-closure uses are proposed at this time.

In the event of any proposed changes in post-closure use, the City will prepare an updated post-closure maintenance plan in accordance with 27 CCR Section 21190, and obtain RWQCB approval as required under Order No. R2-2004-0030, Provision 7.

3.2.2.4 Title 27 Post-closure Land Use Regulations

Any new post-closure land uses for the Sunnyvale Landfill, other than non-irrigated open space, would need to comply with the post-closure land use regulations of CCR Title 27 Section 21190 (see Appendix B). These regulations contain provisions to protect public health and safety and prevent damage to structures, roads, utilities, and landfill monitoring and control systems. Post-closure land uses would need to be designed and operated to maintain integrity of the landfill cap, to prevent water quality

impacts, and to address settlement and landfill gas. Construction of structures, or placement of temporary structures, would need to be designed and maintained so as to not allow concentrations of landfill gas above 1.25% methane to accumulate. Closed structures, such as a small office building, would need to be continuously monitored for potential landfill gas accumulation using methane gas sensors installed in the structures.

Any proposed land uses for the site other than non-irrigated open space would need to be submitted to the RWQCB, the local enforcement agency (LEA) (the Santa Clara County Department of Environmental Health), the local air district (Bay Area Air Quality Management District) and the local land use agency (City of Sunnyvale Department of Community Development).

3.3 Other Regulatory and Administrative Constraints

3.3.1 City of Sunnyvale Zoning

Any proposed additional recreational uses at West Hill, Recycle Hill, and South Hill would need to be evaluated with respect to conformance with City of Sunnyvale zoning.

The City of Sunnyvale zoning for the West Hill, Recycle Hill, and South Hill portions of the Sunnyvale Landfill is Public Facility (PF). These portions of the landfill are designated as a Special Use Facility in Sunnyvale General Plan (2011). A City of Sunnyvale Special Use facility is a park or recreation facility oriented towards single-purpose use and is considered part of the City's total open space acreage.

As noted in the Consideration of Parks of the Future Study Report to Council (City of Sunnyvale, 2009), the Solid Waste Division of the Department of Public Works maintains these three sites in its capacity as solid waste manager. "Public Works has opened the sites to on-trail pedestrian and bicycle access and promotes other recreational activities, including birdwatching on the site with the help of Audubon Society volunteers, which helps to address some of the demand for outdoor education and recreation as identified through the public involvement efforts of the POTF study (p.23)." The Solid Waste Division continues to carry out these functions, but has subsequently been reorganized into the new Environmental Services Department.

Existing open-space recreational activities at the Sunnyvale landfill include:

- Walking/hiking,
- Jogging/running,

- Dog-walking (on leash),
- Biking,
- Birdwatching,
- Photography, and
- Education (information display at northwest edge of West Hill).

Any proposed additional land uses would also need to be considered with respect to City of Sunnyvale goals and policies, discussed in Section 4 of this report.

3.3.2 Burrowing Owl Habitat

Burrowing owls, a California Species of Special Concern, have used the landfill site for nesting and foraging habitat. The City monitors their activity at the site through the services of a wildlife consultant (Debra Chromczak). The 2012 annual summary report prepared for the City (Chromczak, February 4, 2013) states that the City recognizes the importance of this sensitive species and is working to protect the burrowing owl and enhance suitable habitat at the Sunnyvale Landfill and Water Pollution Control Plant (WPCP). The report summarizes burrowing owl history at the site based on over twelve years of monitoring and includes recommendations for maintaining and enhancing burrowing owl nesting and foraging habitat conditions at the landfill. The last active nest as the landfill was observed in 2002. Since 2000, when monthly observations were initiated, an average of two burrowing owls per year have been observed at the landfill and WPCP. One of the recommendations is to implement project evaluations prior to projects involving ground disturbance.

According to a California Department of Fish and Game Staff Report on Burrowing Owl Mitigation (Department of Fish and Game, 2012):

CEQA requires public agencies in California to analyze and disclose potential environmental impacts associated with a project that the agency will carry out, fund, or approve. Any potentially significant impact must be mitigated to the extent feasible. Project-specific CEQA mitigation is important for burrowing owls because most populations exist on privately owned parcels that, when proposed for development or other types of modification, may be subject to the environmental review requirements of CEQA.

Thus, any proposed additional recreational uses at West Hill, Recycle Hill, and South Hill should be evaluated with respect to potential impacts to burrowing owl habitat and other species of concern. Projects or uses that would result in a loss of burrowing owl habitat may require mitigation.

Also, for new recreational projects or uses that may not involve significant impacts to existing burrowing owl habitat, the City may wish to consider opportunities to enhance or add to the existing habitat in conjunction with design and construction for the new uses.

3.3.3 Height Restrictions

Restrictions on the height of the landfill or structures placed on the landfill are stipulated in the 1988 agreement between the Federal Aviation Administration (FAA) and the City of Sunnyvale for the radar facility located north of the landfill, and in the Santa Clara County Compatible Land Use Plan (CLUP) for Moffett Airfield.

Existing elevations at the top of West Hill range from approximately 75 – 80 feet relative to mean sea level (feet-MSL) for most of the top deck of the West Hill, with a maximum elevation of approximately 85 feet-MSL in the middle of the top deck. Existing elevations at the top of Recycle Hill range from approximately 35 – 40 feet-MSL, and at the top of South Hill from approximately 45 – 50 feet-MSL.

Of the two height restrictions, those of the agreement with the FAA are more restrictive in terms of maximum additional room for vertical expansion of landfill or structure height.

3.3.3.1 Height Limitations per FAA Radar facility Agreement

The agreement between the FAA and the City of Sunnyvale (Windus, 2012) for the radar facility located north of the landfill stipulates the maximum heights that the City may construct the landfill surface for different areas of the landfill. The heights for these different areas are as follows:

- Not over 78 feet-MSL in the landfill area from an azimuth of 204° to 215° true bearing from the radar antenna.
- Not over 90 feet-MSL in the landfill area from an azimuth of 233° 30' to 247° true bearing from the radar antenna.

- Not over 110 feet-MSL in the landfill areas at true bearings from the radar antenna not restricted in the two previous bullets above.

It should be noted that the agreement does not specify that the height restrictions apply to anything other than the height of the landfill. It does not specifically refer to the height of structures that might be placed on the landfill surface. The agreement also requires the City to notify FAA each time the landfill reaches a 10-foot increment in height in order to check for possible degradation of coverage, and to notify FAA when the landfill reaches a height of 110 feet-MSL. If the City were to consider placing structures that exceeded the landfill height restrictions of the agreement, such as a barn or office building for AAH, the City would be required to review the plans with the FAA prior to approval.

A map prepared for the City by Kier & Wright in 1996 shows the configuration of these zones as well as the surveyed elevations of high points on West Hill. An internal City memo dated March 21, 1996 summarized the results of Kier & Wright's survey in relation to the FAA height restrictions:

This survey shows that the City is not in violation of any of the elevation limits identified in the agreement with the FAA. The closest West Hill comes to the elevation limits is on the south side where the limit is 78 feet and the landfill is currently at 74.3 feet.

Figure 2 shows an overlay of the height restriction zones for West Hill and Recycle Hill¹. South Hill lies under the 110-ft MSL zone. Most of the top deck of West Hill lies under the 110 feet-MSL zone, as do the hilltop areas at Recycle Hill and South Hill. Thus, with respect to the existing surface elevations discussed above, headroom for new structures or revised grades with respect to the FAA height restriction ranges from approximately 25 – 35 feet for most of the top deck of West Hill, 70 -75 feet at Recycle Hill, and 60 to 65 feet at South Hill. Headroom at the northwest corner of the top deck of West Hill in the 90 feet-MSL zone is about 15 feet and at the southeast corner of the top deck at West Hill in the 78 feet-MSL zone is about 8 feet or less.

¹ The limits of the height restriction zones shown on Figure 2 are approximate and should be confirmed by the City of Sunnyvale for any proposed changes in existing elevations.

3.3.3.2 Moffett Airfield Vicinity Height Limitations per CLUP

Airport vicinity height limitations are explained in the CLUP as follows:

Federal Aviation Regulations (FAR) Part 77, Objects Affecting Navigable Airspace, establishes imaginary surfaces for airports and runways as a means to identify objects that are obstructions to air navigation. Each surface is defined as a slope ratio or at a certain altitude above the Airport elevation.

FAA uses FAR Part 77 obstructions standards as elevations above which structures may constitute a safety hazard. Any penetrations of the FAR Part 77 surface are subject to review on a case-by-case basis by the FAA. The FAA evaluates the penetration based on the published flight patterns for the airport, as they exist at that time. If a safety problem is found to exist, the FAA may issue a determination of a hazard to air navigation. The FAA does not have the authority to prevent the encroachment, however California law can prevent the encroachment if the FAA has made a determination of a hazard to air navigation. The local jurisdiction can establish and enforce height restrictions.

The maximum allowable structure height as shown on Figure 6-FAR Part 77 Surfaces, from the CLUP, is 182 feet-MSL for West Hill, Recycle Hill and most of South Hill. The maximum structure height for the easternmost area of South Hill rises to 207 feet-MSL. Thus, headroom for new structures or revised grades with respect to the CLUP height restriction ranges from approximately 97 to 107 feet at West Hill, 142 – 147 feet at Recycle Hill, and 132 - 137 feet at South Hill.

3.3.4 CLUP Noise Level Thresholds

The CLUP states that the Noise Sub-Element of the Sunnyvale General Plan recommends a maximum exterior noise level limit of 65 CNEL (Community Noise Equivalent Level) for outdoor sports, and recreation, neighborhood parks and playgrounds. According to Figure 5 of the CLUP, airport noise level at the landfill would be less than 65 decibels (dB). While the landfill is outside the 65 dB limit, AAH might want to confirm that their animals and their outreach activities would not be negatively affected by the expected noise levels.

3.3.5 Small Particle (PM-2.5) Generation

Any proposed additional recreational uses would need to be evaluated with respect to conformance with City of Sunnyvale goals or policies for minimizing dust generation, specifically small particle PM-2.5 generation (PM-2.5 consists of particles 2.5 microns or smaller in diameter). Thus, constructing additional gravel-surfaced trails, roads or parking areas, or adding uses with the potential to generate dust (such as the proposed AAH activities) should be evaluated with respect to small particle PM-2.5 generation. Implementation of additional dust control measures to minimize airborne small particle generation may be required.

3.3.6 ADA Compliance/Accessibility

Constraints associated with accessibility and Americans with Disabilities Act (ADA) compliance should be considered by the City for construction and maintenance of new trails, roads, parking areas, and structures. A brief discussion of such considerations and requirements, as well as the assumptions made for this study are presented on Section 5.3 of this report.

3.4 Existing Infrastructure and Other Conditions

Existing infrastructure that will need to be considered as constraints for possible end uses would include:

- Locations of gas collection and control system elements,
- Locations of groundwater wells and leachate risers, and
- Utilities.

These may need to be protected and/or moved if in conflict with improvements. If this includes replacement of landfill gas wells with new wells or reconfiguration of the gas collection and control system, Bay Area Air Quality Management District (BAAQMD) approval of changes to the landfill's Title V permit may be required. If protection involves construction of utility boxes for well heads or other infrastructure features, excavation of the final cover may be required.

Any end uses or improvements would need to be designed to allow current operational, maintenance, and monitoring needs to continue.

Other site conditions that will need to be considered as constraints for possible end uses or improvements would include:

- Locations of current and/or historic burrowing owl burrows,
- Impacts on users of current facilities (such as visitors to the Bay Trail, the existing population of recreational users, and
- Maintenance considerations.

Minimizing the maintenance requirements associated with any new uses or improvements is a concern for the City. Maintenance requirements associated with the potential effects of settlement on any improvements should thus be considered, as well as any other maintenance requirements associated with proposed new uses.

3.5 Access and Parking

This section summarizes parking and access constraints at the site and provides background on City of Sunnyvale standard parking requirements. A more detailed assessment of access and parking is presented in Section 8 of this report.

There are currently 14 public parking spaces (including one designated handicapped parking space) located North of Recycle Hill and East of the West Hill. These spaces are available for visitors to the Sunnyvale Landfill and The Bay Trail. Other users of these spaces include visitors and personnel for the monthly hazardous waste drop-off at the facility at Recycle Hill and by hunters accessing properties north of the landfill. Also, based on an existing cooperative agreement between the City of Sunnyvale and YAHOO! dated 4 February 2003, additional parking spaces in the area of the proposed project are available to the public at 701 First Avenue, a property owned by YAHOO!. The YAHOO! parking spaces were made available to allow public access to the San Francisco Bay Trail; therefore, users of these parking spaces may or may not use the proposed project.

The City of Sunnyvale's parking requirements for recreation, education, and care facilities are as follows:

Primary Use	Minimum Spaces
Adult Day Care Center	2.5 / 1,000 sq. ft.
Child Care Center	0.25 / child
Convalescent Hospital	1.5 / bed
Education - Recreation and Enrichment	4 / 1,000 sq. ft.
Education - Primary (Grades K-8)	3 / classroom
Education – High School (Grades 9-12)	0.25 / student
Education - Institution of Higher Learning	0.5 / student
Place of Assembly – Community Serving or Business-Serving	25/1,000 for primary gathering areas
Recreational and Athletic Facility	5 / 1,000 sq. ft. of general area plus 20 / 1,000 sq. ft. of classroom area

Any additional requirements not listed (e.g., bicycle parking, loading space, etc.) above would also need to be addressed for the project.

As can be observed, regardless of the proposed use for the existing landfill hills, the number of parking spaces currently available to accommodate additional uses is insufficient and will need to be increased. The City's Community Development Department may elect to recommend an exemption for this project; alternatively, additional parking spaces in adjacent businesses such as YAHOO! may be available to meet the expected demand. In addition, special requirements to accommodate handicapped parking would need to be addressed.

A cursory overview of the geometrics of the existing access roads is tabulated below:

Landfill	Surfacing	Does the Road Dead End?	Approximate Road Width	Sample Grades
South Hill	Gravel/unpaved	Yes	8-9 feet	11, 16, and 21 percent
West Hill	Gravel/unpaved	No	8-15 feet	6 and 8.5 percent
Recycle Hill	Gravel/unpaved	Yes	7-8 feet	15 and 18 percent

The City of Sunnyvale's *Requirements for Fire Department Vehicle Access* requires a minimum clear width of 20 feet; if the access road is considered secondary, the width can be reduced if turnouts are installed every 500 feet. The grade cannot exceed 10 percent. If the road dead ends, additional width and turnaround provisions are required. The minimum vehicle weight is 75,000 pounds and the surface would need to be paved with asphalt, concrete, or other approved surface.

For reference, additional road width may be required for guardrail, shoulder/emergency lane, bicycle lane, turning radii, drainage ditch or curb, etc. Based on the above, the three landfill hills would require re-grading which would involve waste excavation and/or filling with additional engineered fill to accommodate emergency access.

Plans for providing additional parking facilities, roadways, trails, or access points at the Sunnyvale Landfill should take into consideration:

- Options for constructing paved or unpaved roads for public access roads on the landfill hills. (Fire Department approval may be needed for any proposed road surfaces other than paved, as noted above.)
- Possible changes to site parking and access associated with the planned Santa Clara Valley Water District levee widening project for the Sunnyvale West Channel,
- Interest by the Water Pollution Control Plant (WPCP) in restricting access at the current site entrance,
- Possible addition of parking along Caribbean Drive,

- Pedestrian and vehicular traffic patterns relative to trail access points near Caribbean Drive,
- Providing trail connections between Recycle Hill and South Hill (consider pedestrian bridge over site entrance road as an alternative to a pedestrian crossing on the site entrance roadway).

3.6 Utilities

The following utilities related to site development may be needed at the various landfill hills:

- Sanitary sewer
- Storm sewer
- Water supply (irrigation and drinking)
- Refuse Removal
- Electrical/Power supply including lighting
- Communications (phone, cable, fiber optic)

For these utilities, apart from the demand, their size and location on the various landfill hills will need to be addressed. The locations of the nearest existing sewers (sanitary and storm), water supply, electrical, and communications to each landfill hill listed below are based on John Carollo Engineers [John Carollo Engineers, 1987 & 1988] and on SCS Engineers 2005 Drawings [SCS, 2005]². As can be observed from the drawings, the following utilities are present:

- 39-inch diameter vitrified clay pipe (VCP) sewer north of South Hill (John Carollo Engineers, 1987 & 1988).
- Two 24-inch diameter VCP sewer West of South Hill and East of Recycle Hill (along Borregas Drive) [John Carollo Engineers, 1987 & 1988].

² Prior to site development, City to confirm which utility lines are still active, and which ones are not, in order to evaluate the best connection points to the existing active utility lines. In addition, the City will need to confirm the utility locations shown on the 1987, 1988 and 2005 drawings, as different drawings show slightly different locations for several utilities.

- 60-inch diameter reinforced concrete pipe (RCP) storm drain West of South Hill and East of Recycle Hill (along Borregas Drive) (1988 Drawings).
- PG&E utilities (along Borregas Drive) (1988 Drawings).
- 18-inch VCP sewer north of Recycle Hill (1988 Drawings).
- 60-inch diameter VCP sewer north of Recycle Hill (1988 Drawings).
- 33-inch diameter VCP sewer near Northwest corner of Recycle Hill (1988 Drawings).
- 36-inch diameter VCP sewer South of the West Hill (along Caribbean Drive) (1988 Drawings).
- 18-inch diameter VCP (abandoned) South of the West Hill (along Caribbean Drive) (1988 Drawings).
- 60-inch diameter reinforced concrete pipe (RCP) storm drain South of the West Hill (along Caribbean Drive) (1988 Drawings).
- Two water lines (unknown diameters) along the North side of Recycle Hill (2005 Drawings)³.
- One recycle water line (unknown diameter) along the North side of Recycle Hill (2005 Drawings).
- Three water lines (unknown diameters) West of South Hill and East of Recycle Hill (along Borregas Drive) (2005 Drawings).
- One recycle water line (unknown diameter) West of South Hill and East of Recycle Hill (along Borregas Drive) (2005 Drawings).

For site development, the new utilities would need to be connected at locations approved by the City, and depending on the development, may need to be upgraded.

The above list of utilities does not include the landfill-related utilities constructed in the landfill area, such as, the landfill gas and condensate collection and control systems, groundwater and leachate monitoring wells, and associated electrical and mechanical

³ The lines shown on the 2005 drawings stop, therefore the City will need to verify their location and extent, prior to designing the new utility connections.

utilities (e.g., pumps). Depending on the chosen development schemes, some of these utilities will need to be relocated and protected.

Utilities constructed on landfills are subject to differential settlement that could cause damage to the pipe or reversal of grades. Over the long-term, maintenance and re-establishment of fluid-containing pipes with positive flow grades will be required. Pipe joints may need to be flexible so that the fluid-containing utilities do not leak. These issues would need to be further evaluated during the detailed design phase.

For communications and electrical, these concerns are not as important as for sewer and water supply. The joints of the pipes that carry fluid could be flexible or welded (for example: steel or high density polyethylene pipe) to minimize leakage of the type observed in bell and spigot connections; however, depending on the magnitude of movement, the pipes may need to be repaired. Reversal of grades in fluid-containing pipes could be addressed by maintenance (i.e., excavation, re-grading, and replacement), pre-loading (i.e., applying temporary loads at the locations of the pipe corridors), and overbuilding (i.e., grading at a steeper slope that would be expected to settle to a flatter slope while maintaining positive flow). Utilities could be constructed in utility corridors where they would be accessible for repair; these utility corridors could be located along the perimeter of the access roads.

If sports fields such as a soccer field were selected as a use, approximately two acres of flat ground would need to be set aside; furthermore, a sports field, if covered with natural turf would need to be irrigated. A concern about irrigating to maintain vegetation and/or to keep fugitive dust emissions low, is that the addition of water, if excessive, would add to infiltration into the landfill. Infiltration of excess water could result in additional leachate being generated. Addition of excess water, to the extent that some water passes through the one-foot thick low permeability clay cap, would increase the rate of decomposition of the waste and create additional landfill gas. Accelerated decomposition of waste would result in accelerated settlement.

As noted above in Section 3.2.2.1, irrigation systems and management plans for landscaped areas or plantings would need to be designed to minimize infiltration through the landfill cap, through monitoring and management of soil moisture conditions and irrigation rates, or by providing drainage features to capture and carry off excess irrigation.

As was discussed in Section 3.2.1, the vegetative layer of the final cover is at least one foot thick and overlies the minimum 1-foot thick low permeability clay layer. The

minimum depth of cover for direct burial electrical cables or conductors is 24 inches. Underground water lines need to be buried a minimum of 12 inches below grade. Additional burial depth could be required to protect the lines from traffic and other loads. Based on the above and the actual thickness of the vegetative layer where the utilities are routed, the final cover could be subject to penetration by utilities. Title 27 post-closure land use regulations prohibit installing utilities in or below the clay layer. Mitigation measures would be needed. Additional soil could be placed above the existing final cover to increase the separation between the utilities and the low permeability clay layer, or excavation into or through the clay layer, with subsequent reconstruction of the clay layer at greater depth, could be performed along the route of the subject utility lines. Note, however, that the addition of soil could also induce settlement in the waste fill. Anticipated settlement would need to be considered in the design of the utilities.

4. GOALS AND POLICIES

4.1 General

A set of goals and policies that should be considered for selection, design, construction, and management of end-use options at the Sunnyvale Landfill was prepared by the Geosyntec/Crawford Team for the City. Goals and policies from the following sources were reviewed and compiled:

- Sunnyvale General Plan
- Council Policy Manual – Solid Waste Management
- Identified in the feasibility study task: Analysis of Issues, Constraints and Opportunities
- Input from Community and Staff

We prepared a draft set of goals and policies for review by the City based on our understanding of applicability. The final set of goals and policies to be considered during the process of selection, design, construction, and management of end-use options, as agreed upon by the City, is presented in Table 1.

5. ALTERNATIVE LAND USES

5.1 General

Based on iterative discussions with City personnel, it was decided that in addition to evaluating the feasibility of establishing the Animal Assisted Happiness operations at the landfill, three other alternative land uses would also be evaluated. The City categorized the three additional alternatives as low, mid and high intensity use of the site. The City decided that Park enhancements, including a combination of open space, habitat enhancements and a dog park should be evaluated as the potential low intensity use for the site. The City decided that for the mid intensity alternative, a Bike skills park should be considered and that a sports facility, including a combined soccer and baseball field, should be studied as the high intensity use for the site.

5.2 Alternative Land Use Location

As directed by the City, only West, Recycle and South Hills were considered for alternative land use development. The table below shows the alternative land use options that were evaluated for each of the landfill hills, as determined by the City. As can be observed, only park enhancements, including dog parks, were considered for Recycle and South Hills given the steep grades along the existing access roads and the limited size of the top decks for each of them. Given the size of its top deck and current road conditions, the AAH, Baseball/Soccer Field, and Bike Skills Park alternative land use options were evaluated for the West Hill.

	West Hill	Recycle Hill	South Hill
Option 1	AAH (and Park Enhancements)	Park Enhancements (including Dog Park)	Park Enhancements
Option 2	Baseball/Soccer Field (and Park Enhancements)	Park Enhancements (including Dog Park)	Park Enhancements
Option 3	Bike Skills Park (and Park Enhancements)	Park Enhancements (including Dog Park)	Park Enhancements
Option 4	Park Enhancements	Park Enhancements (including Dog Park)	Park Enhancements

Descriptions of the layout and features for each of the above study options are presented in Sections 5.3 – 5.6 below. Each of the sections below lists the main features and assumptions that the City agreed should be studied for each option per Study Option Summary and Assumptions memo dated September 17, 2013.

5.3 Americans with Disabilities Act (ADA)

It is our understanding that the City will need to make its own findings about which site improvements will be designed for ADA accessibility. The City has instructed us to assume that for the purposes of this conceptual feasibility study, certain improvements and features may be considered as non-ADA accessible. The City may need to contract with a specialized firm to evaluate accessibility options for the various components proposed in this conceptual feasibility study. To make some of the proposed features ADA-accessible, additional site improvements would be needed.

Assumptions regarding providing ADA accessible features for the various components of this study include:

- We have assumed that individuals with disabilities using the Baseball / Soccer Fields and the Animal Assisted Happiness facilities would have access to the top of the hills using motor vehicles (i.e., cars, vans, trucks). For those proposed facilities at the top of West Hill, improvements would be made to the access road for the expected vehicular traffic, and ADA pathways and interaction areas would be provided at those facilities.
- No improvements would be made to the existing access roads on Recycle Hill and South Hill and public vehicles would not have access to the roads.
- For the Bike Skills Park study option, no improvements would be made to the existing access road on West Hill and public vehicles would not have access to the road.

Therefore, our study does not include provisions for ADA accessible features for the conceptual components of the Park Enhancements for Recycle Hill and South Hill and for the Bike Skills Park for the West Hill. In order to make recreational facilities on Recycle Hill and South Hill ADA-accessible, the roads would need to be improved for public use, ADA drop-off or parking facilities would need to be provided at the top of the hills, and hill-top trails and recreational use areas would need to be designed for ADA accessibility. An alternative to providing vehicular access to ADA-accessible facilities at the hill top areas would be to provide ADA-accessible trails from the bottom to the top of the hills. For a number of the Park Enhancement features on West Hill in the Baseball / Soccer Fields and the Animal Assisted Happiness study options, ADA-accessible pathways could be added from the access road to hill-top picnic and overlook areas.

If the City would like to consider options for providing ADA accessible features beyond what has been considered for this study, we could provide a follow up study to evaluate such options.

5.4 Animal Assisted Happiness (AAH)

5.4.1 General

As noted in the Introduction, AAH is a non-profit organization whose mission is to bring smiles to underserved communities such as at-risk youth, people with special needs, and seniors and veterans through therapeutic animal interaction. AAH's facility and operations are currently located in Gilroy, California (pictures of the current operations are shown on Image 1, below). Our understanding is that AAH would like to expand to a larger facility that is more centrally located to its visitors.



Image 1. Current Operations at AAH facility in Gilroy, California

AAH submitted a proposal to the City of Sunnyvale in November 2010 to lease a portion of the landfill for their use. The proposal presented a conceptual plan for the leasing of land at the site and the key facility components and design values.

A meeting was held with Mr. Peter Higa of AAH at City offices on August 30, 2013 in order to allow the City and our team to ask questions regarding the types of facility features and operations, and the acreage required, for their proposed facility at the landfill. The City and consultants asked Mr. Higa to describe the short-term and long-term goals for their proposed operation at the landfill. City staff also provided Mr. Higa with input on their expectations for the proposed facility and operations. The City and Mr. Higa agreed that the proposed facility location including the pasture areas should be on the top deck of West Hill. Locating pasture areas on the side slopes of West Hill should be avoided due to concerns with potential overgrazing of vegetation and rutting and erosion of surficial soils.

Mr. Higa indicated that the intent would be to move in initially with a relatively limited operation requiring minimal site improvements. The intent would be to use the land as is, with no changes to contours, and with minimal site preparation. Portable, temporary structures would be used to the extent possible. For example, portable restrooms and hand washing stations would be used, and water would be delivered rather than supplied through a water line. Over time, as resources and permitting allowed, AAH would expand their facility features and operations and add more permanent features, such as full restrooms and water service through a utility line.

City staff indicated that, for the purposes of this feasibility study, the City and consultant team would need to evaluate the feasibility for construction and operating the long-term, full build-out plan envisioned for AAH's facility at the landfill. Therefore, a listing of the full build-out features, along with a conceptual layout for the facility, were requested. Mr. Higa subsequently submitted a listing of the facility features envisioned for the short-term as well as long-term operation. The descriptions provided by Mr. Higa, revised with assumptions made by the City and consultant team for the final layout, are presented on Table 2. The long-term, full build-out features and assumptions used in this feasibility study are listed below.

5.4.2 General Features Considered during Evaluation

The main features considered for the evaluation of AAH were:

- Animal Pens with attached pasture land,

- Feed/Equipment/Vehicle storage shed,
- Riding arena,
- Barn/tack room,
- Office,
- Caretaker residence,
- Parking on top of the hill,
- Rest area,
- Perimeter fencing,
- Interior fencing,
- Full utilities – Water/Sewer/Power, and
- Full bathrooms (located on top of hill).

5.4.3 Assumptions for Design

The design assumptions considered for the evaluation of AAH were:

- Ten animal pens with dimensions of 10'x10'x8', with an average of ¼ acre pasture land attached for each. Each pen would also include a 10'x20' interaction area in front of the pen.
- One 30'x80'x15' feed/equipment/vehicle storage shed, three sided. Alternatively two 30'x40'x15' structures would also be acceptable.
- One 80'x120' riding arena with fence and a slope of approximately 1 degree.
- One 24'x48' 4-stall barn and tack room.
- One 12'x24' mobile office, two feet above ground.
- One ~800 square feet modular home for caretaker, two feet above ground.
- Parking on top of the hill to accommodate two school buses, employees, volunteers, and clients.
- Rest area
- Six foot high, black vinyl coated chain-link fence around perimeter of facility.
- Four foot high interior fencing (material dependent on animal).

- Full utilities (i.e., water, sewer and power) at the top of the hill.
- Full restroom at the top of the hill.
- One-way traffic loop using existing road alignment on West Hill, with minimum 12 feet road, turnaround provided at top of hill (minimum road radius = 30 feet), and paved or stabilized gravel surface.
- Layout to allow the existing landfill gas extraction wells and lines to remain in place, if possible, with protective enclosures around the gas wells to remain.

5.4.4 Location Considerations and Conceptual Layout for AAH

The Geosyntec/Crawford Team suggested that the proposed AAH facility be located on the central and eastern portions of the top deck of West Hill. The proposed location would provide adequate space with relatively flat areas for facility structures and operations, and would be situated out of view from most locations on the northern and western slopes and trails at West Hill.

Using the conceptual facility plan and long-term facility features provided by AAH, we developed a proposed conceptual layout for the facility. The structures and features would fit at the proposed location, which has fenced area of 113,846 sq ft (2.6 acres) on the top deck of West Hill. The intent of the proposed layout is to provide a conceptual-level template for an AAH facility given our understanding of their needs. The exact locations of features and structures, and size and location of the facility footprint, could be refined and adjusted based on City and AAH preferences during the City's planning and design stages.

Figure 3 shows the full build-out layout and is intended to reflect their long term goals for the facility. This includes an arena and tack room/barn for full-size horses, separate office and caretaker structures, a permanent restroom facility, and more storage sheds than in the short-term build out.

Figure 4 shows short term layout, and is intended to show the features and structures AAH would need to begin operations on the Sunnyvale Landfill. This includes animal pens and pasture land, parking and an access road, one storage shed, portable restroom and hand washing facilities, and a caretaker or office building.

Structures and access roadways were placed to help with access and ease of providing utility service connections. Structure and feature locations were also considered to

avoid placement of structures (other than fences) over existing landfill gas extraction wells or lines.

There would be a one-way driveway in the facility, leading from the side entrance on the north side of the facility into the main facility yard area and then to the west to a parking and the site exit. Parking for school buses and vans would be provided along the side of the driveway in the parking area.

Based on our discussions with AAH, rather than trying to build an ADA-accessible path to all the interaction areas, an ADA accessible interaction area could be located on the south side of the driveway in the main yard area. AAH could bring animals to this location for interaction with individuals with disabilities.

5.5 Baseball/Soccer Fields

5.5.1 General Features Considered during Evaluation

The main features considered for the evaluation of the Baseball/Soccer Fields were:

- Adult size, dual-use (the two fields will overlay each other),
- Lighting,
- Artificial turf,
- Full utilities – Water/Sewer/Power,
- Full restrooms (located on top of hill), and
- Parking on top of the hill.

5.5.2 Assumptions for Design

The design assumptions considered for the evaluation of the Baseball/Soccer Fields were:

- Baseball field will have a centerfield distance of 400’;
- Soccer field will be standard size, 360’ x 225’, with a 10-ft offset all around per regulations;

- Parking space for approximately 100 vehicles at top of hill as directed by the City. (Assume 360 sq ft per space, based on City of Sunnyvale parking guidelines for non-residential developments.)
- Fields to be located along the eastern side of the West Hill, to accommodate the use of the existing road, with parking on the western side of West Hill.
- Full utilities (i.e., water, sewer and power) at the top of the hill.
- Full restroom at the top of the hill.
- One-way traffic loop using existing road alignment on West Hill, with minimum 12 ft road, turnaround provided at top of hill (minimum road radius = 30 ft), and paved or stabilized gravel surface.
- Existing gas lines and wells within facility footprint will be removed and relocated as necessary.

5.5.3 Location and Conceptual Layout Considerations for Baseball/Soccer Fields

- Fields to be located along the eastern side of the West Hill, with parking on the west side of West Hill to accommodate the use of the existing road configuration.
- Provide enough space to accommodate the number of parking spaces required as per the City.
- Landfill gas extraction trenches, wells and piping along the existing top deck will need to be removed and relocated. New locations for well, valves and pipes to be determined by a landfill gas engineer, as part of future work.

5.6 Bike Skills Park

5.6.1 General Features Considered during Evaluation

The general features considered for the evaluation of the Bike Skills park were:

- Mountain bike skill features,
- Bicycle Motocross (BMX) bike skill features,
- Trick bike skill features,

- Full restrooms (located at bottom of hill),
- Potable water (located on top of hill),
- No lighting, and
- Parking at bottom of the hill.

5.6.2 Assumptions for Design

The design assumptions considered for the evaluation of the Bike Skills park were:

- Potable water needed at top of hill for dust control and maintenance purposes.
- No electrical or sewer utilities needed at the top of the hill.
- No significant cuts or fills, other than the fill required for the track and trail features.
- Import fill will be used as needed to create track features. Other bike skills features will be constructed primarily of wood, not concrete.
- One-way traffic loop using existing road alignment, with minimum 12 ft road and turnaround provided at top of hill (minimum road radius = 30 ft). Paved or stabilized gravel surface.
- No area or amenities for organized events (i.e., park geared towards individuals and small group of users).
- Bike Skills park size similar to those at Cummings Family Park and Calabazas (in Folsom and San Jose, California, respectively; see Images 2 and 3, on the next pages) – approx. 1.5 – 2 acres.



Image 2. Example Layout 1: Cummings Family Park, Folsom, California ⁴ (Facility size is approx. 60,000 sq ft)

⁴ http://www.folsom.ca.us/depts/parks_n_recreation/bike_trails/mountain_bike_bmx_skills_course.asp



Image 3. Example Layout 2: Calabazas Bike Park, San Jose, California (Facility size is approx. 70,000 sq.ft)

- Layout to allow the existing landfill gas extraction wells and lines to remain in place, if possible, with protective enclosures around the gas wells to remain.

5.6.3 Location Considerations for Bike Skills Park

The City's intent is that the Bike Skills Park would be used for a number of bicycle types including mountain, trick, and BMX, would be built for all ages and skill levels, and would tie in with a bike trail system over the whole West Hill.

For the design of a bike skills park, as pointed out by the International Mountain Bicycling Association, “While there doesn't seem to be a set recipe, the ingredients usually include a variety of natural obstacles such as rocks and logs, imaginatively constructed features like teeters and ladder bridges and dirt jumps - all collected in a small setting. Picture a skateboard park or snowboard park, but designed specifically for mountain bikes.”⁵

Based on the size of other bike skills parks in California, as noted later in this section, a bike skills park could easily fit on the top deck of West Hill. Figure 5 shows an area of approximately 74,000 sq ft where a bike skills park could fit on the top deck of West Hill.

Presented below are images of several of the features that we have included in our assumed Bike Skills Park layout on Figure 5. The City can chose to add more of, take out, and/or replace any of the shown features, to include a combination of elements that will appeal to a wide group of users.



Image 4. Bike Skills Park features – dirt jumps and pump track.

⁵ Ref: <http://www.imba.com/resources/freeriding/emergence-bike-parks>



Image 5. *Bike Skills Park features – ladder bridges, natural obstacles, logs, teeters.*



Image 6. *Bike Skills Park features- extreme jumps.*

As discussed more thoroughly in Section 6.4, a Bike Skills Park could be constructed on existing grade. No significant cuts or fills, other than the fill required for the track and trail features, would be required. Also, it might be possible to design a layout that would allow the existing landfill gas extraction wells and lines to remain in place. Protective enclosures could be constructed around wellheads.

5.7 Park Enhancements

5.7.1 General Features Considered during Evaluation

The conceptual park enhancement features proposed for the Sunnyvale Landfill are described herein and reflect the features and assumptions listed in the final Study Options Summary and Assumptions memo dated September 17, 2013. The intent of the proposed feature set is to provide a conceptual level template for the types of improvements and features that could be added. The number, exact types, and locations of features could be refined and adjusted based on City preferences during the City's planning and design stages.

It is our understanding that the City will need to make its own findings about which site improvements will be designed for ADA accessibility. The City has instructed us to assume that for the purposes of this conceptual feasibility study, certain improvements and features may be considered as non-ADA accessible. The City may need to contract with a specialized firm to evaluate accessibility options for the various components proposed in this conceptual feasibility study. To make some of the proposed features ADA accessible, additional site improvements would be needed.

The main features considered for the evaluation of Park enhancements were:

- Habitat enhancement,
- Dog park,
- Additional trails along the side slopes of all three Hills,
- Trail connections between all three Hills,
- Benches,
- Picnic Tables,
- Drinking fountains (located at bottom of hill),
- Full restrooms (located at bottom of hill),
- Shade features,
- Landscaping (landscaping for any intensity of use will not be irrigated and consist only of native/low water use plants that will enhance habitat),
- Signage (including regulatory, informational, educational and interpretive),

- Parcourse (outdoor exercise equipment),
- Parking at bottom of the hill, and
- Potable water (located at bottom of hill).

5.7.2 Location Considerations for Park Enhancement Features and the Dog Park

Most of the current visitors/users of open space recreational activities at the landfill frequent West Hill instead of Recycle Hill or South Hill. Users of the existing access roads and trails on West Hill appreciate the open-space attributes afforded there such as nature appreciation, bird watching, hiking/biking/running on the trails, and taking in the views of the Bay from higher elevations.



Image 7. View of San Francisco Bay from West Hill

Because the gate at the bottom is kept locked, Recycle Hill is not officially “open” to visitors. South Hill is further from the existing parking areas, not as accessible as West Hill, and does not have as many trails or direct connections to the Bay Trail as West Hill.



Image 8. View of San Francisco Bay from Recycle Hill



Image 9. View of San Francisco Bay from South Hill

Based on the above, we recommend the Dog Park be located at Recycle Hill.

5.7.3 Habitat Enhancement Considerations (all hills)

To enhance wildlife habitat including Burrowing Owl habitat, we recommend:

- That the City identify and manage the vegetated areas of the landfill that are not designated for other activities such as special use areas (i.e., bike skills park, AAH, etc.) or other park enhancement uses (e.g., picnic or rest areas) as general habitat enhancement areas.
- Adding signage along the sides of access of roads and trails to inform visitors to stay on trails and out of wildlife enhancement areas (e.g., Notice – Sensitive Wildlife Area – Please stay on Roads and Pathways – Dogs Must Be On Leash).
- Consulting with a burrowing owl specialist for sign design and height considerations (specifically with regard to not providing perching spots for predatory raptors).
- That the City identify and mark with signage the areas recommended by the City’s burrowing owl specialist as Preferred Areas for Habitat Enhancement. These areas are highlighted on Figure 10 as Proposed Areas for Habitat Enhancement. Furthermore, the burrowing owl specialist can advise the City on specific measures that could be implemented such as addition of soil mounds for ground squirrel burrow complexes.
- Following a specific recommendation by the City’s burrowing owl specialist (Chromczak, D., February 4, 2013, Burrowing Owl Habitat Monitoring and Census, 2012 Annual Report, p.3.), burrowing owl habitat enhancement could include measures to improve the owl’s prey base by planting native forbs and shrubs in strips or islands around the perimeter and throughout the landfill to increase food and shelter for prey species. The selected vegetation should be native, low-water use California plants capable of surviving without irrigation.
- That the City consider additional measures to enhance owl nesting and foraging habitat conditions on the site and to provide sufficient owl protection during ongoing maintenance activities and construction projects as recommended in the Burrowing Owl Habitat Monitoring and Census, 2012 Annual Report.
- That the City also use the California Department of Fish and Game Staff Report on Burrowing Owl Mitigation (Department of Fish and Game, 2012) for guidance on mitigation options.

5.7.4 Burrowing Owl Habitat Considerations

To minimize impacts to burrowing owl habitat for a Dog Park on Recycle Hill we recommend:

- Locating the Dog Park on the central and eastern portions of the top deck away from the burrowing owl mounds on the western side.
- Constructing a fence on both sides of the access road to the top deck to keep users and their dogs away from the habitat areas
- Providing screening or slats in the fence to block view lines between the owl mounds and the top deck⁶.
- Keeping the access road as an on-leash area; the only off-leash area will be within the Dog Park at the top of the hill.

5.7.5 Proposed Design

5.7.5.1 Dog Park Features

- Two dog park areas on the top of Recycle Hill. One for all sizes of dogs, one for small dogs.
- Areas of approximately 11,200 sq. ft. and 16,300 sq. ft. (total area ~0.63 acres; see Figure 10). The smaller area on the north side of the road could be used as the areas for small dogs. The location of artificial and historic burrowing owl mounds and burrows on the northwest corner and western slope of Recycle Hill were considered in the placement and configuration shown for the smaller area. If the City desired to increase the size of the dog park areas shown, it's estimated that by extending the eastern and western ends of the areas shown to the edge of the top deck area, approximately 11,000 sq. ft. could be added to the dog park areas, resulting in a total size for the areas of 38,500 sq. ft. or ~ 0.88

⁶ The rationale behind this recommendation is to reduce the chance of observation of burrowing owls by dogs on the access road and vice versa. While we understand that burrowing owls prefer to have open sightlines, we make this recommendation based on the proximity of the access road to existing owl mounds, and the concern that observation of, and attention paid to, the owls by dogs on the access road would be less desirable. Our recommendation for slats in the fencing should be reviewed by a burrowing owl specialist in the context of potential habitat impacts by the overall set of proposed uses being considered for the landfill site.

acres. We recommend that proximity to the artificial burrowing owl mounds and historic nest and wintering burrows be evaluated when considering the layout for the dog park areas.

- Access to Dog Park areas: Access road from the bottom of the northwest corner of Recycle Hill, near existing parking area. Access road would be an on-leash area.
- Double-gated entry for each dog park area located at top of main access road.
- Fencing with slats: 4' high, chain-link fence around the Dog Park and along sides of access road from bottom of the north side of Recycle Hill.
- Layout shown on attached figure allows the existing landfill gas extraction wells and lines to remain in place outside the fenced dog park area. Protective enclosures could also be constructed around the wellheads to provide additional security as well as to improve aesthetics.
- One shade feature and two benches per area.
- Trash receptacles and bag dispensers in each area.
- No re-grading of the existing topography proposed for the Dog Park.
- Addition of surfacing material in the Dog Park areas (e.g., decomposed granite similar to existing surfacing at Sunnyvale's Las Palmas Dog Park). Surfacing material is to mitigate the use of the area by the dogs that will damage the existing vegetation. Without vegetation or surfacing material, erosion of the final cover may become an issue over time.
- A drinking fountain for users and dogs will be provided at the location of the proposed full restrooms for park visitors.

The City received the following comments and recommendations for the Dog Park and Recycle Hill from their burrowing owl consultant as this report was going to press. The City has indicated that these should be considered during the final site selection process:

- Burrowing owls view dog as predators. Since historic burrows are located on the western slope of Recycle Hill in preferred owl habitat, it is unlikely that burrowing owls will select burrows near an active dog park regardless of screened versus slatted fencing, especially if egress to the dog park is at the northwest or southwest corner of Recycle Hill.

- No ground disturbance should occur on the western slope of Recycle Hill that would impact existing burrowing owl habitat conditions. Ground disturbance that should be avoided may include: project-related construction activities, excavation, staging areas and stockpiles, vehicular and foot traffic, installation of roads, trails, crosswalks, stairs, benches, ground squirrel abatement, etc.
- The boundary of the Dog Park should not exceed beyond the top of the hill on the western slope of Recycle Hill.
- Install a chain-link fence around the perimeter of the western slope of Recycle Hill to protect existing burrowing owl habitat enhancement areas from the off-leash dogs and Dog Park visitors.

5.7.5.2 Proposed Trail System

We recommend that the City establish a formal set of trails at the site, incorporating existing landfill access roads, existing “unofficial” dirt trails created by visitors, and new trails. This system of trails, with connections to the Bay Trail, would be shown on park maps provided at key signage locations on site.

We recommend that the City consider making the trail system on South Hill for hikers and runners only (i.e., off-limits for bike use). Construction of new trails on South Hill would be less costly and have a lower impact to the existing landfill cover if they were designed to be for hikers and runners. It would provide a trail system in one of the three hills where hikers and runners would not have to share the trails with bikers. Users of the proposed parcourse stations on the top of South Hill might prefer a bike-free exercise area. For the purposes of this feasibility study, we have made certain assumptions about trail width and construction based on these recommendations. If the City were to choose to allow bicycle access on South Hill, the City may need to consider revisions to trail design and location.

The proposed trail system is shown on the Park Enhancements figure (see Figure 10). New trails and improvements to existing trails are described below.

West Hill

- A new trail around the perimeter of the top deck is proposed. The trail would connect to the existing landfill access road and trail on the northern side of the top deck. This would be a multi-purpose trail for hiker / runners / bikers.

- Adding embedded steps to the steep portions of the “unofficial” dirt trails on the northwest and southwest corners of the hill and on the eastern slope is proposed.
- A short trail spur is proposed at the southwest corner of West Hill to connect the existing “unofficial” trail to a proposed small rest area with park benches.

South Hill

- A new trail is proposed on the lower side slopes to provide a new loop with connections to existing trails and the existing landfill access road. This would be a single-file hiking / running trail (similar width and use as the existing pedestrian trails on South Hill).
- Adding embedded steps to the existing steep “unofficial” dirt trail on the northwest corner of South Hill is proposed for the City to consider.

Recycle Hill

- Two new trail connections are proposed at the northeast and southeast corners of the Hill to connect the existing landfill access road at the top of the Hill to new trail access points (new openings in the perimeter fencing) at the northeast and southeast corners of Recycle Hill. Embedded steps are proposed for the trail on the southeast corner.

5.7.5.3 Proposed Picnic, Rest, and Overlook Areas on West Hill

The locations of proposed picnic, rest, and overlook areas on West Hill are shown on the Park Enhancements figure (Figure 10) and are described below.

- A scenic overlook area on the flat area at the northwest corner of the top deck of West Hill, with park benches, shade features, signage stations, and crushed rock or decomposed granite surfacing.



Image 10. View from proposed overlook area - northwest corner, top deck of West Hill.

- A scenic overlook area with park benches and a shade feature along the north side of the existing trail at the northeastern corner of the top deck.



Image 11. View from proposed overlook area - northeast corner, top deck of West Hill.

- A picnic area on the on the flat area at the southwest corner of the top deck of West Hill, with picnic tables, shade features, signage stations and crushed rock or decomposed granite surfacing.



Image 12. Location of proposed picnic area - southwest corner, top deck of West Hill.

- A picnic area south of the landfill access on the western side of the top deck, with picnic tables, shade features, signage stations and crushed rock or decomposed granite surfacing. Locating this area south of the landfill access

road would help keep visual impacts low for visitors to the trails on the lower portions of the north side of West Hill.



Image 13. Location of proposed picnic area – western side of top deck.

- A small rest area with park benches and a shade feature on the west side slope of West Hill. This area would be accessible via a new short trail connecting to the new embedded step trail on the southwest corner of the hill, near pedestrian bridge from YAHOO!



Image 14. Location of proposed rest area - side slope at southeast corner of West Hill.

5.7.5.4 Proposed Parcourse Stations, Shade Features, and Park Benches on South Hill

Parcourse exercise stations, shade features, and park benches are proposed for the top of South Hill, located along the sides and end of the landfill access road.

5.7.5.5 Proposed Cross Walk

A new cross walk across the site entrance road is proposed to provide a connection from the trail at the northwest corner of South Hill to the sidewalk and proposed new trail access location at the northeast corner of Recycle Hill. The feasibility and exact location for the proposed new crosswalk as well as the need for any additional traffic signage (Stop signs, Yield signs, etc.) should be determined by the City.

Proposed Park Entrance Area – Signage, Restrooms, Drinking Fountain

A formal park entrance area is proposed at the current location of the portable restrooms near the existing parking area.



Image 15. Proposed location of formal entrance area (at location of existing portable restroom).

Proposed features to identify it as the park entrance include signage with site maps, full restrooms, new drinking fountain, and trash receptacles.

New parking areas are proposed near the site entrance area, as shown on the Park Enhancements figure (Figure 10) and as described in the Transportation section of this report.

6. CONSTRUCTABILITY ANALYSIS

6.1 General

This section addresses the Constructability element for the Sunnyvale Landfill Feasibility Study for Community Animal Farm and Alternative Recreational Land Uses. Constructability issues such as depth of excavation or fill to achieve grades, settlement, effect of the proposed improvements on the landfill gas collection system, requirements for buildings, etc., are addressed in this section of the report.

Constructability balances demands such as regulatory compliance with the short-term (e.g., providing utilities) and long-term (e.g., settlement) aspects of developing and maintaining a site. Furthermore, the proposed alternatives do not have formal construction plans; therefore, constructability also allows us to evaluate basic design issues that, with some assumptions, allow us to prepare order-of-magnitude cost estimates for the City.

The section below is a general introduction to the various issues that were evaluated for each alternative and their proposed mitigation. For each alternative, we looked at requirements for occupancy and site development, utilities, landfill management, and parking and access. The discussions that follow do not purport to address final design of any of the proposed uses and/or compliance with all regulations. Furthermore, construction of any of the alternatives may require addressing items such as a Stormwater Pollution Prevention Plan (SWPPP), addressing of dust control before and after construction, wildlife protection, etc.; these items are not specifically addressed in this report.

To address occupancy and site development issues, and, since the Landfill is within the City of Sunnyvale and development of the landfill would be reviewed by the Building Department, we looked at the requirements in the Uniform Building Code⁷ (UBC). We looked at the UBC for guidance because the intent of the UBC is to establish minimum requirements to safeguard the public health, safety and general welfare through such items as structural strength, stability, sanitation, light and ventilation, means of egress, and safety to fire fighters and first responders.

⁷ The UBC is updated every three years. In California, the UBC is adopted with modifications as the California Building Code (CBC). Typically, the CBC update follows the UBC update after 1 year, and local jurisdictions, such as cities and counties, adopt the CBC soon thereafter.

Access requirements are based on Federal and State mandates such as the implementation of the American with Disabilities Act (ADA). We reviewed the *ADA Standards for Accessible Design* published by the U.S. Department of Justice which excerpts 28 CFR Part 36 (Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities); however, given the open space elements of the four alternatives being evaluated in this study, we defined access as “the combination of various elements in a building or outdoor area, which allows access, circulation and full use of the building, facilities and programs by person with disabilities...”⁸ and looked at other sources for guidance⁹.

The proposed alternatives would be constructed over closed landfills subject to 27 CCR; therefore, we also considered how the existing infrastructure (e.g., landfill gas piping and wells and final cover) would be affected by the proposed alternatives. Depending on the alternative, the landfill gas wells that are above ground may need to be protected; we note that currently, the wells casings do not have any protection. As will be described in subsequent sections, the final cover will be affected by the construction of the features for the AAH, Sports Fields, Bike Park Skills, and Park Enhancements.

The assumptions presented below were also needed to be able to provide an order-of-magnitude cost estimate for each of the alternatives described below. These assumptions and quantity estimates will need to be recalculated once the final design of the chosen alternative has been finalized.

6.2 Animal Assisted Happiness (AAH)

6.2.1 General

The evaluation presented below is for the layout presented in Figure 3.

6.2.2 Occupancy

Section 107, Temporary Structures and Uses of the UBC authorizes the building official to “issue a permit for temporary structures and temporary uses. Such permits shall be limited as to time of service, but shall not be permitted for more than 180 days. The

⁸ *California State Parks Accessibility Guidelines, 2009 Edition*, published by the California State Parks Accessibility Section Acquisition and Development Division.

⁹ United States Department of Agriculture (USDA), *Accessibility Guidebook for Outdoor Recreation and Trails*, 2300–Recreation, Publication 1223–2806P–MTDC, August 2012.

building official is authorized to grant extensions for demonstrated cause.” Furthermore, “Temporary structures and uses shall conform to the structural strength, fire safety, accessibility, ..., ventilation and sanitary requirements of this code as necessary to ensure public health, safety, and general welfare.” We understand that AAH plans to use their facilities for more than 180 days; therefore, we conducted our assessment based on the UBC requirements for occupancy for more than 180 days.

Based on the proposed activities and facilities for AAH, we identified the following occupancy classifications in the UBC¹⁰ that may apply to AAH:

- Assembly Group (A) which includes the use for civic and social functions including awaiting transportation;
- Educational Group (E) which includes six or more persons at any one time for educational purposes;
- Residential (R) which includes use of a building for sleeping purposes; and
- Utility and Miscellaneous Group (U) which includes barns, livestock shelters, sheds, stables, and tanks. As part of final design, the designer contracted by AAH would need to confirm the above classifications.

6.2.3 Grading

Federal and State law and the UBC require accessibility to be met. Also, the minimum grade for the final cover of a closed landfill is 3 percent (see 27 CCR).

To accommodate the minimum grade for the landfill of 3 percent, some of the improvements proposed by AAH may need to be modified to accommodate this regulatory requirement. For example, AAH requested that the proposed riding arena have a 1 degree slope; this is less than 3 percent. Furthermore, because of waste decomposition, landfill grades flatten over time. Therefore, if the final grade starts at 1 degree, it will become flatter over time. From a constructability standpoint, the grades are generally steepened to about 5 percent with the expectation that over time they will

¹⁰ Occupancy dictates engineering requirements for each alternative presented in this constructability and feasibility study; therefore, the building official and designer of the final, selected facilities will need to confirm that the assumptions presented herein are applicable. Code interpretation and exemptions have not been evaluated as part of the constructability and feasibility study.

settle to 3 percent. Also, since regulations require the grades of the final cover to be 3 percent, the proposed fill grades for the AAH facility area will need to account for future settlement as part of design.

From a constructability standpoint, the three components for accessibility are width, grade, and surface. The ADA access requirements for grade must meet one of the following criteria:

- From 0% to 5% slope for any length without restriction on rest space intervals.
- From 5.1% to 8.33% slope for up to 50 feet with rest space intervals every 200 feet.
- From 8.34% to 10% slope for a maximum of 30 feet with rest space intervals every 30 feet.
- From 10.1% to 12% slope for a maximum of 10 feet with rest space intervals every 10 feet.

Resting spaces need to be 60 inches minimum in length and have a similar width as the ramp with a slope of 5% or less. The surfaces must be stable, firm and slip resistant. For width, the minimum width needs to be 36 inches to allow passage by a wheelchair and may reach 48 to 60 inches.

For parking areas, slopes shall not exceed 2% (1:50) except for drainage, where it may be up to 3% (1:33) and the surface shall be firm and stable. Accessible paths shall be provided from parking spaces to related facilities, including curb cuts or ramps, as needed. Ramps shall not encroach on any parking or access aisle spaces.

Based on the above, there may be some conflict between the grading requirements for accessibility and those for the final cover of the landfill.

With the above requirements, and without a formal grading plan, we estimated that to level the proposed 2.5 acre AAH site relatively flat, a maximum of approximately 18,000 cubic yards (cy) of fill will need to be imported to the site. As will be discussed below, a 1 foot thick layer of protective soil is proposed across the entire site to protect the final cover from damage from AAH operations and to separate the parking surface

from the final cover. In addition, an 8 ounce geotextile should be deployed¹¹ between the vegetative layer and the proposed protective soil. The 18,000 cy of soil listed above already account for the 1 foot thick protective layer. An advantage of leveling the site is that the Contractor can achieve larger production and the construction price would be lower than if the Contractor is constructing individual pads.

Alternatively, if not all the AAH facilities have to be accessible to all visitors (prior approval of this minimum alternative by the building official would be required), a smaller amount of fill could be placed. However, even if the AAH layout were designed to minimize fills by limiting access to the disabled to small areas, we would recommend that a minimum thickness of 12 inches of soil be placed throughout the site to protect the final cover from damage by AAH operations.

In the area of pasture proposed by AAH; grazing by the animals, if not properly managed, could result in overgrazing and elimination of the vegetation which could in turn increase erosion and damage the final cover's vegetative layer. Therefore, as mentioned above, the 1-foot thick protective layer and nonwoven geotextile would be used as a physical and visual barrier to warn AAH when their operations have come close to the permitted final cover system.

The areas of the pasture as well as areas that will not be covered with structures, roads, parking lots, or other facilities (e.g., arena) would need to be planted or hydroseeded with the appropriate mix that addresses both erosion control and animal feed.

We understand that AAH does not plan to build the complete facility at once; therefore, staged construction is feasible. Given the layout of the pens, arena, pre-fabricated structures, etc. in Figure 3, constructing individual pads to meet grades is possible but may result in the various pads being connected to each other. Therefore, based on the layout shown on Figure 3, structures that may appear to be independent would be underlain by fills which will likely be connected and become wide, uniform fills. Therefore, a minimum re-grading option is difficult to estimate without a design; given

¹¹ A geotextile can address multiple functions such as reinforcement, separation, and filter between two dissimilar soil materials. In a reinforcement/separation function, the geotextile is used to decrease the amount of aggregate base that is needed for wheel loads. In a separation/filter function, the geotextile will prevent the vegetative soil layer from intruding into the aggregate base layer (see *Designing with Geosynthetics*, 3rd Edition by R.M. Koerner, Prentice Hall).

the uncertainty in the volumes of soils required, we have not included this minimum re-grading option in our order-of-magnitude cost estimate.

Besides concrete and asphalt, to stabilize the surfaces, the following materials can provide firm and stable surfaces¹² in the areas that require access:

- Crushed rock (rather than uncrushed gravel).
- Rock with broken faces (rather than rounded rocks).
- A rock mixture containing a full spectrum of sieve sizes, including fine material (rather than a single size).
- Hard rock (rather than soft rock that breaks down easily).
- Rock that passes through a ½-inch screen (rather than larger rocks).
- Rock material that has been compacted into 3- to 4-inch -thick layers (rather than thicker layers).
- Material that is moist (not soggy) before it is compacted (rather than material that is compacted when it is dry).
- Material that is compacted with a vibrating plate compactor, roller, or by hand tamping (rather than material that is laid loose and compacted by use).

Placement and compaction of fill to achieve the desired grades will require the use of heavy equipment (i.e., backhoes, dozers, compactors, etc.). Due to the current width of the existing roads, construction traffic will need to be one-way around the landfill. Areas of temporary stockpiles will need to be delineated. Mitigation measures (i.e., temporary erosion and sediment control best management practices) will need to be installed during construction.

6.2.4 Landfill Gas System

Our conceptual design layout of the AAH facility considered the 4 landfill gas wells and landfill lines that fall within the proposed facility area. For the purposes of our evaluation we assumed that these lines and wells would remain in place if the AAH

¹² United States Department of Agriculture (USDA), *Accessibility Guidebook for Outdoor Recreation and Trails*, 2300–Recreation, Publication 1223–2806P–MTDC, August 2012.

facility were built. We recommend that a landfill gas engineer evaluate whether the wells can remain in place with a protective fence around them; whether they will need to be decommissioned and replaced with new well(s) at an alternate location; whether they can be replaced with horizontal gas extraction trenches; or whether they can simply be removed. Because of enhanced use, redundant systems for gas control and mitigation may be needed.

An issue that needs further evaluation is that leaving the existing landfill gas lines and wells in place may not work over the long-term. For example, adding fills to create access ramps, pads, etc. may result in localized areas of accelerated settlement and differential movement. The wells have flexible connections; however, if the movement is excessive, the connections may break and introduction of air into the landfill may occur which is unacceptable. Furthermore, if the damaged areas are underground and pass undetected, the gas collection efficiency may decrease. A consideration is to reconstruct the system at the time of site development to minimize these future problems; regardless, the landfill gas collection and removal system will need to remain operational during AAH operations. Our understanding is that AAH will need to allow the City access to the AAH facility when access to landfill utilities is required. Operations not only include gas extraction but also include maintenance. Currently gas lines are buried below ground; a review of the landfill gas system construction drawings prepared by SCS in 2005¹³ shows that the minimum depth of burial is 2 feet. This depth of burial needs to be evaluated by the landfill gas designer to evaluate whether the piping would be affected by AAH operations. The disadvantage of adding localized fills is that the settlement of the final cap could be greater below the areas of discrete fills when compared to wider areas of fill. For reference, these concerns will need to be addressed for other types of development proposed at the site.

For our order-of-magnitude cost estimate we will assume that a 10-foot by 10-foot, 6-foot-high cyclone fence with gate could be constructed around each landfill gas well. As for other fences, the main concern is that the fence will penetrate the final cover system since a burial depth of 3 feet will be needed. Given the limited area around each well, we have assumed that a cement bentonite grout will be an acceptable equivalent to the approved final cover; however, other permanent fences may also be used.

¹³ *Landfill Gas Condensate Collection, Return, and Pre-Treatment System for City of Sunnyvale at Sunnyvale Sanitary Landfill*, Sunnyvale, California; PR-98-06(A), PR98-06(B), and PR-02/06-02.

Approximately 1,000 feet of landfill gas piping fall within the proposed AAH facility boundary, therefore, in addition to evaluating the gas wells, the landfill gas engineer should also evaluate whether the landfill gas piping and valves will also need to be removed or abandoned in place, or whether they can remain in place and operational.

6.2.5 Utilities

We have assumed that surface water around AAH's facility will be able to flow toward the existing drainage swales if these swales can be re-used after taking the required grading into consideration; therefore, we have not included the cost of new surface water ditches in our order-of-magnitude cost estimate.

Depending on the utility and its location, the utilities (power, water, and sewer) may need to be buried between 12 and 24 inches below the top surface to protect them from traffic. The minimum depth of cover for sewer laterals in the City of Sunnyvale is 5 feet minimum at the property line unless approved by the City¹⁴. Based on the depth of burial, additional soil will need to be placed above the vegetative layer, to ensure that the excavation and backfill for the utility does not interfere or affect the compacted clay liner. If the utilities are not built in fill placed above the final cover, maintenance for the utilities would require penetrating the final cover and having to re-construct the final cover once maintenance is completed. 27 CCR prohibits placing utilities below the clay layer, so another option would be to reconstruct the clay layer lower at utility trench locations.

Once it departs the top deck, the utilities would follow the alignment of the access road. By following the alignment of the access road, instead of being located perpendicular to the slope (i.e., shorter), the utilities would settle relatively uniformly while maintaining positive grades – this is especially needed for sewer and storm water systems because they are typically designed for gravity flows. It is noted that given the available road width, if a utility were to need maintenance, the access road would be out of service until the repair is complete. Also, a minimum depth of burial would be required for vehicles to be able to drive over the utilities (depending on the vehicle, depth of burial to the crown of the pipe may be 2 feet or more) so excavation into the final cover would be required.

¹⁴ *City of Sunnyvale Wastewater Collection System Master Plan, Technical Memorandum #8, Final*, prepared by Infrastructure Engineering Corporation (Poway, CA), August 2013.

The estimated lengths and sizes of the utilities are presented in the infrastructure section of this report.

6.2.6 Parking and Access

Since traffic is one way, a turnaround is needed at the top of the hill with a minimum turning radius of 30 feet. The turnaround needs to be functional even if the AAH facility is closed; therefore, the existing turnaround at the end of the road will need to be enlarged.

To mitigate damage by users of the facility, the parking lot and the access road would need to be paved. The parking lot was assumed to be paved with aggregate base or crushed rock; the access road was assumed to be paved with asphalt concrete (see Image 16, below) to accommodate the requirements for access by the Fire Department and emergency vehicles. Aggregate base/crushed rock parking lots need more maintenance than those paved with asphalt concrete; we assumed that crushed rock is available for purchase at the nearby Stevens Creek Quarry facility on the East Hill. A minimum thickness of aggregate base or crushed rock of 12 inches underlain by an 8 ounce nonwoven geotextile is recommended for the parking lot (see Image 17, below). The geotextile would serve as a separator between the vegetative layer, and the 12-inch thick separator soil layer or the parking lot's gravel driving surface. The approximate area for the parking is 22,000 square feet (sf).



Image 16. Asphalt concrete for access road.



Image 17. Crushed rock surfacing.

6.2.7 Pre-Fabricated Modular Structures

AAH has expressed that their structures will primarily consist of pre-fabricated structures (Figure 3). Pre-fabricated building manufacturers¹⁵ recommend that the user contact the local building official on the requirement for the foundations. Furthermore, in the State of California, the State of California Department of Housing and Community Development (HCD) oversees modular building construction. The building codes followed by the HCD for modular construction are the 2010 California Building Code (CBC), 2010 California Electrical Code, 2010 California Mechanical Code, and 2010 California Plumbing Code. As described earlier, the CBC is based on the UBC.

Two concerns that need to be addressed for pre-fabricated structures are wind and seismic design. For the Sunnyvale area, the UBC cites a wind design of 85 miles per hour; this wind speed is also listed by the City of Sunnyvale's Building Department¹⁶. For seismic design, building on a landfill classifies as Site F where a site-specific evaluation is required.



Image 18. Pre-fabricated office or caretaker facility.

Pre-fabricated buildings are set on a level pad which typically extends 5 feet away from the footprint of the building to drain. The pad can be soil, rock, asphalt or concrete. If

¹⁵ See Modular Building Concepts of Poway, California (Contact person: Mr. Ken Kerper (President); Phone No.: 858-679-1185).

¹⁶ <http://sunnyvale.ca.gov/Departments/CommunityDevelopment/CommunityDevelopmentDivisions/Building.aspx>

the site slopes more than 1% or 2% in any direction may require a change in installation method and possibly an increase in costs. The typical foundations for a pre-fabricated building include: pier and ground anchor support systems, slabs-on-grade foundation systems, crawl space systems, and basements. We have not evaluated crawl space systems and basements because they are prohibited by 27 CCR.

To resist wind and seismic forces, auger-type (screw-in) ground anchors are the most common device. Anchors are held in place by soil or by encasing the anchors in a concrete slab. At the landfill, the use of anchors penetrating the existing ground would need further evaluation since the final cover system would be penetrated and the underlying waste material would not provide the pullout resistance required over the long-term because of decomposition of the waste.

The structures proposed by AAH vary in dimensions and areas (see Images 19 and 20, below). We understand that in the City of Sunnyvale one-story detached accessory structures (e.g., tool and storage sheds) less than 120 sf of floor area may be exempt from building permit requirements; however, approval from the City's Planning Division may be required. Since the dimensions of the AAH structures are generally larger, we have assumed that building permit's requirements, and, by extension, building code requirements need to be followed. Based on the above, for our order-of-magnitude cost estimate we have assumed that concrete slabs will need to be constructed for the animal barns but not for the pens. We assumed that the concrete slab for the barns will be 6 inches thick. These assumptions will need to be verified at the time of final design.



Image 19. *Animal barns.*



Image 20. *Animal pens/stalls.*

Landfill gas mitigation will be required for the structures constructed on the landfill. As described by Young and Martinez-Centano¹⁷ “Federal (40 CFR Part 258.3) and California State regulations (27 CCR 20921) require that landfill and disposal site owners control landfill gas migration if methane gas concentrations exceed 1.25 percent in on-site structures or 5 percent at the permitted perimeter boundary or an alternative boundary.” These protections may include: under foundation gas-barrier systems, active and passive gas collection and control systems, continuous monitoring of structures, facility active ventilation systems, alarm systems, etc.¹⁸ At this time, we assumed that venting without monitoring will be acceptable for the Group U occupancy structures (i.e., barns, livestock shelters, sheds, stables, etc.). For the office, the restroom, and the caretaker facility we assumed that passive methane gas control systems with continuous monitoring will be acceptable. These assumptions need to be re-evaluated for final design for each selected alternative.

A compacted soil pad is also an option; however, from a constructability standpoint, the thickness of the soil pad may exceed the cost of constructing a concrete slab where the anchors could be encased in a shallower thickness. To illustrate, typical concrete weighs about 150 pounds per cubic foot (pcf) and typical compacted soil weighs about 100 to 130 pcf. If to meet the anchorage requirements for wind and seismic in soil, the pad needs to be 3 feet thick as compared to 1 foot for anchoring into a concrete slab, the slab is a better option. Another constructability issue to consider is that the built-up soil pad needs to meet the surrounding grade; the thicker the pad, the more extensive the area covered by the pad.

An advantage of building a concrete slab is that the pad would also provide an additional barrier against landfill gas migration. Differential settlement is a concern for slabs-on-grade on landfills; however, the slab would be reinforced as a mat. The mat may settle differentially but it can be jacked and re-leveled over time.

¹⁷ G.K. Young and A. Martinez-Centano, *Continuous Monitoring of Structures for Landfill Gas Intrusion*, Publication No. IWMB-2009-014, California Integrated Waste Management Board.

¹⁸ G.K. Young and A. Martinez-Centano, *Continuous Monitoring of Structures for Landfill Gas Intrusion*, Publication No. IWMB-2009-014, California Integrated Waste Management Board.

6.2.8 Restrooms

The permanent restroom facilities¹⁹ will be built on a reinforced concrete slab-on grade, with an estimated thickness of 1 foot. The slab will function as a mat and would address differential settlement concerns and if needed could be re-leveled in the future without damaging the structure. Flexible connections for the utilities would be required. We have assumed that a gas venting system would be needed below the slab.

6.2.9 Fencing

Standard perimeter fencing (see Image 21, below), as required for AAH operations would require the use of footings whose final depth could not be accommodated without entering the final cover layers. To mitigate penetration of the final cover layers, a cement/bentonite grout could be used to backfill around the footings of the fences. A 6-foot high chain-link fence would require a 3-foot deep footing. For our cost estimate, since we assumed the maximum fill option, the minimum required thickness will already be met.



Image 21. Chain-link fence with additional top protection.

¹⁹ For this feasibility study we contacted ROMTEC, Inc. (Contact person: Mr. Todd Black; Phone No.: 541-496-3541) for layout and cost information for the permanent restrooms.

Alternatives such as fences embedded in oversize concrete footings constructed within the top one foot of the operations layer may also be feasible. In addition, barbed wire or protective wires could be placed along the top of the fence for additional security (see Image 21 in the previous page). An approximate length of 1,250 feet of fence will be needed. Alternative fences with above ground footings could also be used. If a berm is installed along the perimeter, pipe crossings would be needed along the berm to allow for surface water runoff to flow to the existing ditches and swales.

The main concern with the footings for the fences is that a footing constitutes a penetration of the final cap which can create a path for methane gas to escape. Each penetration constitutes a potential monitoring point which would add to the operating costs and regulatory compliance with such agencies as California Air Resources Board (CARB) regulations, Bay Area Air Quality Management District (BAAQMD), and others. This concern with the footings for the fences also applies to the other alternatives presented in this report.

Fences for Interaction Areas, Pastures and Arenas will be portable and lay on the surface (see Image 22 on the next page). If necessary, post embedment will not exceed a depth of one foot to avoid damaging the final cover system.



Image 22. Surface laying fences

6.2.10 Cost Evaluation

An order of magnitude cost evaluation for the construction of the AAH facilities, as well as the Park Enhancement features, described in the previous sections and in Section 6.4 (for the Park Enhancements), is presented in Table 3. Notes on the table indicate the assumptions made to estimate the unit pricing and total quantities needed for each item on the table.

The table below summarizes the estimated costs for the alternative.

Description	AAH
Design, Management, and Inspection	\$1,271,132
Mobilization/Demobilization	\$242,120
Items Related to AAH	\$1,973,624
Items Related to Park Enhancements	\$642,979
Items Related to Infrastructure Improvements	\$2,225,807
Construction Contract Contingency	\$484,241
Contingency	\$1,367,981
Total	\$8,207,883

6.3 Baseball/Soccer Fields

6.3.1 General

The evaluation presented below is for the layout presented in Figure 5.

6.3.2 Occupancy

Based on the proposed activities, we identified that some portions of the sport fields classify as UBC Assembly Group A-5, which includes participation in or viewing outdoor activities including but not limited to: amusement park structures, bleachers, grandstands, and stadiums. As part of final design, the designer contracted and the building official would need to confirm the above assumption.

6.3.3 Grading

As described earlier, Federal and State law, and the UBC require accessibility to be met; however, other site development requirements, such as the need for the sports fields to be level over large areas, require re-grading to take place. To meet these requirements:

- The approved cap will need to be removed and re-constructed; therefore removal, reconstruction, and waste handling would be a special concern to address during regulatory permitting.
- Waste excavation will need to be performed in stages to minimize odors. Temporary soil covers, foams and/or tarps will be needed to address the possibility of waste coming in contact with rain water and becoming leachate.

- Temporary surface water control measurements will be needed for the eventuality that rain water comes in contact with waste and becomes leachate.
- Waste excavation will affect the operation of the existing gas control system because introduction of oxygen may cause landfill fires.
- Approximately 120,000 cy of landfill and final cover material will need to be removed. A disposal site for the waste will need to be established. The excavated waste may be disposed at Sunnyvale's SMaRT Station[®] (Hauling distance = 0.7 mile) or at nearby landfills such as Newby Island, Kirby Canyon, or Guadalupe Landfills. For cost estimating purposes, we have assumed that the excavated waste can be disposed at the Newby Island Landfill in Milpitas which is approximately 10 miles from the Sunnyvale Landfill. At this time, assumption is that the waste can be received at Class 3 landfills; however, unusual waste (e.g., drums) that may be encountered may need to be characterized and disposed at an appropriate facility.
- Waste and final cover removal will require the use of heavy equipment (i.e., backhoes, dozers, compactors, etc.).
- Due to the current width of the existing roads, construction traffic will need to be one-way around the landfill.
- To re-use the soils, existing final cover material would need to be segregated into vegetative layer, low permeability soil, and foundation layer soil. Segregation of these final cover components may be difficult; however, importing of material will also impact traffic; therefore, for cost estimating purposes, we have assumed that the materials will be segregated by the Contractor at that sufficient quantities of materials will be available from on-site sources to complete the work (i.e., materials will not need to be imported to re-construct the final cover system).
- Areas of temporary stockpiles will need to be delineated. Mitigation measures (i.e., temporary erosion and sediment control best management practices) will need to be installed.
- Unless foundation layer soils are segregated, approximately 28,000 cy of foundation soil will need to be imported to re-construct the foundation layer component of the approved final cover system for the site. As described above, for cost estimating purposes, we have assumed that the foundation layer soils will be segregated and use to reconstruct the foundation layer.

- Unless low permeability soils are segregated, approximately 14,000 cy of clean low permeability soil, capable of achieving a permeability of 1×10^{-6} cm/sec, when compacted, will need to be imported to re-construct the compacted clay liner component of the approved final cover system for the site. A soil source would need to be identified at the time of construction. As described above, for cost estimating purposes, we have assumed that the low permeability layer soils will be segregated and use to reconstruct the low permeability layer.
- Unless vegetative soils are segregated, approximately 14,000 cy of vegetative soil will need to be imported to re-construct the vegetation layer of the approved final cover system for the site. As described above, for cost estimating purposes, we have assumed that the vegetative layer soils will be segregated and use to reconstruct the vegetative layer.
- An alternative to the 27 CCR final cover configuration, is to deploy a product that combines the artificial turf and the liner components which is known as Closure Turf. This change would require regulatory approval.
- Regulations require the grades of the final cover after settlement to be 3 percent; however, sports fields would need to be relatively level; therefore, a geocomposite underdrain layer with perimeter pipes would need to be installed to control surface water that infiltrates.

For the order-of-magnitude cost estimate, we assumed that the existing 27 CCR final cover would be re-constructed. We also assumed that a geocomposite would be deployed to drain the artificial turf.

6.3.4 Landfill Gas System

- Approximately 7 gas wells will need to be decommissioned and removed prior to removal of the final cover and waste material to avoid damaging lines which will stay.
- The removed/cut gas wells may be replaced with similar wells in protected, below ground, concrete well vaults, replaced with gas wells at nearby locations, or replaced with horizontal gas extraction trenches/wells, as determined by the landfill gas engineer. Because of enhanced use, redundant systems for gas control and mitigation would be needed.
- The existing landfill gas system will be reconstructed with below ground gas wells; gas wells will be inside precast concrete vaults with lids and will need to

be installed at each well. We also assumed that the landfill gas piping system would need to be reconstructed.

- Approximately 2,000 feet of landfill gas piping will need to be removed and reconstructed from the top deck area to accommodate the new facilities and grades.
- We have assumed that passive methane gas control systems with continuous monitoring will be acceptable for the restroom and the storage building; these assumptions need to be re-evaluated for final design.

6.3.5 Utilities

Installation of storm drain pipes or surface water ditches around the Soccer/Baseball fields will be needed to avoid ponded water within their facility and promote drainage towards the storm drain line or the existing drainage swales if they can be re-used after taking the required grading into consideration. Because of the amount of excavation expected, we have assumed that the drainage swales will need to be reconstructed. For cost estimating purposes, we have assumed that: (i) approximately 2,200 feet of drainage swales along the top deck of the reconstructed landfill will be needed, (ii) the swales will be concrete-lined, triangular, have 3 to 1 (horizontal to vertical) side slopes, and a depth of 1.5 feet; these assumptions will need to be confirmed as part of final design.

Depending on the utility, the utilities may need to be buried at least 12 and 24 inches below the top surface to protect them from traffic. The minimum depth of cover for sewer laterals in the City of Sunnyvale is 5 feet minimum at the property line unless approved by the City²⁰. Based on the depth of burial, additional soil will need to be placed above the vegetative layer, to ensure that the utility does not interfere or affect the compacted clay liner in the final cover. If the utilities are not built in fill placed above the final cover, maintenance for the utilities would require excavating through the final cover, and having to re-construct the final cover once maintenance is completed. 27 CCR prohibits placing utilities below the clay layer, so another option would be to reconstruct the clay layer lower for a utility trench.

²⁰ *City of Sunnyvale Wastewater Collection System Master Plan, Technical Memorandum #8, Final*, prepared by Infrastructure Engineering Corporation (Poway, CA), August 2013 (Received by Email on 25 October 2013).

Once it departs the top deck, the utilities would follow the alignment of the access road. By following the alignment of the access road, instead of being located perpendicular to the slope (i.e., shorter), the utilities would settle relatively uniformly while maintaining positive grades – this is especially needed for sewer and storm water sewers. It is noted that given the available road width, if a utility were to need maintenance, the access road would be out of service until the repair is complete. Also, a minimum depth of burial would be required for vehicles to be able to drive over the utilities (depending on the vehicle, depth of burial to the crown of the pipe may be 2 feet or more) so excavation into the final cover would be required.

The estimated lengths and sizes of the utilities are presented in the infrastructure section of the report.

6.3.6 Parking and Access

At some locations, the current road does not meet the minimum widths of 12 feet; therefore, soil will need to be added. Since traffic is one way, there will be a turnaround at the top of the hill, with a minimum turning radius of 30 feet. This turnaround will be separate from the parking area because only an empty parking area would provide sufficient space for emergency vehicles to turnaround. Additional road width could be required for guardrail, shoulder/emergency lane, bicycle lane, turning radii, drainage ditch or curb, etc. We have assumed that only a guardrail and a drainage ditch will be needed. Adding the space for a guardrail and a perimeter drainage ditch to the minimum requested paved width of 12 feet, the minimum total width approaches 20 feet which agrees with the minimum clear width of 20 feet stated by the City of Sunnyvale's *Requirements for Fire Department Vehicle Access*.

To mitigate damage by users during sports field use, the parking lot and the access road would need to be paved. The parking lot would be paved with 12 inches of aggregate base or crushed rock over an 8 ounce nonwoven geotextile. However, the access road would be paved with 4 inches of asphalt concrete over 8 inches of aggregate base to accommodate the requirements for access by the Fire Department and emergency vehicles. Aggregate base/crushed rock parking lots need more maintenance than those paved with asphalt concrete; however, rocky material can be purchased at the nearby facility in the East Hill. The geotextile would serve as a separator between the vegetative layer and the parking lot's gravel driving surface. The approximate area for the parking is 40,000 sf.

6.3.7 Drainage

To create the dual use baseball/soccer sports field, we assumed that approximately 220,000 sf of artificial turf will be needed for the soccer/baseball fields. Artificial turf needs to be drained; therefore, approximately 220,000 sf of a double-sided drainage geocomposite²¹ will need to be installed to drain the turf area.

The parking, restroom and storage shed areas will need to be designed to re-direct surface water that infiltrates to the desired locations, to minimize increasing infiltration through the cover.

6.3.8 Fencing

Standard fencing for the sports fields would penetrate the final cover. To mitigate penetration of the final cover, a cement/bentonite grout could be used to backfill around the footings of the fences. Alternatively, a short perimeter berm can be built, where needed, to install a 4-foot high chain-link fence, which requires a 2.5-foot deep footing, avoiding penetration of the cap (see Image 23, below). Approximately 1,500 feet of fence will be needed.



Image 23. Short perimeter fencing (4-foot high) for soccer/baseball fields.

²¹ Consisting of a geonet core encapsulated between two 8 ounce nonwoven geotextiles.

6.3.9 Lights

With the layout of the dual-use baseball and soccer field, the estimated number of light poles (see Image 24 on the next page) for cost-estimating purposes is eight²².



Image 24. Typical soccer/baseball field light fixtures.

6.3.10 Foul Poles

Foul poles for the baseball field (see Image 25 on the next page), will be temporary (so that they can be removed when the soccer field is used) and will therefore not require a foundation. Temporary 4- or 5-foot high fencing with 8-foot high foul poles is available. Also, the foul poles could be shorter and mounted on sand-fill bases (see Image 26 on the next page).

²² *Lighting Information for Sports Facilities*, University Interscholastic League, Austin, Texas, 2002, and phone conversation with Mr. Bob Crookham (MUSCO Lighting at 415-203-6558).



Image 25. Typical baseball foul poles.



Image 26. Typical sand/water-filled base for poles.

6.3.11 Bleachers

Two sets of metal bleachers (approximately 40 people each) on both sides of the baseball field (along first and third base), and four additional set of bleachers along the western side of the soccer field are proposed. Bleachers (see Image 27 below) for both fields will be temporary (i.e., with wheels) and therefore not require foundations. The bleachers will be double-footboard aluminum bleachers with 4 or 5 rows of seats.



Image 27. Typical baseball/soccer bleachers.

6.3.12 Restrooms and Storage Buildings

Restroom and storage buildings will be built on a reinforced concrete slab-on grade, with an estimated thickness of 1 foot. The slab will function as a mat and would address differential settlement concerns and if needed could be re-leveled in the future without damaging the structure. Landfill gas mitigation will be required. Monitoring sensors, a barrier, and a gas extraction system may be needed for these buildings.

6.3.13 Cost Evaluation

An order of magnitude cost evaluation for the construction of the Baseball/Soccer fields and ancillary facilities, as well as the Park Enhancement features, described in the previous section and in Section 6.4 (for the Park Enhancements), is presented in Table 4. Notes on the table indicate the assumptions made to estimate the unit pricing and total quantities needed for each item on the table. The table below summarizes the estimated costs for the alternative.

Description	Sports Fields
Design, Management, and Inspection	\$3,212,285
Mobilization/Demobilization	\$611,864
Items Related to Sports Fields	\$9,277,190
Items Related to Park Enhancements	\$642,005
Items Related to Infrastructure Improvements	\$2,318,082
Construction Contract Contingency	\$1,223,728
Contingency	\$3,457,030
Total	\$20,742,183

6.4 Bike Skills Park and Park Enhancements (Including Dog Park on Recycle Hill)

6.4.1 General

The layouts for the Bike Skills Park and Park Enhancements (including Dog Park on Recycle Hill) are presented on Figures 6 and 9. For these alternatives, it is our understanding that the City will need to make its own findings about which site improvements will be designed for ADA accessibility. The City has instructed us to assume that for the purposes of this conceptual feasibility study, certain improvements and features may be considered as non-ADA accessible. The City may need to contract with a specialized firm to evaluate accessibility options for the various components

proposed in this conceptual feasibility study. To make some of the proposed features ADA accessible, additional site improvements would be needed.

6.4.2 Grading Considerations for Bike Skills Park

- Approximately 3,000 cy of soil will be needed to create the desired bike course and soil mounds.
- Regulations require the grades of the final cover after settlement of the soil mounds to be 3 percent, therefore areas for the Bike Skills Park where fill would be added would need to be graded as necessary to ensure post-settlement grades.
- Placement and shaping of soil mounds for skills park features will require the use of heavy equipment (i.e., dozers, dump trucks, etc.).
- Care during construction will be needed so that grading does not encroach into the existing final cover.
- Due to the small volume of soil that will need to be brought on-site to create the park features, we have assumed that stockpiling of materials will not be necessary.
- Due to the current width of the existing roads, construction traffic will need to be one-way around the landfill.

6.4.3 Grading Considerations for Park Enhancements

Application of surface treatments such as crushed rock or decomposed granite is expected to have minimal impact on the final cover (i.e., the material would be deposited above the final cover).

It has been assumed that minimal grading will be needed to create the new trails. The City may need to contract with a specialized firm to evaluate accessibility options for the various components proposed in this conceptual feasibility study. To make some of the proposed features ADA accessible, additional site improvements would be needed.

6.4.4 Access Road

Based on agreement with the City, the access roads to the three hills do not need to be improved for Emergency Access for the Park Enhancements (including Dog Park) on the West Hill, Recycle Hill, and South Hill, and for the Bike Skills Park on the West Hill.

6.4.5 Landfill Gas System Considerations for Bike Skills Park and Park Enhancements

Due to the expected pedestrian traffic, the City may want to consider surrounding each well within a fence to avoid people coming in close contact with them, as well as to protect the wells from users riding their bikes up and down the hill (Bike Skills Park) and walking or running by (Park Enhancements). We note that currently, the landfill gas wells are neither enclosed nor protected.

6.4.6 Fencing Considerations for Bike Skills Park

If desired, to prevent visitors from accessing the facility at night time, an optional perimeter fence could be installed around the facility. A 6-foot high chain-link fence, would require a 3-foot deep footing. If the fence is placed on top of a 3-foot high perimeter berm, penetration of the cap would be avoided. In addition, barbed wire or protective wires could be placed along the top of the fence for additional protection (see photo below), if desired. Approximately 1,100 feet of fence would be needed. We have not included this item in our order-of-magnitude cost estimate.

Our order-of-magnitude cost estimate can also assume that an optional 10-foot by 10-foot, 6-foot-high cyclone fence with gate could be constructed to protect the gas wells. We note that currently, the gas wells are not protected.

As for other fences, the main concern is that the fence will penetrate the final cover system since a burial depth of 3-foot-deep is typical; given the limited fence length, we have assumed that the landfill cap will need to be penetrated. We have assumed that for other fences that may have shallower penetration, similar costs would accrue.

6.4.7 Fencing Considerations for Park Enhancements (Dog Park)

Four-foot-high fencing with slats is proposed. As discussed earlier, the main concern is that the fence will penetrate the final cover system. Possible alternatives have been cited earlier.

6.4.8 Utility Considerations for Bike Skills Park

The potable water pipe proposed to provide dust control water to keep the tracks moist may affect the final cover depending on its depth of burial. The choices are to add additional clean soil above the vegetative layer so that the pipe does not affect the

compacted clay liner component of the final cover system and other choices discussed in the utility sections for the AAH alternative.

We have assumed that storm water runoff will be able drain to the existing swales around the Bike Skills park area to minimize water ponding within the tracks and potential for infiltration.

6.4.9 Parking and Access Considerations for Bike Skills Park

The grades along the existing road will allow for users of the bike skills park to reach the facility at the top of the landfill, therefore it is assumed no improvements will be needed for the access road. Access by motor vehicles will be restricted to maintenance vehicles only.

6.4.10 Site Enhancements for Bike Skills Park

All features constructed or created for the bike skills park are assumed to be above the existing grades and do not require a foundation. Features such as ladders, branches, etc. are expected to be held in place using above-ground elements such as concrete blocks or wooden blocks, rocks, etc.

6.4.11 Site Enhancements for Park Enhancements

Features proposed for the Park Enhancements such as park benches, picnic tables, trash receptacles, bag dispensers, shade features, and par course features will need to be constructed with minimal disturbance of the final cover. Benches and picnic table can have surficial concrete footings. However, signs and shade features need to be designed following requirements in the UBC so will need foundations that will penetrate the final cover; alternative foundations could be considered with approval by the Building Official.

6.4.12 Restroom for Bike Skills Park and Park Enhancements

Restrooms will be located at the bottom the Recycle Hill, adjacent to the west end of the existing parking lot north of Recycle Hill. It is assumed that standard construction techniques would be used for the foundation of this structure, as the facility will not be located within the footprint of a landfill. As for the restrooms proposed for AAH and the Sports Field, we have assumed that a passive methane gas control systems with continuous monitoring will be acceptable; these assumptions need to be re-evaluated for final design for each selected alternative.

6.4.13 Proposed Construction

The City indicated that park enhancement fixtures should be City park standards including recycled plastic/powder coated steel benches and tables from DuMor®. The outdoor fitness system should be HealthBeat®, and shade systems should be Cooltoppers® from Landscape Structures Inc.²³

Examples of these types of park fixtures are shown below. For the purposes of this feasibility study we have included cost estimates for CoolToppers® shade systems, but note that the City may want to consider other types of shade features less susceptible to the forces of wind, given the conditions at the site.



Image 28. Examples of DuMor® park benches.

6.4.13.1 Stepped Trails

For adding steps to existing “unofficial” user trails on West Hill (northwest and southwest corners of West Hill and up the east side of West Hill) and South Hill (northwest corner of South Hill), and for creating new stepped trails on the southeastern slopes of Recycle Hill, railroad ties or similar lumber can be embedded into existing soil, and crushed rock could be added between the steps.

²³ For this feasibility study we contacted Ross Recreation Equipment (Contact person: Ms. Judy Ogburn; Phone No.: 707-538-3800) which are the Northern California distributors for DuMor (benches, tables, bike racks, waste receptacles) and Landscape Structures, Inc. (exercise stations, shade structures, bike skills/trick equipment).

6.4.13.2 New Trails on Side Slopes of South Hill

To create a single-file hiking/running trail on the slopes of South Hill, a prism of imported, compacted soil would be added and keyed above the existing landfill surface. Assume would construct a 2-ft wide surface for the trail. Would involve importing, placing, and compacting soil, crushed rock, or decomposed granite along a distance of the sideslopes. Existing vegetation would need to be restored, and the trails would need to be located to avoid damage to existing landfill gas extraction lines.

6.4.13.3 New Trails on West Hill

For the new multi-purpose trail for hiker / runners / bikers around the perimeter of the top deck, assume a 6-ft wide trail with crushed rock or decomposed granite surfacing. Construction of this trail will involve grubbing of the existing vegetated surface and placing a layer of crushed rock or decomposed granite surfacing. No grading of the existing surface is anticipated.

For the short trail spur proposed at the southwest corner of West Hill to connect the existing “unofficial” trail to a proposed small rest area with park benches, assume a 3-ft wide trail with crushed rock or decomposed granite surfacing. Construction of this trail will involve grubbing of the existing vegetated surface and placing a layer of crushed rock or decomposed granite surfacing. No grading of the existing surface is anticipated.

For existing dirt trails on the top deck of West Hill, surfacing similar to the material selected for the new trails on West Hill would be placed on the trails.

6.4.13.4 Parcourse Stations on South Hill

For the exercise stations on the South Hill, the proposed site preparation includes concrete slabs. Image 29 on the next page shows several photos of HealthBeat® exercise stations.



Image 29. Examples of HealthBeat® exercise stations.

6.4.13.5 Shade Features and Picnic Tables

Concrete footings embedded 1-foot deep in the vegetative soil layer, with wide footprint for stability could be used as foundation for the shade features and picnic tables (See Images 30 and 31 on the next page).



Image 30. Examples of CoolToppers® shade features.



Image 31. Examples of DuMor® picnic tables.

6.4.14 Cost Evaluation

An order of magnitude cost evaluation for the construction of the Bike Skills Park, including Park Enhancement features, described in the previous sections, is presented in Table 5. Table 6 presents an order of magnitude cost estimate evaluation for the construction of the Park Enhancements only. Notes on the tables indicate the assumptions made to estimate the unit pricing and total quantities needed for each item on the tables.

The table below summarizes the estimated costs for the Bike Skills Park alternative.

Description	Bike Skills Park
Design, Management, and Inspection	\$432,822
Mobilization/Demobilization	\$82,442
Items Related to Bike Skills Park	\$308,700
Items Related to Park Enhancements	\$652,074
Items Related to Infrastructure	\$688,070
Construction Contract Contingency	\$164,884
Contingency	\$465,798
Total	\$2,794,791

The table below summarizes the estimated costs for the Park Enhancements alternative.

Description	Park Enhancements
Design, Management, and Inspection	\$338,518
Mobilization/Demobilization	\$64,480
Items Related to Park Enhancements	\$791,299
Items Related to Infrastructure	\$498,295
Construction Contract Contingency	\$128,959
Contingency	\$338,518
Total	\$2,160,070

7. INFRASTRUCTURE EVALUATION

7.1 General

This section addresses the Infrastructure element for the Sunnyvale Landfill Feasibility Study for Community Animal Farm and Alternative Recreational Land Uses. A review of the existing sewer, electrical and potable water network is presented, as well as a summary of the infrastructure enhancements needed to support the land use options under consideration. Infrastructure needs have been defined as the required improvements and enhancements to the existing infrastructure (i.e., water and sewer lines, electrical lines, roadways, etc.) to allow the operation of the proposed improvements in the landfill area.

7.2 Existing Infrastructure around Project Site

The nearest paved roads are described in the Transportation/ Circulation evaluation section of this report (i.e., Section 8). A brief overview of the existing access roads on the landfill is tabulated below:

Landfill	Surfacing	Does the Road Dead End?	Approximate Road Width	Sample Grades
South Hill	Gravel/unpaved	Yes	8-9 feet	11, 16, and 21 percent
West Hill	Gravel/unpaved	No	8-15 feet	6 and 8.5 percent
Recycle Hill	Gravel/unpaved	Yes	7-8 feet	15 and 18 percent

Based on John Carollo Engineers²⁴ (1988 Drawings) and on SCS Engineers²⁵ (2005 Drawings) the electrical, sewer, and water lines in the vicinity of the project are:

1. 39-inch diameter vitrified clay pipe (VCP) sewer north of South Hill (1988 Drawings).

²⁴ *Landfill Gas Control/Recovery System, City of Sunnyvale Landfill, Sunnyvale, California*, prepared for City of Sunnyvale, May 26, 1987.

²⁵ *Landfill Gas Condensate Collection, Return and Pre-Treatment System, City of Sunnyvale Landfill, Sunnyvale, California*, prepared for City of Sunnyvale, April 15, 2005.

2. Two 24-inch diameter VCP sewer West of South Hill and East of Recycle Hill (along Borregas Drive) (1988 Drawings).
3. 60-inch diameter reinforced concrete pipe (RCP) storm drain West of South Hill and East of Recycle Hill (along Borregas Drive) (1988 Drawings).
4. PG&E utilities (along Borregas Drive) (1988 Drawings).
5. 18-inch VCP sewer north of Recycle Hill (1988 Drawings).
6. 60-inch diameter VCP sewer north of Recycle Hill (1988 Drawings).
7. 33-inch diameter VCP sewer near Northwest corner of Recycle Hill (1988 Drawings).
8. 36-inch diameter VCP sewer South of the West Hill Landfill (along Caribbean Drive) (1988 Drawings).
9. 18-inch diameter VCP (abandoned) South of the West Hill Landfill (along Caribbean Drive) (1988 Drawings).
10. 60-inch diameter reinforced concrete pipe (RCP) storm drain South of the West Hill Landfill (along Caribbean Drive) (1988 Drawings).
11. Two water lines (unknown diameters) along the North side of Recycle Hill (2005 Drawings).
12. One recycle water line (unknown diameter) along the North side of Recycle Hill (2005 Drawings).
13. Three water lines (unknown diameters) West of South Hill and East of Recycle Hill (along Borregas Drive) (2005 Drawings).
14. One recycle water line (unknown diameter) West of South Hill and East of Recycle Hill (along Borregas Drive) (2005 Drawings).

7.3 Infrastructure Needs for Alternate Land Use Options

7.3.1 Roadway

For the feasibility study we assumed that infrastructure related to roads includes the minimum road width and cross section so that motorized vehicles can access the various hills. The landfills are currently accessible to motor vehicles and maintenance vehicles (e.g., construction equipment) used by landfill maintenance crews and contractors. The landfills are not accessible by motorized vehicles (e.g., cars, motorcycles, etc.) to

private users. Access to motorized vehicles to private users for some alternatives is being considered.

To evaluate the need for improvements, we looked at the surfacing, circulation pattern, road width, and grades. Another requirement that roadways need to consider is access to emergency vehicles. Some of the requirements listed in the City of Sunnyvale's Requirements for Fire Department Vehicle Access include: (i) a minimum clear width of 20 feet; if the access road is considered secondary, the width can be reduced if turnouts are installed every 500 feet; (ii) the grade cannot exceed 10 percent; (iii) if the road dead ends, additional width and turnaround provisions are required; (iv) the minimum vehicle weight to be considered is 75,000 pounds; and (v) the surface needs to be paved with asphalt, concrete, or other approved surface.

Based on information received from the City²⁶, the minimum width of pavement is 12 feet for a one-way loop with a turnaround at the top. Additional road width could be required for guardrail, shoulder/emergency lane, bicycle lane, turning radii, drainage ditch or curb, etc. We have assumed that only a guardrail and a drainage ditch will be needed. Adding the space for a guardrail and a perimeter drainage ditch to the minimum requested paved width of 12 feet, the minimum total width approaches 20 feet which agrees with the minimum clear width of 20 feet, stated by the City of Sunnyvale's Requirements for Fire Department Vehicle Access.

For the AAH and Sports Fields alternatives on the West Hill, we assumed a one-way loop using the existing road alignment. For the Bike Skills Park and the Park Enhancements on the West Hill, we assumed that no traffic by private motor vehicles would be allowed; therefore, no improvements to the existing roads would be needed.

For the Recycle Hill's Park Enhancements (including Dog Park) and for the South Hill's Park Enhancements, we assumed that no traffic by private motor vehicles would be allowed and no additional provisions for emergency vehicle access would be needed; therefore, no major improvements would be needed.

Based on the tabulation presented earlier, the West Hill road is between 8- and 15-feet wide. Since the minimum total width approaches 20 feet, the existing West Hill road would need to be widened between 5 to 12 feet for the AAH and Sports Field options. Furthermore, turnouts, which require widening, will be required based on the City of

²⁶ E-mail communication City of Sunnyvale to Crawford/Geosyntec on 30 August 2013.

Sunnyvale's Requirements for Fire Department Vehicle Access unless hydrants are located along the alignment²⁷. Road widening may require the addition of fill or excavation into the existing landfill (which requires re-construction of the final cover). To estimate volumes of fill and excavation requires formal design and grading plans which is not part of the current feasibility study; therefore, for the order-of-magnitude cost estimate, we assumed that approximately 5 cubic yards per foot of access road will be needed to widen the access road for both the AAH and the Sports Field Alternatives.

As described in previous sections of the document, a roadway cross section has not been designed. Roads are typically designed based on a traffic index (TI) or an equivalent single axle load (ESAL). Neither of these values has been developed for the project. However, Sunnyvale's Municipal Code, Section 16.52.190 requires the minimum TI to be 5.0. Using CALTRANS²⁸ we estimated that the equivalent ESAL was less than 10,000; therefore, we assumed an ESAL of 10,000 for the life of the facility. Chart solutions²⁹ suggest that a roadway cross section consisting of 4 inches of asphalt concrete over 8 inches of compacted aggregate base would be adequate. We have also included an 8 ounce nonwoven geotextile to separate the aggregate base from the existing vegetative layer. The above pavement cross section will need to be re-evaluated as part of the final design for the selected end use for the facility.

7.3.2 Utilities

As described earlier, the existing sewer and water lines in the vicinity of the project are VCP and RCP. Typically, these pipes have bell and spigot joints. For use in areas where settlements are expected, the joints may separate over time; therefore, we propose non-corrugated, high density polyethylene (HDPE) pipes with welded joints for the sewers and for water supply³⁰. HDPE pipe is used in above-ground and buried applications at landfills.

For the AAH and the Sports Field alternatives on the West Hill, the following utilities are assumed:

²⁷ E-mail communication City of Sunnyvale to Crawford/Geosyntec on 30 August 2013.

²⁸ See section 602.4 Traffic Index in Caltrans *Highway Design Manual*, 20 December 2004.

²⁹ *Thickness Design – Asphalt Pavements for Highways and Streets*, Manual Series No. 1 (MS-1), Asphalt Institute, October 1984.

³⁰ The use of HDPE pipe and the assumed diameter for buried potable water lines that supply firefighting needs to be confirmed by the City of Sunnyvale's Fire Department.

- Sewer: 6 inches and 8 inches in diameter (depending on location), non-corrugated, SDR 26³¹ high density polyethylene (HDPE) pipe with fusion-welded joints in general accordance with AWWA C906-99³².
- Potable water: 6 inches in diameter³³, non-corrugated, SDR 11 HDPE pipe with fusion-welded joints in general accordance with AWWA C906-99³⁴.
- Electrical conduit: 4 inches in diameter³⁵, non-corrugated, HDPE SDR 17 HDPE pipe conduit with fusion welded joints.

Sewers are typically designed for flow velocities greater than 2 feet per second to prevent settling of solids³⁶ and have a minimum slope of 2 percent. Another variable that needs to be considered is the flow that needs to be carried by the pipe. We have assumed that the sewer would need to accommodate a flow of approximately 0.3 cubic foot per second (cfs) from: (i) public restroom area consisting of four wash sinks (men and women), two urinals (men), one service sink, six water closets (two men, four women), and four water fountains; (ii) caretaker/maintenance area facilities³⁷; and (iii) a peak demand of two times the average flow³⁸. The above assumptions will need to be confirmed as part of final design.

³¹ SDR based on *City of Sunnyvale Wastewater Collection System Master Plan, Technical Memorandum #8, Final*, prepared by Infrastructure Engineering Corporation (Poway, CA), August 2013 provided in E-mail communication to Geosyntec on 25 October 2013.

³² *Guidance Memo No. 2003-02: Guidance Criteria for the Separation of Water Mains and Non-Potable Pipelines*, State of California, Department of Health Services, 14 April 2003.

³³ E-mail communication City of Sunnyvale to Geosyntec on 25 October 2013 regarding fire hydrants.

³⁴ *Guidance Memo No. 2003-02: Guidance Criteria for the Separation of Water Mains and Non-Potable Pipelines*, State of California, Department of Health Services, 14 April 2003.

³⁵ See http://ecityhall.sunnyvale.ca.gov/cd/i_electrical.aspx. The minimum size conduit in the City of Sunnyvale is 1-3/4 inches based on the 2010 California Electrical Code.

³⁶ *City of Sunnyvale Wastewater Collection System Master Plan, Technical Memorandum #8, Final*, prepared by Infrastructure Engineering Corporation (Poway, CA), August 2013.

³⁷ The assumption is that both the Sports Field and the AAH alternatives will need sewage service for maintenance activities. The estimated sewage volume assumes that AAH will not require additional sewage service for their animals; animal care facilities require special evaluation that is beyond the scope of our evaluation. The above assumptions will need to be confirmed for final design.

³⁸ *City of Sunnyvale Wastewater Collection System Master Plan, Technical Memorandum #8, Final*, prepared by Infrastructure Engineering Corporation (Poway, CA), August 2013. Average flow estimated using Drainage Fixture Unit Value (DFU) method in 2010 California Plumbing Code.

For the AAH alternative, available information for the area adjacent to the West and Recycle Hills indicate that the nearest water line connection point is located at a distance of approximately 2,200 feet from the proposed restroom at the top of the landfill. Similarly, the nearest sewer and electrical lines are located approximately 2,400 and 3,450 feet away, respectively. An additional 450 feet of sewer pipe will be needed from the bathroom located at the northwest corner of Recycle Hill to the nearest existing line.

For the Sports Fields alternative, available information for the area adjacent to the West and Recycle Hill indicate the nearest water line connection point would be located at a distance of approximately 1,700 feet from the proposed restroom location at the top of the landfill. Similarly, the nearest sewer and electrical lines are located approximately 1,950 and 4,950 feet away, respectively. Our estimated length for electrical piping includes approximately 2,100 feet in order to provide electricity to the light poles along the top deck. An additional 450 feet of sewer pipe will be needed from the bathroom located at the northwest corner of Recycle Hill to the nearest existing line.

For the Bike Skills Park alternative on the West Hill, potable water was assumed to be needed at the top of the hill for dust control purposes and at the northwest corner of Recycle Hill for a drinking fountain; for reference, this is the same drinking fountain as included in the Park Enhancements alternative. The potable water line was assumed to be 6 inches in diameter, SDR 11 HDPE pipe with fusion-welded joints in general accordance with AWWA C906-99. Available information for the area adjacent to the West and Recycle Hills indicate that the nearest water line connection point is located at a distance of approximately 1,900 feet (this includes approximately 100 feet of piping from the proposed drinking fountain to the nearest existing line).

Electricity or sewer facilities were assumed not to be needed for the Bike Skills Park alternative on the West Hill nor for any of the Park Enhancements for the West Hill, Recycle Hill (including Dog Park), and South Hill.

For the Park Enhancements alternative on the West Hill, Recycle Hill (including the Dog Park), and South Hill access to potable water was assumed on the Northeast corner at the bottom of Recycle Hill. The potable water line was assumed to be 6 inches in diameter, SDR 11 HDPE pipe with fusion-welded joints in general accordance with AWWA C906-99.

Available information for the area adjacent to the Recycle Hill and West Hill indicates that the nearest water line connection point is located at a distance of approximately 100

feet from the proposed drinking fountain at the bottom of the landfill. Utilities needed for the proposed restroom located at the northwest corner of Recycle Hill are described in Section 7.3.3.

Typically, utilities have manholes or pull boxes every 100 to 300 feet; manholes require space and excavation. Therefore, based on the alignment, excavation of the landfill's final cover system is expected at some locations. The above pipe/conduit sizes will need to be re-evaluated as part of final design selected end use for the facility. For cost estimating purposes, we have assumed that the contingency in our order-of-magnitude cost estimate will address the manholes and connections.

Maintenance of the utilities constructed over waste will be required because of the long-term settlement. To address settlement for utility connections to structures, flexible connections will need to be installed. To address settlement along the pipes that may cause sags and affect the joints, we assumed that the pipes would have welded joints; however, over the long-term, the sag may become unacceptable and sections of pipes will need to be maintained or replaced.

To allow each pipe to be maintained independently, a minimum separation between the pipes will need to be assumed. Furthermore, based on requirements from the State of California's Department of Health Services³⁹, the minimum required separation between pipes in areas where pipes are below ground, is between 3 and 9 feet plus 1 foot additional from the edge of the pipe. The separation requirements also need to address the installation of water mains near potential contamination sources such as solid waste disposal sites. Based on the above requirements, for the order-of-magnitude cost estimate, we assumed that the pipes would be installed in individual trenches, and that the minimum depth of burial will be 2 feet below the finish ground surface. So that the existing final cover is not damaged, the areas where the utilities are proposed may need to be built up; alternatively, excavation and reconstruction of the low permeability soil layer will be required.

For cost estimating purposes, we assumed that the utility trenches would be backfilled with controlled low strength material (CLSM) or flowable fill and that the trench dimensions would be as tabulated below.

³⁹ *Guidance Memo No. 2003-02: Guidance Criteria for the Separation of Water Mains and Non-Potable Pipelines*, State of California, Department of Health Services, 14 April 2003.

Pipe	Diameter (inches)	Trench Depth (feet)	Trench Width (feet)
Electrical	4	2.5	1.0
Sewer (West Hill – only)	6	5.83 ⁴⁰	2.0
Sewer (Along Road North of Recycle Hill)	8	6.0 ⁴¹	2.5
Potable Water	6	3.5	2.0

7.3.3 Restrooms and Water Fountains

For the AAH and Sports Fields alternatives, restrooms are proposed at the top of the West Hill landfill; the features have been described earlier in this report⁴².

For the Bike Skills Park and the Park Enhancements alternatives (including the Dog Park) in West Hill, Recycle Hill, and South Hill, a full restroom with water fountains is proposed at the northwest corner of Recycle Hill. Electricity, sanitary sewer, and potable water will be needed. The assumed features for this restroom are the same as for the AAH and Sports Fields restroom described earlier in this report; therefore, we have assumed that the sewer, electric, and potable water needs will be the same as those described earlier for estimating the sewer needs for the AAH and Sports Fields alternatives.

If the City elects to construct the AAH or the Sports Field alternative on the West Hill and the Park Enhancements (including Dog Park on Recycle Hill) on Recycle Hill and South Hill, we have assumed that the last portion of sewer would need to accommodate approximately 0.6 cfs (i.e., 0.3 cfs from the West Hill facilities and 0.3 cfs from the Recycle Hill restroom). Minor additional lengths of water and electrical lines will also be needed.

⁴⁰ 5 feet minimum cover (see *City of Sunnyvale Wastewater Collection System Master Plan, Technical Memorandum #8, Final*, prepared by Infrastructure Engineering Corporation (Poway, CA), August 2013) plus 0.33 foot pipe bedding plus pipe diameter.

⁴¹ 5 feet minimum cover (see *City of Sunnyvale Wastewater Collection System Master Plan, Technical Memorandum #8, Final*, prepared by Infrastructure Engineering Corporation (Poway, CA), August 2013) plus 0.33 foot pipe bedding plus pipe diameter.

⁴² The areas shown for the bathrooms on the layout figures are not the areas of the proposed buildings.

Based on available information for the area adjacent to Recycle Hill, the nearest utility connections points would be as follow: approximately 450 feet to the closest sewer line (due East), approximately 100 feet to the closest water line (due East); and approximately 700 feet to the closest electrical line (due East).

7.4 Cost Evaluation

Costs for utilities and other infrastructure elements for each alternative land use evaluated as part of this study have been included in the individual order of magnitude cost estimates for each alternative. Infrastructure costs for the AAH facilities have been included on Table 3. Table 4 includes infrastructure costs associated with the Baseball/Soccer fields. Tables 5 and 6, include the costs of infrastructure elements for the Bike Skills Park and Park Enhancements land use options, respectively. The table below summarizes the estimated infrastructure costs for the various alternatives (without design, management, and inspection; mobilization and demobilization; and contingencies).

Infrastructure Costs for Alternative	Costs
AAH with Park Enhancements	\$2,225,807
Sports Fields with Park Enhancements	\$2,318,082
Bike Skills Park with Park Enhancements	\$652,074
Park Enhancements	\$498,295

8. TRANSPORTATION/CIRCULATION EVALUATION

8.1 Existing Transportation/Circulation Network around Project Site

8.1.1 General

As part of the study, a conceptual evaluation of the existing transportation/circulation features within the vicinity of the project site was performed. The following sections describe the existing transportation, roadway, pedestrian and bicycle network, and existing parking facilities, as well as a summary of the access and parking needs to support each of the proposed alternative land use options evaluated.

8.1.2 Public Roadway Access

Public roadway access to the Sunnyvale Landfill is provided via Borregas Avenue through the site entrance at the intersection of Borregas Avenue and Caribbean Avenue (see Figure 15). This site entrance also serves as roadway access to the Sunnyvale Water Pollution Control Plant (WPCP), the reclaimed water facility, a public access point for the San Francisco Bay Trail (Bay Trail), the levees located north of the landfill, the Household Hazardous Waste Event Site (HHW Event Site) at Recycle Hill (where monthly household hazardous waste recycling events are held), the SMaRT Station Disposal & Recycling Center, and the concrete recycling facility on East Hill. Visitors driving to Sunnyvale Landfill who wish to park and use the trails and open-space amenities at the site enter through the main entrance at the intersection of Borregas Avenue and Caribbean Drive, go north to the intersection with Carl Road, turn left and continue to the public parking area at the end of the road. Visitor parking is discussed further in the Parking section below.



Image 32. Site entrance on Borregas Avenue. (View north from intersection of Borregas Avenue and Caribbean Drive.)

There is no public roadway access to Sunnyvale Landfill other than through the Borregas Avenue entrance. Gates to the Santa Clara Valley Water District (SCVWD) levees along West Sunnyvale Channel and the gates to the landfill hills are locked for authorized vehicular access only.

8.1.3 Pedestrian/Trail Access

Pedestrian access to the Sunnyvale Landfill is currently available at the locations listed below.

1. Connections from the San Francisco Bay Trail on the north side of Sunnyvale Landfill at two locations: at a footbridge near the northwest corner of West Hill (see Figure 16) and at the Bay Trail access point at the bridge over West Sunnyvale Channel, near the public parking area at the northwest corner of Recycle Hill (see Figure 15). The location of Sunnyvale Landfill with respect to the regional Bay Trail system is shown on Figure 17. To the west, the Bay Trail connects with Shoreline Park in Mountain View and to the east the Bay Trail connects with Sunnyvale Baylands Park.



Image 33. Footbridge connection to the Bay Trail and signage near the northwest corner of West Hill.



Bay Trail signage

Image 34. Connections from the Bay Trail at bridge over West Sunnyvale Channel.



Image 35. Bay Trail access point and signage (see arrow in picture above).

2. Sidewalk along the west side of the Borregas Avenue entrance (see Figure 15). Marked crosswalks provide access to this sidewalk from the intersection of Borregas Avenue and Caribbean Drive.

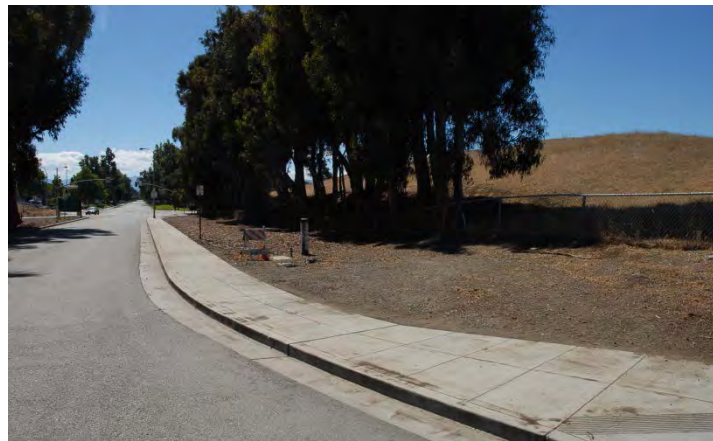


Image 36. View south along sidewalk to intersection of Borregas Ave and Caribbean Drive. (Recycle Hill is on the right side of the photo.)

3. Trail access points (openings in the perimeter fence) to South Hill trails at the southwest corner of South Hill at the intersection of Borregas Avenue and Caribbean Drive, and on the southeast corner of South Hill, along Borregas Avenue between Geneva Drive and Crossman Avenue (see Figure 16).



Image 37. Trail access at Southwest corner of South Hill. (Adjacent to intersection of Borregas Avenue and Caribbean Drive.)



Image 38. Trail access at Southeast corner of South Hill. (On north side of Borregas Avenue.)

4. Through openings at gated access points to the levees along West Sunnyvale Channel (see Figures 15 and 16). Hikers and runners from the office building areas south of the site and levees along the West Sunnyvale Channel south of the site use these openings as access points to the levees, landfill trails, and the Bay Trail.



Image 39. Gate to Caribbean Drive, at south end of SCVWD levee on west side of West Sunnyvale Channel.

5. From a public sidewalk along the western side of West Caribbean Drive adjacent to the YAHOO! campus (see Figure 16). This sidewalk connects to a pedestrian footbridge at the southwestern corner of West Hill. This sidewalk also provides pedestrian access from a Bay Trail parking area provided by YAHOO! (discussed further in the Parking section below).



Image 40. *Pedestrian footbridge connection to public sidewalk and YAHOO! parking lot.*

On site, there are no direct, formal trail connections between West Hill, Recycle Hill, and South Hill. Of the three hills, West Hill has the most extensive trail network, with connections to off-site as well as on-site access points. West Hill is also directly accessible from the on-site public parking area to the north of Recycle Hill. Recycle Hill has no formal pedestrian access point. There is a perimeter chain-link fence around most of the perimeter of Recycle Hill on its north, east and south sides, with no trail access points. On the west side of Recycle Hill there is “unofficial” pedestrian access around the gate and fence onto the SCVWD levee on the east side of West Sunnyvale Channel and onto the maintenance road on Recycle Hill.



Image 41. Access around gate onto SCVWD levee. (Recycle Hill is on the background.)

Other than the maintenance road, there are no trails on Recycle Hill. Access between the three hills is limited because of the lack of convenient trail access points.

One of the purposes of this feasibility study is to provide suggestions as to how to better connect the existing, and proposed future, trails at the hills. Options for adding trails and trail connection points to West Hill, Recycle Hill, and South Hill are proposed as part of the Park Enhancements land use option in this study.

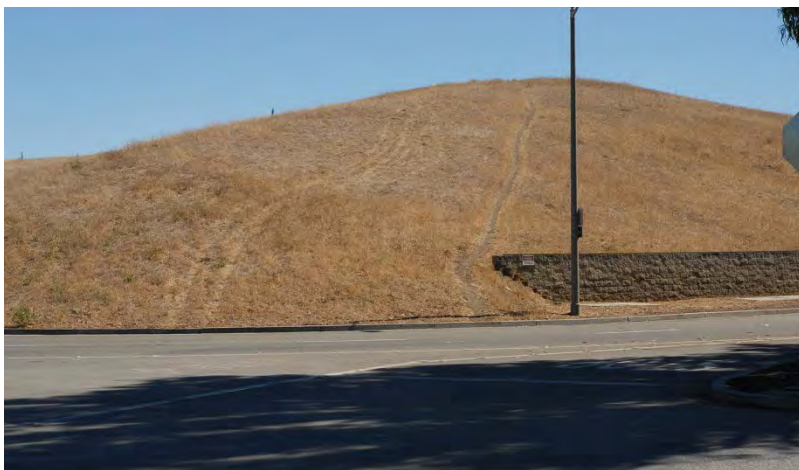


Image 42. “Unofficial” trail access point at the Northwest corner of South Hill.

8.1.4 Bicycle Access

Bicycle access to the Sunnyvale Landfill is available at the locations listed below:

1. Bicyclists using public roadways could access the site through the main site entrance at the intersection of Borregas Avenue and Caribbean Drive and from bike lanes along Borregas Avenue and Caribbean Drive. However, the on-site roadways are not striped with bike lanes and bike racks are not provided at the public parking area.
2. Bicyclists using the Bay Trail could access the site through the Bay Trail connection points discussed above in the Pedestrian / Trail section.

As discussed above in the Pedestrian / Trail section, West Hill has the most extensive trail network with connections to off-site as well as on-site access points and is more heavily used by bicyclists than Recycle or South Hill.

8.1.5 Public Transportation Access

There are no Valley Transportation Agency (VTA) public bus stops in the immediate vicinity of the site entrance (at the intersection of Borregas Avenue and Caribbean Drive), nor on Caribbean Drive along the entire frontage of the landfill site. The closest bus stop is located approximately 2,000 feet south at the intersection of Borregas Avenue and Java Drive.

The closest connection to a VTA light rail station is also at the intersection of Borregas Avenue and Java Drive.

8.1.6 Existing Parking

There are currently fourteen marked parking spaces (including one designated handicapped parking space) located at the designated public parking area north of Recycle Hill and east of West Hill. These spaces are available for visitors to the Sunnyvale Landfill and The Bay Trail. Other users of these spaces include visitors and personnel for the monthly household hazardous materials drop-off at the facility at Recycle Hill and by hunters, fishermen, and others accessing properties north of the landfill.

Visitors also frequently park along the north side of the HHW Event Site at Recycle Hill (see “Unmarked Parking Areas” on Figure 15). This side of the access road is not

striped or signed for parking but there is room for approximately eight cars along this side of the road.



Image 43. View east from West Hill (Recycle Hill is on the right; designated public parking area and portable restroom are in foreground.) Unmarked parking area is on the right side of the lane to the right of the traffic islands, in front of the HHW Event Site. Striped parking spaces to the left of the traffic islands are signed as Employee Parking Only (WPCP).

Based on an existing cooperative agreement between the City of Sunnyvale and YAHOO! dated 4 February 2003, additional parking spaces are available to the public at 701 First Avenue, a property owned by YAHOO!. The YAHOO! parking spaces were made available to allow public access to the San Francisco Bay Trail. See Figure 4 for the location of the Bay Trail parking area at YAHOO!. There appear to be seventeen spaces allocated for public Bay Trail parking. There is no known available usage information for this Bay Trail parking area at YAHOO!.

8.1.7 Existing Parking Demand

Our understanding is that the available public parking (the 14 marked spaces) provided at the site is insufficient for existing demand by visitors to the Sunnyvale Landfill and the Bay Trail, visitors and personnel for the monthly household hazardous materials

drop-off at the facility at Recycle Hill, and by hunters, fishermen and others accessing properties north of the landfill.

We understand from anecdotal input from the public at the first community meeting that at times all the spaces in this public parking area and along the curb in front of the Household Hazardous Waste Event Site are filled and that anyone else wanting to park and visit the site has to find parking somewhere else off-site or come back at times of less usage. At the times of the monthly household hazardous materials drop-off events, it is apparently difficult for the open-space and Bay Trail users to find any parking at all onsite. And during the hunting season, hunters fill many of the spaces starting early in the morning, thus taking up spaces that would otherwise be available to the open space and Bay Trail users during the day.

8.2 Potential On-Site Parking Enhancements

8.2.1 Small Parking Lot along Borregas Avenue

The area between the sidewalk along the west side of Borregas Avenue and the eastern fence line at Recycle Hill may be suitable for an additional public parking lot. The distance between the curb and fence line is approximately 21 – 22 feet. It is estimated that a small paved parking lot with six to seven spaces (with a minimum drive aisle width of 12 feet, parking space width of 8.5 feet, and a parking bay length of 29 feet, per City of Sunnyvale parking lot design guidelines) could fit in this area (see picture below). The drive aisle would be located on the west side of the sidewalk, with an entry just beyond the landfill gas collection system components in the foreground of the picture. Parallel parking spaces would be located along the fence line. The drive aisle exit could be located near the light pole at the far end of the sidewalk. A traffic study of this proposed parking lot on existing traffic patterns would need to be conducted.



Image 44. Area for possible additional parking lot along west side of Borregas Avenue, between sidewalk and fence line along Recycle Hill.



Image 45. Potential alignment of additional parking along Borregas Avenue.

8.2.2 After-Hours Use of WPCP Employee Parking

If some, or all, of the spaces designated as Employee Parking Only on the north side of the site access road adjacent to the WPCP were made available for public use after

hours that would add up to twenty nine additional spaces for after hours and weekend parking.

8.3 Transportation/Circulation Needs for Alternate Land Use Options

For the Baseball / Soccer Field facility, the City estimated that approximately 100 spaces in a parking lot at the top of West Hill would be adequate to serve the facility.

For the AAH facility, the conceptual layout includes a parking area with an area of approximately 11,450 square feet (sq. ft.) Assuming 20% of the that area would be required for drive-through lanes, an area of 9,160 sq. ft. would be available for parking. At an assumed parking space requirement of 360 sq. ft. per space for automobile parking, we estimate that there would be sufficient parking for 1 school bus, two handicapped spaces, and approximately fifteen to seventeen automobiles. Based on our understanding of the estimated parking needs for AAH, this parking area should be sufficient for this conceptual evaluation.

For the Bike Skills Park, the Park Enhancements, and Open-Space areas, the City recommended using a guideline of one parking space per 2,500 to 5,000 sq. ft. for developed park areas (Bike Skills park, Dog Park, parcourse stations, benches, picnic areas, etc.) and one space per five acres for undeveloped open-space areas.

A summary of the vehicular, pedestrian, and bicycle access and parking needs for the land use options under consideration in this study is shown on Table 7. West Hill options and needs are shown on page one of Table 7 and Recycle Hill and South options and needs are shown on page two of Table 7. Calculations for the parking needs “off hill” (or, at the bottom of the hill) for each of the four study options are presented in Tables 8 - 10. These calculations are for the parking needs for the developed park areas and undeveloped open-space areas of each option, using the guidelines recommended by the City as discussed above, and do not include the spaces that would be included at the top of West Hill for the AAH and Baseball / Soccer field facilities. A summary of the off-hill parking needs by study option is presented below.

	Number of Off-Hill Parking Spaces Needed
AAH and Park Enhancements Option	21 - 33
Bike Skills Park and Park Enhancements Option	37 - 63
Baseball / Soccer Field and Park Enhancements Option	23 - 38
Park Enhancements Option	24 - 38

Bicycle spaces would also need to be provided in parking areas at the site. The City guideline for providing bicycle parking spaces for non-residential developments is that the number of bicycle spaces should be calculated as 5% of the total number of vehicular spaces provided.

9. ENVIRONMENTAL REVIEW

9.1 General

Possible environmental issues that will need to be addressed, and process recommendations, should the City choose to move forward with end-use projects evaluated as part of the Sunnyvale Landfill feasibility study are discussed in this section.

9.2 Potential Exposure to Landfill Materials and Gas

The City should evaluate potential exposure to landfill materials and landfill gas for:

- Construction-related activities associated with development of any of the four study options, and
- Potential exposures to users of the existing and proposed open-space and recreational facilities.

9.2.1 Construction-Related Activities

For planned construction activities that penetrate or remove the clay layer of the landfill cap, or that involve replacement or modifications to existing landfill monitoring and control facilities, the City would need to:

- Evaluate potential health hazards associated with potential exposures to landfill gas, landfill gas condensate, groundwater, leachate, and/or landfill materials, as applicable to the planned activities,
- Prepare/adhere to Site Specific Health and Safety plans,
- Prepare/adhere to construction management and monitoring plans, and
- Prepare/adhere to waste handling and disposal plans, as necessary.

Construction related activities expected to require plans to address such potential exposures are listed below by study option.

Animal Assisted Happiness (AAH)

- For the fence posts, if using a construction approach that involves installation of footings through the clay and foundation layers.

- Installation of anchors for structures (if the structures are not placed on concrete slabs), which would require cutting through the landfill cap.
- Installation of utility lines if the lines are placed in a utility corridor that requires excavation and replacement of the landfill cap along the corridor alignment.
- Any improvements or widening of the access road that would require cutting through the landfill cap.

Sports Fields

- Removal and replacement of the landfill cap, excavation and handling of landfill waste, in a portion of the top deck of West Hill
- Decommissioning and relocation of landfill gas extraction wells and piping and other landfill monitoring and control facilities on the top deck and sideslopes of West Hill.
- Installation of utility lines if the lines are placed in a utility corridor that requires excavation and replacement of the landfill cap along the corridor alignment.
- Any improvements or widening of the access road that would require cutting through the landfill cap.
- For the light poles, installation of deep foundations through the landfill cover.

Bike Skills Park

- For the fence posts, if a security fence is installed and if using a construction approach that that involves installation of footings through the clay and foundation layers.
- Installation of utility lines if the lines are placed in a utility corridor that requires excavation and replacement of the landfill cap along the corridor alignment.

Park Enhancements (including Dog Park)

- For the fence posts, if using a construction approach that that involves installation of footings through the clay and foundation layers.

Also, to address potential impacts to surface water during construction activities for projects involving land disturbance equal to or greater than one acre, a construction storm water pollution and prevention plan may need to be implemented.

9.2.2 Potential Exposure to Users

Exposures of landfill gas or landfill gas condensate to users of the open space and recreational areas at the landfill could result from accidental releases from the landfill gas extraction and conveyance facilities. Thus, isolation of these facilities from users is recommended through the use of physical barriers such as fenced enclosures around well heads and other exposed landfill gas collection system components, and institutional controls such as signage restricting access to such areas.

Accumulation of landfill gas at potentially explosive concentrations could occur in structures or paved areas if they are not adequately protected through active or passive venting systems below and/or inside the structures and continuously monitored through the use of gas sensors. Potential accumulation of landfill gas could be mitigated through the use of open-air structures, raised structures, installation of venting systems beneath building slabs and paved areas (where used) and/or within the structures. Such mitigation and monitoring features are reviewed in the draft Constructability memo for this project.

9.3 Potential Environmental Impacts and Exposures from Proposed End-Use Facilities

Potential environmental impacts and exposures from the proposed end-use facilities, operations, and activities could result from leaks or spills of chemicals, process / wash water, or other waste materials, or operations or activities that damage the function or integrity of the landfill cap or landfill gas collection system components. Potential sources or causes of impacts and exposures are listed below.

Animal Assisted Happiness (AAH)

- Storage and use of fuels and fluids for farm equipment, machinery, and vehicles.
- Wash water for farm equipment, machinery, and vehicles.
- Over-watering for dust control or irrigation, if used, in pasture areas.
- Accidental releases or spills from delivery vehicles, waste collection vehicles, or visitor/employee vehicles.
- Potential damage / erosion to the vegetative soil layer of the landfill cap through overgrazing or rutting from animals in the pasture areas, or through rutting from use of farm equipment and vehicles.

- Potential impacts to surface water runoff from operational activities, vehicles, and animal waste.
- Potential leakage from or exposure to sanitary lines, water supply lines, or power lines if connections or lines are damaged due to differential settlement over time.

Sports Fields

- Storage and use of fuels and fluids for maintenance equipment and vehicles.
- Wash water for maintenance equipment and vehicles.
- Potential leakage of surface water from the drainage layer beneath the artificial turf, if the drainage layer is damaged due to differential settlement over time.
- Accidental releases or spills from delivery vehicles, waste collection vehicles, or visitor/employee vehicles.
- Potential impacts to surface water runoff from operational activities and vehicles.
- Potential leakage from or exposure to sanitary lines, storm water conveyance lines, water supply lines, or power lines if connections or lines are damaged due to differential settlement over time.

Bike Skills Parks

- Potential leakage or exposures from water supply line if connections or lines are damaged due to differential settlement over time.
- Over-watering for dust control.
- Accidental releases or spills from maintenance or waste collection vehicles.
- Potential damage / erosion to the vegetative soil layer of the landfill cap through development of unauthorized bike trails in open-space areas.

Park Enhancements

- Accidental releases or spills from maintenance or waste collection vehicles.
- Over-watering for irrigation, if used, such as to establish plantings in habitat enhancement or landscaped areas.

- Potential damage / erosion to the vegetative soil layer of the landfill cap through development of unauthorized bike or pedestrian trails in open-space areas.

The potential impacts and exposures listed above could be addressed and monitored through the implementation of facility and operations management plans, settlement monitoring, storm water pollution and prevention plans, and implementation of engineering and institutional controls to keep pedestrians and bicyclists on authorized trails.

Private entities with operations on the landfill, such as the proposed AAH operations, may need to address Proposition 65 noticing requirements if they expose individuals to listed chemicals, or discharge listed chemicals.

9.4 Small Particle (PM-2.5) Generation

Any proposed additional recreational uses would need to be evaluated with respect to conformance with City of Sunnyvale goals or policies for minimizing dust generation, specifically small particle PM-2.5 generation (PM-2.5 consists of particles 2.5 microns or smaller in diameter). Thus, constructing additional gravel-surfaced trails, roads or parking areas, or adding uses with the potential to generate dust should be evaluated with respect to small particle PM-2.5 generation. Implementation of additional dust control measures to minimize airborne small particle generation may be required.

9.5 Environmental Permitting

As discussed in the draft Analysis of Issues, Constraints, and Opportunities memo, any new post-closure land uses for the Sunnyvale Landfill, other than non-irrigated open space, would need to comply with the post-closure land use regulations of CCR Title 27 Section 21190. Any proposed land uses for the site other than non-irrigated open space would need to be submitted to the Regional Water Quality Control Board (RWQCB) San Francisco Region, the local enforcement agency (LEA) (the Santa Clara County Department of Environmental Health), the local air district (Bay Area Air Quality Management District) and the local land use agency (City of Sunnyvale Department of Community Development).

We believe it is technically feasible to address the post-closure land use regulations of CCR Title 27 Section 21190 for the four study options evaluated in this study using approaches such as those discussed in our draft Constructability memo.

However, we recommend that the City review the conceptual end-use options and the related constructability issues with the LEA and RWQCB before entering the final review and selection process for the four study options. We advise engaging the LEA and RWQCB in a discussion about the options being considered in order to determine any specific concerns or issues they may have for conceptual level approval of the proposed end-uses and to confirm the anticipated permitting and approval process.

The California Environmental Quality Act (CEQA) requires public agencies in California to analyze and disclose potential environmental impacts associated with a project that the agency will carry out, fund, or approve. Such potential impacts would include, for example, those related to burrowing owl habitat impacts, other wildlife and habitat impacts, lighting, and traffic. If the City chooses to move forward with any of the four study options reviewed for this feasibility study, the City will need to address CEQA permitting requirements. To proceed with construction of the project, the City would need to then address any impacts or mitigations that are identified.

10. SUMMARY AND FUTURE WORK

10.1 Summary of Alternative Land Use Evaluation

After iterative discussions and review with the City, it was decided that in addition to evaluating the feasibility of establishing the Animal Assisted Happiness operations at the landfill, three other alternative land uses would also be evaluated. The City decided that high-, mid- and low-intensity uses of the site should be evaluated as follows:

- High-intensity use: A sports facility with combined baseball/soccer fields.
- Mid-intensity use: a Bike skills park.
- Low-intensity use: Park Enhancements, including a combination of open space, habitat enhancements and a dog park.

The alternative land use options that were evaluated for each of the landfill hills are shown below. West Hill, the hill with the largest area on the top deck, was considered as the location for the AAH, baseball/soccer field, and bike skills park alternatives.

	West Hill	Recycle Hill	South Hill
Option 1	AAH (and Park Enhancements)	Park Enhancements (including Dog Park)	Park Enhancements
Option 2	Baseball/Soccer Field (and Park Enhancements)	Park Enhancements (including Dog Park)	Park Enhancements
Option 3	Bike Skills Park (and Park Enhancements)	Park Enhancements (including Dog Park)	Park Enhancements
Option 4	Park Enhancements	Park Enhancements (including Dog Park)	Park Enhancements

The intent of the facility and feature layouts that we prepared for each study option was to provide configurations that could be used for our conceptual-level feasibility evaluations of the proposed AAH and recreational uses that could potentially be developed at the landfill. The facility and feature layouts are not intended to represent a specific, recommended design, but rather, a starting point for consideration of what uses, features, and facilities would work within the constraints and opportunities afforded at the site. The exact locations of features and structures, and size and location of the footprints for the different facilities evaluated could be refined and adjusted based on the City's preferences during planning and design stages.

10.2 Future Studies

To move forward with any of the uses evaluated for this feasibility study, the City would need to address the constraints reviewed in this study and would need to undertake a number of studies for design and permitting purposes. Additional studies needed, as reviewed in this report, are summarized below.

10.2.1 **Parking/Traffic**

Existing parking available for visitors to the Sunnyvale Landfill and The Bay Trail at the site is limited and would be insufficient for the demand for any of the study options evaluated. There are only about twenty-two parking spaces currently available (fourteen marked spaces and space for about eight vehicles in unmarked curb areas). Using a guideline of one parking space per 2,500 to 5,000 sq. ft. for developed park areas (Bike Skills park, Dog Park, parcourse stations, benches, picnic areas, etc.) and one space per five acres for undeveloped open-space areas, the estimated parking needs “off-hill” (not provided in parking lots at the top of West Hill, as considered for the AAH and Baseball / Soccer field) for the study options are:

Options	Number of Off-Hill Parking Spaces Needed
AAH and Park Enhancements Option	21 - 33
Bike Skills Park Enhancements Option	37 - 63
Baseball/Soccer Field and Park Enhancements Option	23 - 38
Park Enhancements Option	24 - 38

An additional six to seven spaces may fit in an area between the sidewalk along the west side of Borregas Avenue and the eastern fence line at Recycle Hill. That would bring the number of available spaces to twenty-nine, still not enough to meet demands shown above. Up to twenty-nine additional spaces could be provided for after-hours use if spaces designated as Employee Parking Only for the WPCP were made available for public use after hours. That would bring the total to 58 spaces available after business hours and on weekends.

In addition, promoting the use of the YAHOO! parking available nearby could help alleviate some of the on-site parking demand for Bay Trail users.

Traffic and parking studies would need to be performed to verify the ability to add more on-site parking as reviewed herein.

10.2.2 Environmental

Possible environmental issues that will need to be addressed should the City choose to move forward with end-use projects evaluated as part of this feasibility study include:

- Potential Exposure to Landfill Materials and Gas
- Potential Impacts from Proposed End-Use Facilities
- Small Particle (PM-2.5) Generation
- Environmental Permitting

The City should evaluate potential exposure to landfill materials and landfill gas for:

- Construction-related activities associated with development of any of the four study options, and
- Potential exposures to users of the existing and proposed open-space and recreational facilities.

The City should evaluate potential environmental impacts and exposures from the proposed end-use facilities, operations, and activities that could result from leaks or spills of chemicals, process / wash water, or other waste materials, or operations or activities that damage the function or integrity of the landfill cap or landfill gas collection system components.

The City would need to evaluate any proposed additional recreational uses with respect to conformance with City of Sunnyvale goals or policies for minimizing dust generation, specifically small particle PM-2.5 generation.

If the City chooses to move forward with any of the four study options reviewed for this feasibility study, the City will need to address CEQA permitting requirements. To proceed with construction of the project, the City would need to then address any impacts or mitigations that are identified. Such potential impacts would include, for example, those to burrowing owl habitat, other wildlife and habitats, lighting, traffic, public safety, and emergency response.

10.3 Recommendations

10.3.1 Baseball/Soccer Field Recommendations

We believe it is technically feasible to design and construct each of the four study options evaluated in this study in a manner that could address post-closure land use regulations of CCR Title 27 Section 21190.

However, we do not recommend pursuing the Baseball/Soccer Field option, or another sports field option that would require similar construction considerations. The premium to develop that type of facility at the Sunnyvale Landfill would be significant, with a substantially higher cost per user to design, permit, build, and maintain than if it were built on native ground. One of the most difficult aspects to quantify and predict for design of such a facility at the landfill would be the location and amount of total and differential landfill settlement that would occur post-construction, and how settlement might affect the ability to maintain, adjust, and repair utility lines, utility connections, roadway and parking lot surface, playing field surfaces and drainage systems, structural foundations, and the engineered landfill cover. While it is possible to design mitigative features for those systems, and while some of the same types of concerns exist for elements of the other study options, the potential for settlement damage is greater with the sports field option because of the amount of cut and fill that would be required, and the necessity to build and maintain a large flat playing field surface.

10.3.2 Environmental Permitting

While we believe it is technically feasible to address the post-closure land use regulations of CCR Title 27 Section 21190 for the four study options evaluated in this study, using approaches such as those discussed in the Constructability section, we recommend that the City review the conceptual end-use options and the related constructability issues with the LEA and RWQCB before entering the final review and selection process for the four study options. We advise engaging the LEA and RWQCB in a discussion about the options being considered in order to determine any specific concerns or issues they may have for conceptual level approval of the proposed end-uses and to confirm the anticipated permitting and approval process.

A number of the types of recreational uses and facilities evaluated in this study have been successfully permitted and implemented at other closed landfills in California and in other states, and we believe the landfill permitting agencies would generally be supportive of each of the proposed options with the exception of the baseball / soccer

field option, for the reasons discussed above. However, we do note that the agencies may have some concerns about some of the elements of the proposed AAH option, including full-time boarding of animals on the landfill, and having a caretaker residence on the landfill. Those aspects of the proposed AAH option should be reviewed with the LEA and RWQCB before pursuing the AAH option.

10.3.3 Environmental Recommendations

For existing and proposed users of the open space and recreational areas at the landfill, the City should consider posting signs with information about the nature of the facility and the importance of following posted guidelines. The City may also want to consider posting emergency evacuation procedures, including routes for exiting the landfill area that should be followed in the event of fire, earthquake, or other site emergency and emergency contact information.

10.3.4 Bike Skills Park Recommendations

If the City decides to go forward with building a Bike Skills Park at the Sunnyvale Landfill we recommend contacting the Parks and Recreation Department at the City of Folsom for more information on demand for different types of skill features, building techniques, and their general experiences with the Mountain Bike Skills Course built at Cummings Family Park in Folsom in 2007.

An alternate location that the City could consider for a Bike Skills Park at Sunnyvale Landfill is the South Hill, rather than West Hill. While the top deck of West Hill is larger, a bike skills park of similar size to those at Calabazas and Cummings Family Park would fit on the top of South Hill. As the elements of a bike skills park are modular, and could be designed to fit in long rectangular spaces, the long rectangular top of South Hill might be an interesting and workable location for the Bike Skills Park. The park enhancement features considered for location on South Hill in this study could easily be swapped for location at West Hill, should the City decide to locate a Bike Skills Park on South Hill.

10.3.5 Habitat Consultation

Any proposed additional recreational uses at West Hill, Recycle Hill, and South Hill will need to be evaluated with respect to potential impacts to burrowing owl habitat and other wildlife and habitats of special concern. Projects or uses that would result in a loss of burrowing owl habitat or other protected habitat may require mitigation. Before

further development of design plans, we recommend that the City consult with habitat specialists for (1) a conceptual level evaluation of the potential impacts of the conceptual option layouts and features discussed in this study and (2) to review opportunities to enhance or add to the existing habitat in conjunction with design and construction for the new uses as proposed in this report.

10.4 Limitations

This report was prepared in general accordance with the accepted standard of practice existing in California at the time the project was performed. It should be recognized that definition and evaluation of environmental conditions is a difficult and inexact art. Judgments leading to conclusions and recommendations are generally made with a limited knowledge of the conditions present. Geosyntec Consultants, Inc. and Crawford Consulting, Inc. prepared this report for the City of Sunnyvale's exclusive use for this particular project and in accordance with generally accepted engineering practices within the area at the time of our investigation and evaluation. No other representations, expressed or implied, and no warranty or guarantee is included or intended.

This report may be used only by the City of Sunnyvale and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both onsite and offsite) or other factors may change over time, and additional work may be required with the passage of time. Any party other than the City of Sunnyvale who wishes to use this report shall notify Geosyntec Consultants, Inc. and Crawford Consulting, Inc. of such intended use. Based on the intended use of the report, Geosyntec Consultants, Inc. and Crawford Consulting, Inc. may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the City of Sunnyvale or anyone else will release Geosyntec Consultants, Inc. and Crawford Consulting, Inc. from any liability resulting from the use of this report by any unauthorized party.

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Appendix B. Wildlife Species Potentially Occurring at Baylands Park and the Sunnyvale Landfill

Wildlife Species Potentially Occurring at Baylands Park and the Sunnyvale Landfill

Common Name	Scientific Name	Status	Baylands Park	Landfill
Amphibians				
California slender salamander	<i>Batrachoseps attenuatus</i>		X	
Western toad	<i>Anaxyrus boreas</i>		X	
Sierran chorus frog	<i>Pseudacris sierra</i>		X	X
Bullfrog	<i>Lithobates catesbeiana</i>		X	
Reptiles				
Western pond turtle	<i>Actinemys marmorata</i>	CSSC		X
Western fence lizard	<i>Sceloporus occidentalis</i>		X	X
Western skink	<i>Plestiodon skiltonianus</i>		X	X
Southern alligator lizard	<i>Elgaria multicarinata</i>		X	X
Ringneck snake	<i>Diadophis punctatus</i>		X	X
Racer	<i>Coluber constrictor</i>		X	X
Gopher snake	<i>Pituophis melanoleucus</i>		X	X
Common kingsnake	<i>Lampropeltis getula</i>		X	X
California red-sided garter snake	<i>Thamnophis sirtalis infernalis</i>		X	X
Western terrestrial garter snake	<i>Thamnophis elegans</i>		X	
Mammals				
Virginia opossum	<i>Didelphis virginiana</i>		X	X
Salt marsh wandering shrew	<i>Sorex vagrans halicoetes</i>	CSSC	X	
Broad-footed mole	<i>Scapanus latimanus</i>		X	X
Yuma myotis	<i>Myotis yumanensis</i>		X	X
Western red bat	<i>Lasiurus blossevillii</i>	CSSC	X	X
Hoary bat	<i>Lasiurus cinereus</i>		X	X
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>		X	X
Black-tailed hare	<i>Lepus californicus</i>		X	X
California ground squirrel	<i>Spermophilus beecheyi</i>		X	X
Eastern gray squirrel	<i>Sciurus carolinensis</i>		X	X
Eastern fox squirrel	<i>Sciurus niger</i>		X	X
Botta's pocket gopher	<i>Thomomys bottae</i>		X	X
Western harvest mouse	<i>Reithrodontomys megalotis</i>		X	X
Salt marsh harvest mouse	<i>Reithrodontomys raviventris</i>	FE, SE, SP	X	
Deer mouse	<i>Peromyscus maniculatus</i>		X	X
California vole	<i>Microtus californicus</i>		X	X
Black rat	<i>Rattus rattus</i>		X	X
Norway rat	<i>Rattus norvegicus</i>		X	X
House mouse	<i>Mus musculus</i>		X	X
Gray fox	<i>Urocyon cinereoargenteus</i>		X	X
Red fox	<i>Vulpes vulpes</i>		X	X

Common Name	Scientific Name	Status	Baylands Park	Landfill
Raccoon	<i>Procyon lotor</i>		X	X
Long-tailed weasel	<i>Mustela frenata</i>		X	X
Striped skunk	<i>Mephitis mephitis</i>		X	X
House cat	<i>Felis catus</i>		X	X
Birds				
Great blue heron	<i>Ardea herodias</i>		X	X
Great egret	<i>Ardea alba</i>		X	X
Turkey vulture	<i>Cathartes aura</i>		X	X
Greater white-fronted goose	<i>Anser albifrons</i>		X	X
Snow goose	<i>Chen caerulescens</i>		X	X
Ross' goose	<i>Chen rossii</i>		X	X
Canada goose	<i>Branta canadensis</i>		X	X
Mallard	<i>Anas platyrhynchos</i>		X	X
White-tailed kite	<i>Elanus leucurus</i>	SP	X	X
Northern harrier	<i>Circus cyaneus</i>	CSSC	X	X
Sharp-shinned hawk	<i>Accipiter striatus</i>		X	X
Cooper's hawk	<i>Accipiter cooperii</i>		X	X
Red-shouldered hawk	<i>Buteo lineatus</i>		X	X
Swainson's hawk	<i>Buteo swainsoni</i>	ST	X	
Red-tailed hawk	<i>Buteo jamaicensis</i>		X	X
Golden eagle	<i>Aquila chrysaetos</i>	CSSC, SP	X	X
American kestrel	<i>Falco sparverius</i>		X	X
Merlin	<i>Falco columbarius</i>		X	X
Peregrine falcon	<i>Falco peregrinus</i>	SP	X	X
American coot	<i>Fulica americana</i>		X	X
Killdeer	<i>Charadrius vociferus</i>		X	X
Ring-billed gull	<i>Larus delawarensis</i>		X	X
California gull	<i>Larus californicus</i>	CSSC	X	X
Rock dove	<i>Columba livia</i>		X	X
Band-tailed pigeon	<i>Columba fasciata</i>		X	
Mourning dove	<i>Zenaidura macroura</i>		X	X
Barn owl	<i>Tyto alba</i>		X	X
Great horned owl	<i>Bubo virginianus</i>		X	X
Burrowing owl	<i>Athene cunicularia</i>	CSSC	X	X
Vaux's swift	<i>Chaetura vauxi</i>	CSSC	X	X
White-throated swift	<i>Aeronautes saxatalis</i>		X	X
Black-chinned hummingbird	<i>Archilochus alexandri</i>		X	
Anna's hummingbird	<i>Calypte anna</i>		X	X
Rufous hummingbird	<i>Selasphorus rufus</i>		X	X

Common Name	Scientific Name	Status	Baylands Park	Landfill
Allen's hummingbird	<i>Selasphorus sasin</i>		X	X
Acorn woodpecker	<i>Melanerpes formicivorus</i>		X	
Red-breasted sapsucker	<i>Sphyrapicus ruber</i>		X	
Nuttall's woodpecker	<i>Picoides nuttallii</i>		X	X
Downy woodpecker	<i>Picoides pubescens</i>		X	X
Northern flicker	<i>Colaptes auratus</i>		X	X
Olive-sided flycatcher	<i>Contopus cooperi</i>		X	
Western wood-pewee	<i>Contopus sordidulus</i>		X	
Willow flycatcher	<i>Empidonax traillii</i>	SE	X	X
Dusky flycatcher	<i>Empidonax oberholseri</i>			X
Pacific-slope flycatcher	<i>Empidonax difficilis</i>		X	X
Black phoebe	<i>Sayornis nigricans</i>		X	X
Say's phoebe	<i>Sayornis saya</i>		X	X
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>		X	
Western kingbird	<i>Tyrannus verticalis</i>		X	X
Loggerhead shrike	<i>Lanius ludovicianus</i>	CSSC	X	X
Cassin's vireo	<i>Vireo cassinii</i>		X	
Hutton's vireo	<i>Vireo huttoni</i>		X	
Warbling vireo	<i>Vireo gilvus</i>		X	X
Western scrub-jay	<i>Aphelocoma californica</i>		X	X
American crow	<i>Corvus brachyrhynchos</i>		X	X
Common raven	<i>Corvus corax</i>		X	X
Western bluebird	<i>Sialia mexicana</i>		X	X
Swainson's thrush	<i>Catharus ustulatus</i>		X	
Hermit thrush	<i>Catharus guttatus</i>		X	X
American robin	<i>Turdus migratorius</i>		X	X
Varied thrush	<i>Ixoreus naevius</i>		X	
Horned lark	<i>Eremophila alpestris</i>	CSSC		X
Tree swallow	<i>Tachycineta bicolor</i>		X	X
Violet-green swallow	<i>Tachycineta thalassina</i>		X	X
Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>		X	X
Barn swallow	<i>Hirundo rustica</i>		X	X
Cliff swallow	<i>Petrochelidon pyrrhonota</i>		X	X
Chestnut-backed chickadee	<i>Poecile rufescens</i>		X	X
Bushtit	<i>Psaltiriparus minimus</i>		X	X
Red-breasted nuthatch	<i>Sitta canadensis</i>		X	
White-breasted nuthatch	<i>Sitta carolinensis</i>		X	
Brown creeper	<i>Certhia americana</i>		X	
Bewick's wren	<i>Thryomanes bewickii</i>		X	

Common Name	Scientific Name	Status	Baylands Park	Landfill
House wren	<i>Troglodytes aedon</i>		X	
Marsh wren	<i>Cistothorus palustris</i>		X	X
Golden-crowned kinglet	<i>Regulus satrapa</i>		X	
Ruby-crowned kinglet	<i>Regulus calendula</i>		X	X
Blue-gray gnatcatcher	<i>Polioptila caerulea</i>		X	
Northern mockingbird	<i>Mimus polyglottos</i>		X	X
Sage thrasher	<i>Oreoscoptes montanus</i>			X
European starling	<i>Sturnus vulgaris</i>		X	X
American pipit	<i>Anthus rubescens</i>		X	X
Red-throated pipit	<i>Anthus cervinus</i>			X
Cedar waxwing	<i>Bombycilla cedrorum</i>		X	X
Orange-crowned warbler	<i>Oreothlypis celata</i>		X	X
Tennessee Warbler	<i>Oreothlypis peregrina</i>		X	
Nashville Warbler	<i>Oreothlypis ruficapilla</i>		X	
Yellow warbler	<i>Setophaga petechia</i>	CSSC	X	X
Yellow-rumped warbler	<i>Setophaga coronata</i>		X	X
Black-throated gray warbler	<i>Setophaga nigrescens</i>		X	
Townsend's warbler	<i>Setophaga townsendi</i>		X	X
Hermit warbler	<i>Setophaga occidentalis</i>		X	
Blackpoll warbler	<i>Setophaga striata</i>		X	
Black-throated blue warbler	<i>Setophaga caerulescens</i>		X	
Chestnut-sided warbler	<i>Setophaga pensylvanica</i>		X	
Palm warbler	<i>Setophaga palmarum</i>		X	
American redstart	<i>Setophaga ruticilla</i>		X	
Black-and-white warbler	<i>Mniotilta varia</i>		X	
MacGillivray's warbler	<i>Geothlypis tolmiei</i>		X	
Common yellowthroat	<i>Geothlypis trichas</i>		X	X
Canada warbler	<i>Cardellina canadensis</i>		X	
Wilson's warbler	<i>Cardellina pusilla</i>		X	X
Yellow-breasted chat	<i>Icteria virens</i>	CSSC	X	
Western tanager	<i>Piranga ludoviciana</i>		X	X
Spotted towhee	<i>Pipilo maculatus</i>		X	
California towhee	<i>Melospiza crissalis</i>		X	X
Chipping sparrow	<i>Spizella passerina</i>		X	
Savannah sparrow	<i>Passerculus sandwichensis</i>		X	X
Fox sparrow	<i>Passerella iliaca</i>		X	X
Song sparrow	<i>Melospiza melodia</i>		X	X
Lincoln's sparrow	<i>Melospiza lincolni</i>		X	X
White-throated sparrow	<i>Zonotrichia albicollis</i>		X	

Common Name	Scientific Name	Status	Baylands Park	Landfill
White-crowned sparrow	<i>Zonotrichia leucophrys</i>		X	X
Golden-crowned sparrow	<i>Zonotrichia atricapilla</i>		X	X
Dark-eyed junco	<i>Junco hyemalis</i>		X	X
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>		X	X
Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>		X	
Lazuli bunting	<i>Passerina amoena</i>		X	
Red-winged blackbird	<i>Agelaius phoeniceus</i>		X	X
Tricolored blackbird	<i>Agelaius tricolor</i>	CSSC	X	X
Western meadowlark	<i>Sturnella neglecta</i>		X	X
Brewer's blackbird	<i>Euphagus cyanocephalus</i>		X	X
Brown-headed cowbird	<i>Molothrus ater</i>		X	X
Orchard oriole	<i>Icterus spurius</i>		X	
Hooded oriole	<i>Icterus cucullatus</i>		X	X
Bullock's oriole	<i>Icterus bullockii</i>		X	X
Purple finch	<i>Carpodacus purpureus</i>		X	
House finch	<i>Haemorhous mexicanus</i>		X	X
Red crossbill	<i>Loxia curvirostra</i>		X	
Pine siskin	<i>Carduelis pinus</i>		X	
Lesser goldfinch	<i>Carduelis psaltria</i>		X	X
American goldfinch	<i>Carduelis tristis</i>		X	X
House sparrow	<i>Passer domesticus</i>		X	X

Appendix C. Special-status Plant Species Considered but Rejected for Occurrence on Sunnyvale Baylands Park and Landfill

**Special-status Plant Species Considered but Rejected for Occurrence on Sunnyvale Baylands
Park and Landfill**

Scientific Name	Common Name	No suitable habitat	Lack of serpentine soils	Lack of other edaphic requirements	Outside elevation range	Absent from project vicinity	Extirpated from project vicinity
<i>Acanthomintha lanceolata</i>	Santa Clara thorn-mint		x	x	x	x	
<i>Androsace elongata</i> ssp. <i>acuta</i>	California androsace				x	x	
<i>Arctostaphylos andersonii</i>	Anderson's manzanita	x			x	x	
<i>Astragalus tener</i> var. <i>tener</i>	alkali milk-vetch						x
<i>Atriplex depressa</i>	brittlescale					x	
<i>Extriplex joaquiniana</i> (<i>Atriplex joaquiniana</i>)	San Joaquin spearscale	x					
<i>Atriplex minuscule</i>	lesser saltscall	x					
<i>Balsamorhiza macrolepis</i>	big-scale balsamroot	x			x	x	
<i>Calandrinia breweri</i>	Brewer's calandrinia					x	
<i>California macrophylla</i>	round-leaved filaree					x	
<i>Campanula exigua</i>	chaparral harebell	x	x	x	x	x	
<i>Chloropyron maritimum</i> ssp. <i>palustre</i>	Point Reyes bird's-beak	x					x
<i>Chorizanthe robusta</i> var. <i>robusta</i>	robust spineflower	x		x			x
<i>Cirsium fontinale</i> var. <i>campylon</i>	Mt. Hamilton fountain thistle	x	x		x	x	
<i>Clarkia concinna</i> ssp. <i>automixa</i>	Santa Clara red ribbons	x			x	x	
<i>Collinsia multicolor</i>	San Francisco collinsia	x				x	
<i>Cypripedium fasciculatum</i>	clustered lady's-slipper	x			x	x	
<i>Delphinium californicum</i> ssp. <i>interius</i>	Hospital Canyon larkspur				x	x	
<i>Dirca occidentalis</i>	western leatherwood	x				x	
<i>Dudleya abramsii</i> ssp. <i>setchellii</i>	Santa Clara Valley dudleya	x			x	x	
<i>Eriogonum nudum</i> var. <i>decurrens</i>	Ben Lomond buckwheat	x			x	x	
<i>Eriophyllum jepsonii</i>	Jepson's woolly sunflower	x			x	x	
<i>Eryngium aristulatum</i> var. <i>hooveri</i>	Hoover's button-celery						x
<i>Fritillaria agrestis</i>	stinkbells		x			x	
<i>Fritillaria liliacea</i>	fragrant fritillary		x			x	
<i>Hoita strobilina</i>	Loma Prieta hoita	x	x			x	
<i>Iris longipetala</i>	coast iris	x				x	
<i>Lasthenia conjugens</i>	Contra Costa goldfields						
<i>Leptosiphon acicularis</i>	bristly leptosiphon	x				x	
<i>Leptosiphon ambiguus</i>	serpentine leptosiphon		x		x	x	
<i>Lessingia hololeuca</i>	woolly-headed lessingia		x			x	
<i>Malacothamnus aboriginum</i>	Indian Valley bush-mallow	x		x	x	x	
<i>Malacothamnus arcuatus</i>	arcuate bush-mallow	x					
<i>Malacothamnus hallii</i>	Hall's bush-mallow	x					
<i>Micropus amphibolus</i>	Mt. Diablo cottonweed			x	x	x	

Scientific Name	Common Name	No suitable habitat	Lack of serpentine soils	Lack of other edaphic requirements	Outside elevation range	Absent from project vicinity	Extirpated from project vicinity
<i>Monardella antonina</i> ssp. <i>antonina</i>	San Antonio Hills monardella	x			x	x	
<i>Monolopia gracilens</i>	woodland woollythreads	x	x		x	x	
<i>Navarretia prostrata</i>	prostrate vernal pool navarretia	x					
<i>Plagiobothrys glaber</i>	hairless popcorn-flower						x
<i>Senecio aphanactis</i>	chaparral ragwort	x				x	
<i>Sidalcea malachroides</i>	maple-leaved checkerbloom	x				x	
<i>Streptanthus albidus</i> ssp. <i>albidus</i>	Metcalf Canyon jewel-flower		x		x	x	
<i>Streptanthus albidus</i> ssp. <i>peramoenus</i>	most beautiful jewel-flower	x	x		x	x	
<i>Stuckenia filiformis</i> ssp. <i>alpina</i>	slender-leaved pondweed				x	x	
<i>Suaeda californica</i>	California seablite	x					
<i>Trifolium hydrophilum</i>	saline clover	x					
<i>Azolla microphylla</i>	Mexican mosquito fern	x				x	
<i>Calochortus umbellatus</i>	Oakland star-tulip	x	x		x		
<i>Calystegia collina</i> ssp. <i>venusta</i>	South Coast Range morning-glory	x	x		x	x	
<i>Clarkia breweri</i>	Brewer's clarkia	x	x		x	x	
<i>Eriastrum tracyi</i>	Tracy's eriastrum	x			x	x	
<i>Eriogonum argillosum</i>	clay buckwheat	x	x		x	x	
<i>Eriogonum umbellatum</i> var. <i>bahiiforme</i>	bay buckwheat	x	x	x	x	x	
<i>Erysimum franciscanum</i>	San Francisco wallflower		x			x	
<i>Galium andrewsii</i> ssp. <i>gatense</i>	phlox-leaf serpentine bedstraw	x	x	x	x	x	
<i>Helianthus exilis</i>	serpentine sunflower	x	x		x	x	
<i>Isocoma menziesii</i> var. <i>diabolica</i>	Satan's goldenbush	x				x	
<i>Leptosiphon grandiflorus</i>	large-flowered leptosiphon					x	
<i>Lessingia tenuis</i>	spring lessingia	x			x	x	
<i>Malacothrix phaeocarpa</i>	dusky-fruited malacothrix	x			x	x	
<i>Navarretia cotulifolia</i>	cotula navarretia					x	
<i>Perideridia gairdneri</i> ssp. <i>gairdneri</i>	Gairdner's yampah					x	
<i>Piperia leptopetala</i>	narrow-petaled rein orchid	x			x	x	
<i>Piperia michaelii</i>	Michael's rein orchid	x				x	
<i>Plagiobothrys chorisianus</i> var. <i>hickmanii</i>	Hickman's popcorn-flower	x				x	
<i>Psilocarphus brevissimus</i> var. <i>multiflorus</i>	Delta woolly-marbles	x				x	

Appendix D. Special-status Animal Species, Their Status, and Potential Occurrence on the Sunnyvale Baylands Park and Landfill

Special-Status Animal Species, Their Status, Habitat Description, and Potential for Occurrence within the Baylands Park and Sunnyvale Landfill

Name	*Status	Habitat	Potential for Occurrence in Baylands Park and Sunnyvale Landfill
Federal or State Endangered, Threatened, or Candidate Species			
California tiger salamander (<i>Ambystoma californiense</i>)	FT, ST	Vernal or temporary pools in annual grasslands or open woodlands.	Absent. Populations located on the Santa Clara Valley floor have been extirpated due to habitat loss, and the species is now considered absent from the majority of the valley floor, including Sunnyvale (H. T. Harvey & Associates 1999a, 2012; Santa Clara Valley Water District 2011). No records of California tiger salamanders are located within their dispersal distance (i.e., 1.3 mi) from Baylands Park (CNDDDB 2014) or the Sunnyvale Landfill, and the species is determined to be absent from the Park, the Landfill, and the surrounding vicinity.
California red-legged frog (<i>Rana draytonii</i>)	FT, CSSC	Streams, freshwater pools, and ponds with emergent or overhanging vegetation.	Absent. This species has been extirpated from the urbanized Santa Clara Valley floor due to development, the alteration of hydrology of its aquatic habitats, and the introduction of non-native predators such as non-native fishes and bullfrogs (H. T. Harvey & Associates 1997; Santa Clara Valley Water District 2011). Thus, California red-legged frogs are determined to be absent from Baylands Park and the Landfill.
San Francisco garter snake (<i>Thamnophis sirtalis tetrataenia</i>)	FE, SE	Freshwater marshes, ponds, and slow-moving streams along the coast.	Absent. Common garter snakes in the Sunnyvale area belong to the infernalis subspecies (i.e., the red-sided garter snake [<i>Thamnophis sirtalis infernalis</i>]) (Barry 1994). Thus, true San Francisco garter snakes do not occur at Baylands Park or the Landfill.
Bank swallow (<i>Riparia riparia</i>)	ST	Colonial nester on vertical banks or cliffs with fine-textured soils near water.	Absent as Breeder. No recent nesting records from Santa Clara County, and no suitable nesting habitat occurs in or near Baylands Park or the Landfill. Occurs only as a rare migrant.
Bald eagle (<i>Haliaeetus leucocephalus</i>)	SE, SP	Occurs mainly along seacoasts, rivers, and lakes; nests in tall trees or in cliffs, occasionally on electrical towers. Feeds mostly on fish.	Absent. Has been recorded nesting in the San Francisco Bay region only at inland reservoirs; very rare along the San Francisco Bay edge. No suitable nesting or foraging habitat at Baylands Park or the Landfill.

Name	*Status	Habitat	Potential for Occurrence in Baylands Park and Sunnyvale Landfill
Swainson's hawk (<i>Buteo swainsoni</i>)	ST	Nests in trees surrounded by extensive marshland or agricultural foraging habitat.	Absent as Breeder. High-quality foraging habitat is absent and the species does not breed in the vicinity of Sunnyvale. However, individuals may occasionally fly over Baylands Park and the Landfill.
California Ridgway's rail (<i>Rallus obsoletus obsoletus</i>)	FE, SE, SP	Salt marsh habitat dominated by pickleweed and cordgrass.	Absent. Although the brackish marshes of Moffett Channel north of the Landfill are expected to be used by clapper rails for foraging, at least occasionally, and they may use the freshwater marsh at the southern extent of Moffett Channel for foraging on rare occasions, suitable habitat for this species is not present at Baylands Park or the Landfill. Further, because California clapper rails typically nest in broader marshes with well-developed tidal channels (conditions that are absent from Moffett Channel), they are not expected to breed in marshes immediately adjacent to the Landfill. Individuals have occasionally been reported in the vicinity of the Landfill by birders (Santa Clara County Bird Data, Unpublished; S. Rottenborn, pers. obs.), but all reliable observations by birders have been along Guadalupe Slough, usually north of Ponds 1 and 2 (rarely along the northeastern edge of Pond 4). They are not expected to occur within Ponds 1 or 2 due to a lack of tidal connectivity and suitable marsh habitat.
California black rail (<i>Laterallus jamaicensis coturniculus</i>)	ST, SP	Breeds in fresh, brackish, and tidal salt marsh.	Absent. Until 2011, this species was known in the South Bay only as a rare winter visitor. However, the species has recently been recorded in tidal marshes in Alviso Slough near Ponds A10 and A11 (approximately 0.8 mi to the northeast of the Landfill), in Artesian Slough (approximately 2.7 mi to the east), and in Triangle Marsh (approximately 2.3 mi to the northeast) during the breeding season (L. Hall pers. comm., South Bay Birds List-serve 2013). Although there are no records of this species in the vicinity of Baylands Park or the Landfill (in any season), black rails may occasionally forage in the brackish or freshwater marshes of Moffett Channel north of the Landfill, and if black rails are breeding in South Bay marshes, there is potential for this species to breed in this channel as well. However, there is no suitable foraging or nesting habitat at or very close to Baylands Park or the Landfill.

Name	*Status	Habitat	Potential for Occurrence in Baylands Park and Sunnyvale Landfill
Western snowy plover (<i>Charadrius alexandrinus nivosus</i>)	FT, CSSC	Sandy beaches on marine and estuarine shores and salt pannes in San Francisco Bay saline managed ponds.	Absent. Suitable habitat (i.e., sandy beaches/salt pannes/dry salt ponds) for snowy plovers is not present at or near Baylands Park or the Landfill.
California least tern (<i>Sterna antillarum browni</i>)	FE, SE, SP	Nests along the coast on bare or sparsely vegetated, flat substrates. In the South Bay, nests in a managed pond and occasionally on dry salt pond bottoms. Forages for fish in open waters.	Absent. The South Bay is an important post-breeding staging area for least terns, and individuals may occasionally forage in Ponds 1 and 2 and Moffett Channel north of the Landfill. However, this species does not nest in Santa Clara County, and suitable foraging habitat is not present at Baylands Park or the Landfill.
Least Bell's vireo (<i>Vireo bellii pusillus</i>)	FE, SE	Nests in heterogeneous riparian habitat, often dominated by cottonwoods (<i>Populus</i> sp.) and willows (<i>Salix</i> sp.).	Absent. The only breeding records in Santa Clara County are from Llagas Creek southeast of Gilroy in 1997 and the Pajaro River south of Gilroy in 1932. Otherwise, records in the County include 1–2 singing males along lower Llagas Creek in May 2001, and a singing male in June 2006 along Coyote Creek near the Coyote Creek Golf Club. This species is not known to breed in or near Sunnyvale, and no suitable breeding habitat is present at Baylands Park or the Landfill.
Salt marsh harvest mouse (<i>Reithrodontomys raviventris</i>)	FE, SE, SP	Salt marsh habitat dominated by common pickleweed.	May be Present. Suitable salt marsh habitat is not present at the Landfill. However, pickleweed is present in the seasonal wetlands at Baylands Park, and it is possible the species could occur in this habitat and immediately adjacent annual grasslands. The nearest recorded occurrence of the species is from Guadalupe Slough approximately 1.4 mi from the Park (CNDDDB 2014).
California Species of Special Concern			
Foothill yellow-legged frog (<i>Rana boylei</i>)	CSSC	Partially shaded shallow streams and riffles with a rocky substrate. Occurs in a variety of habitats in coast ranges.	Absent. Suitable habitat for foothill yellow-legged frogs is absent from Baylands Park and the Landfill. This species occurs in less urbanized areas of Santa Clara County and it has disappeared from farmed and urbanized areas of the county as well as many of the perennial streams below major reservoirs (H. T. Harvey & Associates 1999b).

Name	*Status	Habitat	Potential for Occurrence in Baylands Park and Sunnyvale Landfill
Western pond turtle (<i>Actinemys marmorata</i>)	CSSC	Permanent or nearly permanent water in a variety of habitats.	May be Present. The freshwater wetlands at Baylands Park are not extensive enough to support western pond turtles and no aquatic habitat is present at the Landfill. However, the species has been documented within the Lockheed Channel and North Moffett Channel (TN & Associates, Inc. and Tetra Tech EC, Inc. 2006 as cited in EDAW 2007). Consequently, it is likely that small numbers of western pond turtles occur in the Sunnyvale West Channel, especially in the northern portion of the channel that bisects the Landfill, and there is a low potential for western pond turtles to nest on the northern face of West Hill, adjacent to the Lockheed Channel.
Redhead (<i>Aythya americana</i>)	CSSC	Nests in marshes and at pond margins.	Absent. Recorded nesting in the region only on a few occasions, in the 1970s and 1980s, at the Palo Alto Flood Control Basin. Suitable nesting habitat is not present at Baylands Park or the Landfill.
Western least bittern (<i>Ixobrychus exilis hesperis</i>)	CSSC (nesting)	Nests and forages in freshwater marshes.	Absent. Suitably large freshwater marsh habitat is not present at Baylands Park or the Landfill. Although the species has been recorded occasionally in the region, there are no records from either, and no breeding records from Santa Clara County. This species likely occurs only as an occasional migrant (e.g., along Moffett Channel), if it occurs in the vicinity of Baylands Park or the Landfill at all.
Black skimmer (<i>Rynchops niger</i>)	CSSC (nesting)	Nests on abandoned levees and islands in saline managed ponds and marshes.	Absent. No suitable nesting or foraging habitat is present at Baylands Park or the Landfill, although the species may occasionally forage in ponds north of the Landfill.
Northern harrier (<i>Circus cyaneus</i>)	CSSC (nesting)	Nests in marshes and moist fields, forages over open areas.	Absent as Breeder. Occasional forager over grasslands associated with Baylands Park and the Landfill (Cornell Lab of Ornithology 2014). Although suitable nesting habitat is not present at either site, one or two pairs of harriers could potentially nest in the tidal marsh at the mouth of Moffett Channel north of the Landfill and in the Baylands Preserve.
Long-eared owl (<i>Asio otus</i>)	CSSC (nesting)	Riparian bottomlands with tall, dense willows and cottonwood stands (also dense live oak and California Bay along upland streams); forages primarily in adjacent open areas.	Absent as Breeder. Rare resident and occasional winter visitor in Santa Clara County. Suitable nesting habitat for long-eared owls is not present in Baylands Park or the Landfill, but individuals may occasionally forage over the sites.

Name	*Status	Habitat	Potential for Occurrence in Baylands Park and Sunnyvale Landfill
Short-eared owl (<i>Asio flammeus</i>)	CSSC (nesting)	Nests in marshes and moist fields, forages over open areas.	Absent. Possibly a rare forager during the non-breeding season, but not expected to breed on or near Baylands Park or the Landfill, as this species has not been recorded nesting in the South Bay since the 1970s.
Burrowing owl (<i>Athene cunicularia</i>)	CSSC	Nests and roosts in open grasslands and ruderal habitats with suitable burrows, usually those made by California ground squirrels.	Present. Grasslands at Baylands Park and the Landfill provide suitable nesting and foraging habitat. The species was formerly known to occur in the grasslands at Baylands Park (Chromczak 2014, CNDDDB 2014), but they have not been recorded on the site in recent years. Burrowing owls over winter on the Landfill and were formerly known to breed in the grasslands on West Hill. However, they have not successfully bred on the site since 1999 (Chromczak 2014).
Vaux's swift (<i>Chaetura vauxi</i>)	CSSC (nesting)	Nests in snags in coastal coniferous forests or, occasionally, in chimneys; forages aerially.	Absent as Breeder. In the South Bay, breeds primarily in snags within Santa Cruz Mountain forests and in residential chimneys in the foothills of the Santa Cruz Mountains. Suitable breeding habitat is not present in Baylands Park or the Landfill. However, swifts occur at both sites as an occasional forager during migration (Cornell Lab of Ornithology 2014).
Olive-sided flycatcher (<i>Contopus cooperi</i>)	CSSC (nesting)	Breeds in mature forests with open canopies, along forest edges in more densely vegetated areas, in recently burned forest habitats, and in selectively harvested landscapes.	Absent as Breeder. Common summer resident in higher-elevation areas of western Santa Clara County (Bousman 2007a). This species breeds widely in the Santa Cruz Mountains, and more sparingly in the Diablo Range, but it does not breed on the Santa Clara Valley floor. The species may occur at the Landfill as an occasional forager during migration, and has been observed at Baylands Park (Cornell Lab of Ornithology 2014).
Loggerhead shrike (<i>Lanius ludovicianus</i>)	CSSC (nesting)	Nests in tall shrubs and dense trees; forages in grasslands, marshes, and ruderal habitats.	Present. Breeds in a number of locations in the region where open grassland, ruderal, or agricultural habitat with scattered brush, chaparral, or trees provides perches and nesting sites (Bousman 2007b), though populations have declined in recent years as suitable habitat has been increasingly developed. Grasslands at Baylands Park and the Landfill provide suitable breeding and foraging habitat for one or two pairs each, and the species has been recorded at Baylands Park and the Sunnyvale WPCP just north of the Landfill (Cornell Lab of Ornithology 2014).

Name	*Status	Habitat	Potential for Occurrence in Baylands Park and Sunnyvale Landfill
Yellow warbler (<i>Setophaga petechia</i>)	CSSC (nesting)	Nests in riparian woodlands.	Absent as Breeder. Suitable riparian nesting habitat is not present at Baylands Park or the Landfill. For nesting, the species prefers riparian corridors with adjacent open space (rather than in heavily developed areas) and an overstory of mature cottonwoods and sycamores, a midstory of box elders (<i>Acer negundo</i>) and willows, and a substantial shrub understory (Bousman 2007d). Although the species is an uncommon breeding bird in Santa Clara County, it is a common fall migrant (Bousman 2007d) and has been observed at both Baylands Park and the Sunnyvale Landfill (Cornell Lab of Ornithology 2014).
San Francisco common yellowthroat (<i>Geothlypis trichas sinuosa</i>)	CSSC	Nests in herbaceous vegetation, usually in wetlands or moist floodplains.	Absent as Breeder. Common yellowthroats nesting in the Baylands Park and Landfill vicinity are of the special-status subspecies <i>sinuosa</i> (San Francisco Bay Bird Observatory 2012). The greatest proportion of nesting records in the South Bay occur within brackish and freshwater marshes near the edge of the Bay, and in early-successional riparian habitat in broader floodplains (Bousman 2007c). Nests are typically located in extensive stands of bulrushes in brackish marshes and dense cattail beds in freshwater marshes, but the species also nests in forbs in riparian habitats. The freshwater marsh habitat within Baylands Park is not extensive enough to support breeding by this species and suitable breeding habitat is absent from the Landfill. However, the species may nest adjacent to the Landfill in the brackish and freshwater marshes of Moffett Channel and the Sunnyvale West Channel and forage on the lower slopes of the Landfill.
Yellow-breasted chat (<i>Icteria virens</i>)	CSSC (nesting)	Nests in dense stands of willow and other riparian habitat.	Absent as Breeder. This species is a rare breeder, and only slightly more regular transient, in willow-dominated riparian habitats in the South Bay, and does not nest this close to the Bay (Bousman 2007e). However, it may occur as a rare nonbreeding transient on the Landfill and has been recorded as a nonbreeder at Baylands Park (Cornell Lab of Ornithology 2014).

Name	*Status	Habitat	Potential for Occurrence in Baylands Park and Sunnyvale Landfill
Alameda song sparrow (<i>Melospiza melodia pusillula</i>)	CSSC	Nests in salt marsh, primarily in marsh gumplant and cordgrass along channels.	Absent as Breeder. The <i>pusillula</i> subspecies of song sparrow is endemic to the Central and South Bay. Although suitable nesting habitat is not present at Baylands Park or the Landfill, this subspecies forages and breeds in salt and brackish marshes associated with Moffett Channel north of the Landfill and may forage on the lower slopes at the Landfill.
Grasshopper sparrow (<i>Ammodramus savannarum</i>)	CSSC (nesting)	Nests and forages in grasslands, meadows, fallow fields, and pastures.	Absent. Known to occur in the San Francisco Bay region primarily in grasslands and less frequently disturbed agricultural habitats, mostly in the foothills. Suitably extensive grasslands are not present at Baylands Park or the Landfill.
Bryant's savannah sparrow (<i>Passerculus sandwichensis alaudinus</i>)	CSSC	Nests in pickleweed dominant salt marsh and adjacent ruderal habitat.	May be Present. In the South Bay, nests primarily in short pickleweed-dominated portions of diked/muted tidal salt marsh habitat and in adjacent ruderal habitats (Rottenborn 2007a). This species is a rare breeder that may nest in the seasonal wetlands and grasslands at Baylands Park and in the scattered pickleweed patches in the expansive marshes at the confluence of Moffett Channel and Guadalupe Slough north of the Landfill; however, suitable nesting habitat is not present at the Landfill. During the nonbreeding season, dispersing individuals occur at Baylands Park and the Landfill.
Tricolored blackbird (<i>Agelaius tricolor</i>)	SE	Nests near fresh water in dense emergent vegetation.	Absent as Breeder. In Santa Clara County, this species has bred in only a few scattered locations, and is absent, or occurs only as a nonbreeder, in most of the county (Rottenborn 2007b). It typically nests in extensive stands of tall emergent herbaceous vegetation in non-tidal freshwater marshes and ponds. In the vicinity of Baylands Park and the Landfill, such habitat is present only in the southern portion of Moffett Channel and a few scattered areas in the interior of Ponds 1 and 2, although this species (whose colonies are loud and conspicuous) has never been recorded breeding there. Tricolored blackbirds occur at the Park and Landfill as nonbreeding foragers (Cornell Lab of Ornithology 2014).

Name	*Status	Habitat	Potential for Occurrence in Baylands Park and Sunnyvale Landfill
Salt marsh wandering shrew (<i>Sorex vagrans halicoetes</i>)	CSSC	Medium to high marsh 6 to 8 feet above sea level with abundant driftwood and common pickleweed.	May be Present. Suitable salt marsh habitat is not present at the Landfill. However, pickleweed is present in the seasonal wetlands at Baylands Park and it is possible the species could occur in this habitat.
Pallid bat (<i>Antrozous pallidus</i>)	CSSC	Forages over many habitats; roosts in caves, rock outcrops, buildings, and hollow trees.	Absent. Historically, pallid bats were likely present in a number of locations throughout the South Bay, but their populations have declined in recent decades. Pallid bats have been extirpated from highly urbanized areas close to the Bay in the region, and thus this species is not expected to roost at Baylands Park or the Landfill. Further, due to the urbanized nature of the surrounding areas, it is unlikely that pallid bats are present as foragers.
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	CSSC, SC	Roosts in caves and mine tunnels, and occasionally in deep crevices in trees such as redwoods or in abandoned buildings, in a variety of habitats.	Absent. No known extant populations occur on the Santa Clara Valley floor, and no breeding sites are known from Baylands Park, the Landfill, or vicinity. Suitable breeding habitat is not present at either site.
Western red bat (<i>Lasiurus blossevillei</i>)	CSSC	Roosts in foliage in forest or woodlands, especially in or near riparian habitat.	Absent as Breeder. Does not breed in the region. May occur in low numbers as a migrant, but Individuals are expected to roost primarily in wooded riparian areas; thus, they are unlikely to roost at Baylands Park or the Landfill due to a lack of suitable roosting habitat.
San Francisco dusky-footed woodrat (<i>Neotoma fuscipes annectens</i>)	CSSC	Nests in a variety of habitats including riparian areas, oak woodlands, and scrub.	Absent. No suitable habitat occurs at Baylands Park or the Landfill. With the exception of records along Coyote Creek and along the edges of the Santa Clara Valley, San Francisco dusky-footed woodrats are not known to occur in the more urbanized portions of Santa Clara County (H. T. Harvey & Associates 2010).
American badger (<i>Taxidea taxus</i>)	CSSC	Burrows in grasslands and occasionally in infrequently disked agricultural areas.	Absent. Suitably extensive grasslands or agricultural habitats are not present at Baylands Park or the Landfill.

Name	*Status	Habitat	Potential for Occurrence in Baylands Park and Sunnyvale Landfill
State Fully Protected Species			
California brown pelican (<i>Pelecanus occidentalis californicus</i>)	SP (nesting colony and communal roosts)	Undisturbed islands near estuarine, marine, subtidal, and marine pelagic waters.	Absent. Suitable nesting and foraging habitat is not present at Baylands Park or the Landfill.
American peregrine falcon (<i>Falco peregrinus anatum</i>)	SP	Forages in many habitats; nests on cliffs and tall bridges and buildings.	Absent as Breeder. Peregrine falcons are known to nest on electrical transmission towers over managed ponds north of Moffett Field (using the old nests of other species), but they are not currently nesting at, or adjacent to, Baylands Park or the Landfill. However, peregrine falcons may forage for birds over both sites.
Golden eagle (<i>Aquila chrysaetos</i>)	SP	Breeds on cliffs or in large trees (rarely on electrical towers), forages in open areas.	Absent as Breeder. Suitable breeding habitat is not present at Baylands Park or the Landfill, but this species forages in open grassland habitats in the region, including the Landfill and Baylands Park, albeit infrequently.
White-tailed kite (<i>Elanus leucurus</i>)	SP	Nests in tall shrubs and trees, forages in grasslands, marshes, and ruderal habitats.	May be Present. There are a number of records from Sunnyvale Baylands Park and the Sunnyvale Landfill (Cornell Lab of Ornithology 2014, Santa Clara County Bird Data, unpublished). Open grassland areas at Baylands Park and the Landfill provide suitable foraging habitat. Trees in Baylands Park provide suitable nesting habitat for up to one pair and trees and shrubs along the edge of the Landfill provide suitable nesting habitat for up to two pairs.
Ringtail (<i>Bassariscus astutus</i>)	SP	Cavities in rock outcrops and talus slopes, as well as hollows in trees, logs, and snags that occur in riparian habitats and dense woodlands, usually in close proximity to water.	Absent. Species is present in less urbanized settings in the South Bay; however, there are no records from Baylands Park or the Landfill and suitable riparian and dense woodland habitat is not present.

Key to Abbreviations:

Status: Federally Endangered (FE); Federally Threatened (FT); State Endangered (SE); State Threatened (ST); State Fully Protected (SP); California Species of Special Concern (CSSC)