

17 October 2013

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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.

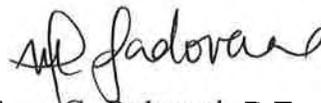


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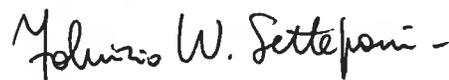


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**FEASIBILITY REPORT
FOR ESTABLISHING A COMMUNITY
ANIMAL FARM AND ALTERNATIVE
RECREATIONAL LAND USES AT THE
SUNNYVALE LANDFILL**

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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.

TABLE OF CONTENTS

Executive Summary..... i

1. INTRODUCTION 1

 1.1 Purpose of Study..... 1

 1.2 Background..... 1

 1.3 Scope of Services..... 2

 1.4 Assistance from the City..... 3

2. OUTREACH AND COMMUNITY PARTICIPATION..... 4

 2.1 General..... 4

 2.2 Community Meeting #1 (15 August 2013)..... 4

 2.3 Community Meeting #2 (12 September 2013)..... 5

3. ANALYSIS OF ISSUES, CONSTRAINTS AND OPPORTUNITIES 6

 3.1 General..... 6

 3.2 Landfill Status and Regulatory Framework..... 6

 3.2.1 Landfill Setting and Description 6

 3.2.2 Regulatory Framework..... 7

 3.3 Other Regulatory and Administrative Constraints 12

 3.3.1 City of Sunnyvale Zoning 12

 3.3.2 Burrowing Owl Habitat..... 13

 3.3.3 Height Restrictions..... 14

 3.3.4 CLUP Noise Level Thresholds 16

 3.3.5 Small Particle (PM-2.5) Generation..... 17

 3.3.6 ADA Compliance/Accessibility..... 17

 3.4 Existing Infrastructure and Other Conditions..... 17

 3.5 Access and Parking..... 18

 3.6 Utilities 21

4. GOALS AND POLICIES 25

 4.1 General..... 25

5. ALTERNATIVE LAND USES..... 26

 5.1 General..... 26

| | | |
|-------|--|----|
| 5.2 | Alternative Land Use Location..... | 26 |
| 5.3 | Americans with Disabilities Act (ADA) | 27 |
| 5.4 | Animal Assisted Happiness (AAH)..... | 28 |
| 5.4.1 | General | 28 |
| 5.4.2 | General Features Considered during Evaluation..... | 29 |
| 5.4.3 | Assumptions for Design..... | 30 |
| 5.4.4 | Location Considerations and Conceptual Layout for AAH..... | 31 |
| 5.5 | Baseball/Soccer Fields..... | 32 |
| 5.5.1 | General Features Considered during Evaluation..... | 32 |
| 5.5.2 | Assumptions for Design..... | 32 |
| 5.5.3 | Location and Conceptual Layout Considerations for Baseball/Soccer Fields..... | 33 |
| 5.6 | Bike Skills Park | 33 |
| 5.6.1 | General Features Considered during Evaluation..... | 33 |
| 5.6.2 | Assumptions for Design..... | 34 |
| 5.6.3 | Location Considerations for Bike Skills Park..... | 36 |
| 5.7 | Park Enhancements..... | 39 |
| 5.7.1 | General Features Considered during Evaluation..... | 39 |
| 5.7.2 | Location Considerations for Park Enhancement Features and the Dog Park | 40 |
| 5.7.3 | Habitat Enhancement Considerations (all hills)..... | 42 |
| 5.7.4 | Burrowing Owl Habitat Considerations..... | 43 |
| 5.7.5 | Proposed Design | 43 |
| 6. | CONSTRUCTABILITY ANALYSIS..... | 51 |
| 6.1 | General..... | 51 |
| 6.2 | Animal Assisted Happiness (AAH)..... | 52 |
| 6.2.1 | General | 52 |
| 6.2.2 | Occupancy..... | 52 |
| 6.2.3 | Grading..... | 53 |
| 6.2.4 | Landfill Gas System..... | 56 |
| 6.2.5 | Utilities..... | 58 |
| 6.2.6 | Parking and Access | 59 |

| | | |
|--------|---|----|
| 6.2.7 | Pre-Fabricated Modular Structures | 60 |
| 6.2.8 | Restrooms..... | 63 |
| 6.2.9 | Fencing..... | 63 |
| 6.2.10 | Cost Evaluation | 65 |
| 6.3 | Baseball/Soccer Fields..... | 66 |
| 6.3.1 | General | 66 |
| 6.3.2 | Occupancy..... | 66 |
| 6.3.3 | Grading..... | 66 |
| 6.3.4 | Landfill Gas System..... | 68 |
| 6.3.5 | Utilities..... | 69 |
| 6.3.6 | Parking and Access | 70 |
| 6.3.7 | Drainage..... | 71 |
| 6.3.8 | Fencing..... | 71 |
| 6.3.9 | Lights | 72 |
| 6.3.10 | Foul Poles..... | 72 |
| 6.3.11 | Bleachers | 73 |
| 6.3.12 | Restrooms and Storage Buildings | 74 |
| 6.3.13 | Cost Evaluation | 74 |
| 6.4 | Bike Skills Park and Park Enhancements (Including Dog Park on Recycle Hill) 74 | |
| 6.4.1 | General | 74 |
| 6.4.2 | Grading Considerations for Bike Skills Park..... | 75 |
| 6.4.3 | Grading Considerations for Park Enhancements | 75 |
| 6.4.4 | Access Road | 75 |
| 6.4.5 | Landfill Gas System Considerations for Bike Skills Park and Park Enhancements | 76 |
| 6.4.6 | Fencing Considerations for Bike Skills Park | 76 |
| 6.4.7 | Fencing Considerations for Park Enhancements (Dog Park)..... | 76 |
| 6.4.8 | Utility Considerations for Bike Skills Park..... | 76 |
| 6.4.9 | Parking and Access Considerations for Bike Skills Park..... | 77 |
| 6.4.10 | Site Enhancements for Bike Skills Park..... | 77 |
| 6.4.11 | Site Enhancements for Park Enhancements | 77 |

| | | |
|--------|---|-----|
| 6.4.12 | Restroom for Bike Skills Park and Park Enhancements | 77 |
| 6.4.13 | Proposed Construction | 78 |
| 6.4.14 | Cost Evaluation | 81 |
| 7. | INFRASTRUCTURE EVALUATION | 83 |
| 7.1 | General..... | 83 |
| 7.2 | Existing Infrastructure around Project Site | 83 |
| 7.3 | Infrastructure Needs for Alternate Land Use Options..... | 84 |
| 7.3.1 | Roadway..... | 84 |
| 7.3.2 | Utilities | 86 |
| 7.3.3 | Restrooms and Water Fountains | 90 |
| 7.4 | Cost Evaluation..... | 91 |
| 8. | TRANSPORTATION/CIRCULATION EVALUATION | 92 |
| 8.1 | Existing Transportation/Circulation Network around Project Site..... | 92 |
| 8.1.1 | General | 92 |
| 8.1.2 | Public Roadway Access | 92 |
| 8.1.3 | Pedestrian/Trail Access..... | 93 |
| 8.1.4 | Bicycle Access | 100 |
| 8.1.5 | Public Transportation Access..... | 100 |
| 8.1.6 | Existing Parking..... | 100 |
| 8.1.7 | Existing Parking Demand | 101 |
| 8.2 | Potential On-Site Parking Enhancements..... | 102 |
| 8.2.1 | Small Parking Lot along Borregas Avenue..... | 102 |
| 8.2.2 | After-Hours Use of WPCP Employee Parking | 103 |
| 8.3 | Transportation/Circulation Needs for Alternate Land Use Options | 104 |
| 9. | ENVIRONMENTAL REVIEW | 106 |
| 9.1 | General..... | 106 |
| 9.2 | Potential Exposure to Landfill Materials and Gas..... | 106 |
| 9.2.1 | Construction-Related Activities | 106 |
| 9.2.2 | Potential Exposure to Users | 108 |
| 9.3 | Potential Environmental Impacts and Exposures from Proposed End-Use Facilities..... | 108 |

| | | |
|--------|---|-----|
| 9.4 | Small Particle (PM-2.5) Generation | 110 |
| 9.5 | Environmental Permitting..... | 110 |
| 10. | SUMMARY AND FUTURE WORK | 112 |
| 10.1 | Summary of Alternative Land Use Evaluation..... | 112 |
| 10.2 | Future Studies | 113 |
| 10.2.1 | Parking/Traffic | 113 |
| 10.2.2 | Environmental | 114 |
| 10.3 | Recommendations | 115 |
| 10.3.1 | Baseball/Soccer Field Recommendations | 115 |
| 10.3.2 | Environmental Permitting | 115 |
| 10.3.3 | Environmental Recommendations | 116 |
| 10.3.4 | Bike Skills Park Recommendations | 116 |
| 10.3.5 | Habitat Consultation | 116 |
| 10.4 | Limitations..... | 117 |
| 11. | REFERENCES | 118 |

LIST OF TABLES

| | |
|---------|---|
| Table 1 | Goals and Policies |
| Table 2 | Animal Assisted Happiness (AAH) Facilities and Layout Assumptions |
| Table 3 | Animal Assisted Happiness & Park Enhancements Cost Estimate |
| Table 4 | Baseball/Soccer Fields & Park Enhancements Cost Estimate |
| Table 5 | Bike Skills Park & Park Enhancements Cost Estimate |
| Table 6 | Park Enhancements Cost Estimate |
| Table 7 | Summary of Access and Parking Needs for Alternative Land Use Options |
| Table 8 | Parking Space Calculations for Bike Skills Park with Park Enhancements Option |
| Table 9 | Parking Space Calculations for AAH with Park Enhancements Option |

Table 10 Parking Space Calculations for Baseball/Soccer Fields with Park Enhancements Option

LIST OF FIGURES

- Figure 1 Site Plan
- Figure 2 FAA Height Restriction Areas
- Figure 3 Animal Assisted Happiness (AAH) – Full Build-out Features
- Figure 4 Animal Assisted Happiness (AAH) – Short Term Build-out Features
- Figure 5 Baseball/Soccer Fields
- Figure 6 Bike Skills Park
- Figure 7 Animal Assisted Happiness & Park Enhancements Features
- Figure 8 Baseball/Soccer Fields & Park Enhancements Features
- Figure 9 Bike Skills Park & Park Enhancements Features
- Figure 10 Park Enhancements Features
- Figure 11 Infrastructure Improvements Layout – Animal Assisted Happiness & Park Enhancements
- Figure 12 Infrastructure Improvements Layout – Baseball/Soccer Fields & Park Enhancements
- Figure 13 Infrastructure Improvements Layout – Bike Skills Park & Park Enhancements
- Figure 14 Infrastructure Improvements Layout – Park Enhancements
- Figure 15 Main Site Access and Parking Area
- Figure 16 Pedestrian Access and Offsite Bay Trail Parking
- Figure 17 Bay Trail Connections
- Figure 18 YAHOO! – Visitor/Bay Trail Parking

LIST OF APPENDICES

- Appendix A Public Meeting Flyers, Notes and Presentations
 - A-1 Community Meeting #1 (15 August 2013)
 - A-2 Community Meeting #2 (12 September 2013)
- Appendix B Title 27 Post-closure Land Use Regulations for Waste Management Units

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.

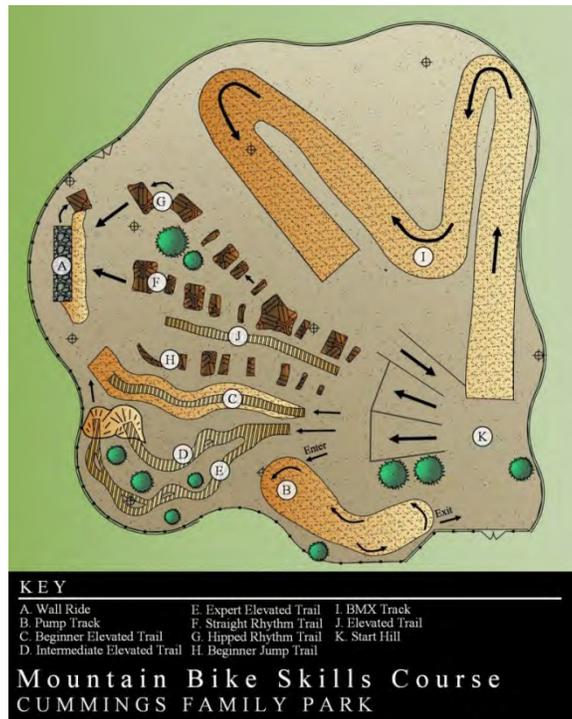


Image 2. Example Layout 1: Cummings Family Park, Folsom, California ⁴ (Facility size is approx. 60,000 sq ft)

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).

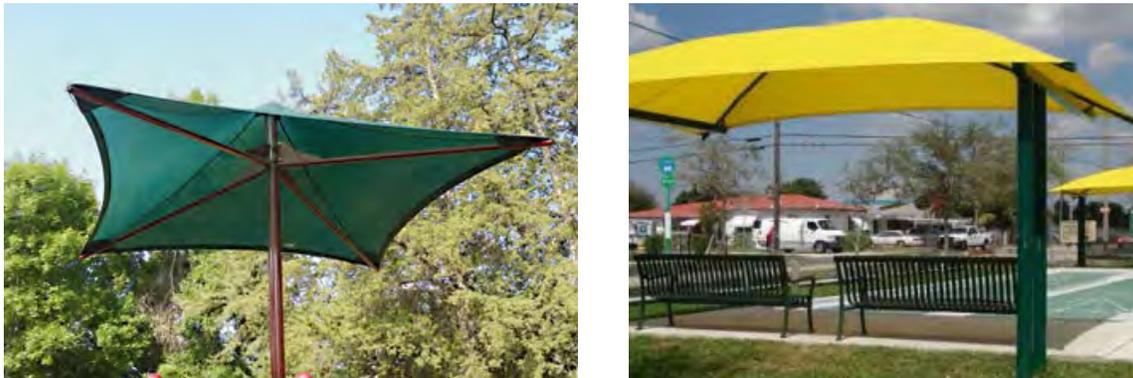


Image 30. Examples of CoolToppers[®] shade features.



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-foot 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.

Parallel Parking Area Drive Aisle

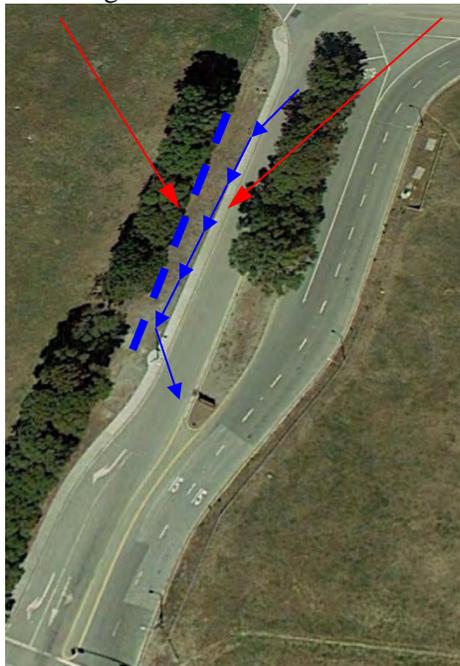


Image 45. Potential alignment of additional parking along Borregas Avenue.

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 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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