Final EIR

Moffett Park Specific Plan

SCH: 2021080338

Prepared by

Sunnyvale

In Consultation with

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SECTION 1.0 INTRODUCTION

This document, together with the Draft Environmental Impact Report (Draft EIR), constitutes the Final Environmental Impact Report (Final EIR) for the Moffett Park Specific Plan project.

1.1 PURPOSE OF THE FINAL EIR

In conformance with the California Environmental Quality Act (CEQA) and CEQA Guidelines, this Final EIR provides objective information regarding the environmental consequences of the proposed project. The Final EIR also examines mitigation measures and alternatives to the project intended to reduce or eliminate significant environmental impacts. The Final EIR is intended to be used by the City and any Responsible Agencies in making decisions regarding the project.

Pursuant to CEQA Guidelines Section 15090(a), prior to approving a project, the lead agency shall certify that:

(1) The Final EIR has been completed in compliance with CEQA;
(2) The Final EIR was presented to the decision-making body of the lead agency, and that the decision-making body reviewed and considered the information contained in the final EIR prior to approving the project; and
(3) The Final EIR reflects the lead agency's independent judgment and analysis.

1.2 CONTENTS OF THE FINAL EIR

CEQA Guidelines Section 15132 specify that the Final EIR shall consist of:

a) The Draft EIR or a revision of the Draft;
b) Comments and recommendations received on the Draft EIR either verbatim or in summary;
c) A list of persons, organizations, and public agencies commenting on the Draft EIR;
d) The Lead Agency's responses to significant environmental points raised in the review and consultation process; and
e) Any other information added by the Lead Agency.

1.3 PUBLIC REVIEW

In accordance with CEQA and the CEQA Guidelines (Public Resources Code Section 21092.5[a] and CEQA Guidelines Section 15088[b]), the City shall provide a written response to a public agency on comments made by that public agency at least 10 days prior to certifying the EIR. The Final EIR and all documents referenced in the Final EIR are available for public review at the Sunnyvale Planning Division located at 456 West Olive Avenue on weekdays during normal business hours. The Final EIR is also available for review on the City's website: https://www.sunnyvale.ca.gov/business-and-development/planning-and-building/ceqa-environmental-notices, as well as the project website: https://www.moffettparksp.com/project-documents.

SECTION 2.0 DRAFT EIR PUBLIC REVIEW SUMMARY

The Draft EIR for the Moffett Park Specific Plan project, dated December 19, 2022, was circulated to affected public agencies and interested parties for a 53-day review period from December 19, 2022 through February 10, 2023. Under CEQA, a 45-day review period is required. The public review period for the Draft EIR, therefore, included an additional eight days beyond what is required. The City undertook the following actions to inform the public of the availability of the Draft EIR:

- A Notice of Availability of Draft EIR was published on the City's website (https://www.sunnyvale.ca.gov/home/showpublisheddocument/4011);
- Notification of the availability of the Draft EIR was mailed to project-area residents and other members of the public who had indicated interest in the project;
- The Draft EIR was delivered to the State Clearinghouse on December 16, 2022, as well as sent to various governmental agencies, organizations, businesses, and individuals (see Section 3.0 for a list of agencies, organizations, businesses, and individuals that received the Draft EIR); and
- Copies of the Draft EIR were made available on the City's website (https://www.sunnyvale.ca.gov/business-and-development/planning-and-building/ceqa-environmental-notices) and Specific Plan website (https://www.moffettparksp.com/).

In addition, during the public review period for the Draft EIR, the City hosted the following meetings and hearing to provide an overview of the Draft EIR and solicit public comments:

- Specific Plan Open House on January 17, 2023
- Planning Commission Hearing on January 23, 2023
- City Council Meeting on January 31, 2023

SECTION 3.0 DRAFT EIR RECIPIENTS

CEQA Guidelines Section 15086 requires that a local lead agency consult with and request comments on the Draft EIR prepared for a project of this type from responsible agencies (government agencies that must approve or permit some aspect of the project), trustee agencies for resources affected by the project, adjacent cities and counties, and transportation planning agencies.

The NOA for the Draft EIR was sent to owners and occupants adjacent to the project site and to adjacent jurisdictions. The following received a copy of the NOA or Draft EIR from the City or via the State Clearinghouse:

- Adams Broadwell Joseph & Cardoza
- Bay Area Air Quality Management District
- California Air Resources Board
- California Department of Fish and Wildlife, Bay Delta Region 3
- California Department of Fish and Wildlife, Marin Region 7
- California Department of Forestry and Fire Protection
- California Department of Housing and Community Development
- California Department of Parks and Recreation
- California Department of Transportation, District 4
- California Department of Transportation, Division of Aeronautics
- California Department of Transportation, Division of Transportation Planning
- California Department of Water Resources
- California Governor's Office of Emergency Services
- California Highway Patrol
- California Native American Heritage Commission
- California Natural Resources Agency
- California Public Utilities Commission
- California Regional Water Quality Control Board, San Francisco Bay Region 2
- California State Lands Commission
- California Water Service Company
- City of Cupertino
- City of Los Altos
- City of Mountain View
- City of San José
- County of Santa Clara Planning Office
- Cupertino Union School District
- Department of the Navy
- Department of Toxic Substances Control
- Division of Aeronautics Department of Transportation
- Fremont Union High School District
- Indian Canyon Mutsun Band of Costanoan
- Lozeau Drury LLP
- Office of Historic Preservation
- Pacific Gas & Electric

- Peninsula Corridor Joint Powers Board
- San Francisco Bay Conservation and Development Commission
- San Francisco Public Utilities Commission
- Santa Clara County Department of Roads and Airports
- Santa Clara Unified School District
- Santa Clara Valley Water District
- Silicon Valley Clean Energy
- Specialty Solid Waste & Recycling
- State Water Resources Control Board, Division of Drinking Water

SECTION 4.0 RESPONSES TO DRAFT EIR COMMENTS

In accordance with CEQA Guidelines Section 15088, this document includes written responses to comments received by the City of Sunnyvale on the Draft EIR. This section also summarizes and provides responses to verbal comments related to the Draft EIR received at the Open House, Planning Commission hearing, and City Council meeting on January 17, 2023, January 23, 2023, and January 31, 2023, respectively. Verbal comments received pertaining to the merits of the project are not included, nor are responses to these types of comments required under CEQA. The City prepared a separate response to comments on the merits of the Specific Plan, which is available at: https://www.moffettparksp.com/.

Comments received on the Draft EIR are organized under headings containing the source of the comment and its date. The comments are presented with the response directly following. Copies of the letters and emails received by the City of Sunnyvale are included in their entirety in Appendix A of this document. Comments received on the Draft EIR are listed below.

None of the comments provided significant new information requiring the recirculation of the EIR, pursuant to CEQA Guidelines Section 15088.5.

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5.1 TOPIC RESPONSES

Many of the comments received raised similar concerns and questions regarding the following topics:

- Public review period for the Draft EIR
- School impacts and facility needs
- Park and recreation impacts

Since many of the comments raised the same concerns and questions, topic responses have been prepared. The purpose of the topic responses is to provide comprehensive answers in one location and to avoid redundancy throughout the individual response. Cross-references to topic responses are made, when appropriate, in individual responses.

Topic Response 1: Public Review Period for the Draft EIR – Pursuant to CEQA, the public review period for the Draft EIR is 45 days, though a shorter public review period may be approved by the State Clearinghouse. The Draft EIR was published and made available for public review on December 19, 2022. The public review period ended on February 10, 2023, which equates to a 53-day review period or eight additional days beyond the required 45-day public review period. The City will not be extending the public review period for the Draft EIR further.

During the public review period for the Draft EIR, the City hosted three meetings in which the public could provide comments on the Draft EIR. These meetings are not required under CEQA and included a Specific Plan Open House on January 17, 2023, Planning Commission hearing on January 23, 2023, and a City Council meeting on January 31, 2023. The public may also provide comments on the Draft EIR at the upcoming Planning Commission and City Council hearings when the Draft EIR is considered for certification.

Topic Response 2: School Impacts and Facility Needs – School impacts are discussed in Section 3.15 Public Services of the Draft EIR. As discussed in the Draft EIR (see pages 266 through 269), Moffett Park is within the boundaries of Sunnyvale School District (SSD), Fremont Union High School District (FUHSD), Santa Clara Unified School District (SCUSD), and Mountain View Whisman School District (MVWSD). Moffett Park is in the attendance boundaries of several local schools. The current capacity and enrollment at the local schools that project-generated students would attend is shown in Table 3.15-1 on page 269 of the Draft EIR.

Under CEQA, the impacts to schools are focused on whether a project would result in substantial adverse physical impacts associated with the provision of (or need for) new or physically altered school facilities, the construction of which could cause significant environmental impacts. The projected number of students anticipated from buildout of the Specific Plan and the project's impact to schools is discussed under Impact PS-3 on pages 272 through 274 of the Draft EIR. Some local schools have available capacity (i.e., Dolores Huerta Middle School and Kathleen MacDonald High School) for the students estimated to be generated from the buildout of the Specific Plan and others (i.e., Lakewood Elementary School, George Mayne Elementary School, Columbia Middle School, Fremont High School) do not. The number of students were estimated based on student generation rates provided by the local school districts, which are identified in Table 3.15-2 on page 273 of the Draft EIR. As noted in Table 3.15-2, only Santa Clara Unified School District identified different

student generation rates between market rate and below market rate housing. As disclosed on page 273 of the Draft EIR, new or expanded school facilities may be required to serve the students resulting from the build out of the Specific Plan.

As explained on page 274 of the Draft EIR, future development is required to pay the school impact fees established by the impacted school districts. Pursuant to state law (Government Code Section 65996[1]), the payment of established school impact fees is considered adequate, full, and complete mitigation of impacts associated with increased demands on school facilities resulting from development. The purpose of the school impact fees is to fund the construction or reconstruction of school facilities. No additional fee, charge, dedication, or other requirement for the construction or reconstruction of school facilities can be levied or imposed in connection with, or made a condition of, project approval. Also, CEQA requires the analysis of the environmental impacts of a project; fiscal analyses of the construction of new schools are not required under CEQA.

While no school is proposed at this time and no site within Moffett Park has been explicitly reserved for a future school in the Specific Plan, schools are an allowed use under the proposed MP-R: Residential and I: Institutional land use district designations, which total over 140 acres in Moffett Park. For reference, the school site size and capacities of local schools are provided below.

- Colombia Middle School, approximately 19 acres, enrollment capacity for 608 students
- Combined Dolores Huerta Middle School and Kathleen MacDonald High School, approximately 56 acres, enrollment capacity for 1,000 kindergarten through eighth grade students and 1,500 high school students
- Fremont High School, approximately 32 acres, enrollment capacity for 2,100 students
- George Mayne Elementary School, approximately 18 acres, enrollment capacity for 480 students
- Lakewood Elementary School, approximately eight acres, enrollment capacity for 410 students

In addition, as noted on page 266 and 273 the Draft EIR, Fremont Union High School District has an existing high school campus that is under lease to King's Academy until 2035 that could be used in the future as a public high school.

The City is supportive of the local school districts and will continue to work in good faith with the districts to explore opportunities for new school sites, as described in the Specific Plan. Specifically, Chapter 6 of the Specific Plan identifies continuing coordination with local school districts as an ongoing action to determine the need for a new public school in Moffett Park. As mentioned in Chapter 10.5 of the Specific Plan (Appendix B of the Draft EIR), a combination of sources will be required to fund the capital improvements required to support future development in Moffett Park. The funding and financing strategy will identify major categories of private and public funding sources and their application to capital improvement projects Moffett Park. These capital

[1] Note that Government Code 656696 was rendered ineffective for a period due to the failure of a bond measure in 2020 and was recently reinstated by the enactment of Assembly Bill 2022 signed by Governor Newsom on September 27, 2022.

improvements include new public facilities such as public schools, a library, community center, and police substation.

When a school is proposed, separate environmental review will be required. The Draft EIR discussion explains that, in general, construction of new public, local-serving school facilities would not result in significant environmental impacts in compliance with existing regulations and similar measures identified in the Draft EIR.

Topic Response 3: Park and Recreation Impacts – The project's impact on recreational facilities is discussed in Section 3.16 Recreation on pages 279 through 282 of the Draft EIR. As stated on page 280 of the Draft EIR, consistent with Appendix G of the CEQA Guidelines, for the purpose of determining the significance of the project's impact on existing recreational facilities, "Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?" This question is answered in Section 3.16.2.1 Project Impacts under Impact REC-1 on page 281 of the Draft EIR.

The Draft EIR acknowledges the implementation of the Specific Plan would increase use of existing park and recreational facilities. Page 281 of the Draft EIR states: "The implementation of the Specific Plan would result in a net increase of approximately 42,000 residents. Future residents (as well as employees) in Moffett Park would increase the use and demand on existing park and recreational facilities."

As mentioned in comments, and noted on page 280 of the Draft EIR, existing recreational facilities include Baylands Park and San Francisco Bay Trail. The current use, operations, and restrictions at existing recreational facilities would not change as part of the project. For example, the San Francisco Bay Trail is an existing regional trail facility that is open to the public and serves more than seven million Bay Area residents. The San Francisco Bay Trail "provides space for recreation and active transportation to work, school and other destinations in the community."[2] Baylands Park and San Francisco Bay Trail direct visitors to designated trails (and not sensitive wildlife habitat) and dogs are prohibited at Baylands Park and the San Francisco Bay Trail segment at the closed landfill to avoid substantially impacting special status species.

The City has a standard of five acres of public park and recreational facilities per net new 1,000 residents, pursuant to Municipal Code Chapter 19.74. Chapter 19.74 of the City's Municipal Code sets forth requirements and in-lieu fees for parkland dedication associated with new development in the City, requiring new housing projects to either provide the appropriate amount of park space or otherwise pay in-lieu fees. Any in-lieu fees received from future development projects would be used to fund the construction of new or expanded park or recreation facilities in or within proximity to Moffett Park for the purpose of serving residents of the project.

[2] Metropolitan Transportation Commission. "About the Bay Trail." 2023. Accessed February 28, 2023. https://mtc.ca.gov/operations/regional-trails-parks/san-francisco-bay-trail/about-bay-trail

In addition, the Specific Plan includes the following policies requiring development of parks and open space within Moffett Park (which are also described on pages 274 through 275 of the Draft EIR):

- OSE-2.1: Provide a minimum of one tot lot for ages two to five within each residential neighborhood or one per 7,000 residents.
- OSE-2.2: Provide a minimum of one inclusive, all-abilities and ages play space within each residential neighborhood or one per 7,000 residents.
- OSE-2.4: Provide a minimum of four dog parks or dog walking areas located within 10-minute walk of residential buildings or one per 10,500 residents.
- OSE-2.5: Provide a minimum of one multi-use/flexible field area, 50 by 100 yards minimum or equivalent to a high school soccer field as defined by the US Youth Soccer Association.
- OSE-2.6: Provide a minimum of three open field/flexible recreation areas, 35 by 65 yards minimum or equivalent to a U10 soccer field as defined by the US Youth Soccer Association. Fields may be synthetic or natural turf with grading and drainage to allow for regular use for informal/drop-in, youth sports, and community events.
- OSE-2.7: When and where possible, increase the quantity of multi-use flex fields to include more opportunities for informal and youth athletics.
- OSE-2.8: Co-locate a community or neighborhood park with potential school site(s).

Projects that comply with Chapter 19.74 of the Municipal Code are determined by the City to be provide adequate park and recreational facilities to serve its increase in population and not result in substantial deterioration of existing facilities because the recreational demand of project residents would be met by new (as well as existing) recreational facilities. In other words, the provision of new recreational facilities pursuant to Chapter 19.74 of the Municipal Code would offset the project's demand on existing recreational facilities by providing additional and alternative sources of recreation to existing facilities, thereby not resulting in substantial acceleration or physical deterioration of existing facilities.

The Draft EIR discusses how the Specific Plan's provision of 212 to 230 acres of new park and open space would meet and exceed the required ratio in the City's Municipal Code Chapter 19.74 of five acres per 1,000 residents, thereby sufficiently offsetting the project's demand (see discussion on pages 274 and 281 of the Draft EIR). In addition, the City currently has approximately 772 acres of park and open space and 156,234 residents, which results in 4.94 acres of park and open space per 1,000 residents. The implementation of the Specific Plan would result in approximately 42,000 new residents and at least 212 acres of new park and open space. Under existing conditions with the Specific Plan, the City would have 984 acres of park and open space and 198,234 residents, resulting in 4.96 acres of park and open space per 1,000 residents. The project, therefore, would result in a slight increase in the amount of park and open space provided per resident compared to existing conditions. This clarification has been added to page 275 of the Draft EIR (refer to Section 5.0 Draft EIR Text Revisions). While employees in Moffett Park may use existing park and recreational facilities in the area, their use is expected to be minimal given their primary purpose in Moffett Park is to work (verses residents who live and recreate in Moffett Park) and would further be minimized with provision of on-site amenities that are typically provided with non-residential development.

For the above reasons, the Draft EIR concluded that substantial physical deterioration of existing park and recreational facilities (including Baylands Park and the San Francisco Bay Trail referenced in the above comment) would not occur or be substantially accelerated. The cumulative impact on recreational facilities is discussed on pages 281 through 282 of the Draft EIR and concluded to be less than significant. No significant impacts to parks or recreational facilities were identified; therefore, no mitigation is required.

5.2 VERBAL COMMENTS – OPEN HOUSE (JANUARY 17, 2023)

A. Open House (January 17, 2023)

Comments on the Draft EIR received during the Open House are summarized and grouped by topic below. Comments pertaining to the merits of the Specific Plan are not included.

Process

Comment A.1: Comments were received requesting extension of the public review period for the Draft EIR.

Response A.1: Refer to Topic Response 1: Public Review Period for the Draft EIR.

Comment A.2: Comments were received regarding the timing of subsequent site-specific environmental review for site master plans and development agreements, and who prepares technical reports.

Response A.2: Additional site-specific CEQA review would occur at the time development details for the site master plan and development agreement are known. Section 1.0 on pages 1 and 2 of the Draft EIR describes how the EIR allows for streamlined environmental review of subsequent development projects consistent with the Specific Plan and analysis in the EIR. The scope of the environmental review for development projects (including the need for site-specific technical reports and what party will be responsible for completing them) would be determined by the City at the time a site master plan application is filed and development details are known.

Utility and Infrastructure-Related Comments

Comment A.3: Comments were received regarding the existing capacity and function of the sanitary sewer system, the need for upsized water and sewer lines, and the responsible parties for utility system improvements.

Response A.3: As discussed in more detail in Section 3.19 on page 324 of the Draft EIR, the existing sanitary sewer system is deficient and experiences surcharging. Based on the City's Wastewater Collection System Master Plan (WWMP), in order to adequately accommodate existing flows (i.e., for pipes to meet the City's performance design criteria) in Moffett Park, select sewer lines would need to be upsized.

While no specific development is proposed at this time, the Specific Plan would allow for the development of up to 20,000 new residential units and approximately 11 million square feet of non-residential development. The amount of development allowed by the proposed Specific Plan is detailed in Section 2.3 on pages 8 through 39 of the Draft EIR and assumed when evaluating the impacts of projects on utility systems.

As discussed in Section 3.19 under Impact UTL-1 on pages 329 through 334 of the Draft EIR, planned and new capital improvement projects (CIPs) are required to provide adequate utility service for the project under existing and cumulative (i.e., General Plan buildout) conditions. The design and service standards used to determine adequate operating capacity and service are detailed in Section 3.19 as well. The analysis in the Draft EIR is based on technical utility impact studies included in Appendices K and L of the Draft EIR. Water and sewer system CIPs are funded through water and sewer connection fees. Developers are required to pay these connection fees prior to development or redevelopment of a property. CIPs for the storm drainage system are funded through the City's General Fund. The City is responsible for implementing CIPs.

At the time specific development projects are proposed, they will be subject to the City's development review process and utility capacity confirmation studies may be required.

Comment A.4: Comments were received regarding the storm drainage requirements for development and whether rainwater recapture and reuse by development would be considered a community benefit.

The analysis in the Draft EIR assumes that all future development would comply with existing storm water regulations including the National Pollution Discharge Elimination Systems (NPDES) Construction General Permit and Municipal NPDES Permit Provision C.3. Impacts to the storm drain system are discussed in Sections 3.10 and 3.19 of the Draft EIR, including under Impact HYD-3 on pages 210 through 211 and under Impact UTL-1 on page 334 of the Draft EIR. The analysis concluded that the buildout of the Specific Plan, in compliance with Specific Plan policies and existing regulations, would not worsen drainage conditions compared to existing conditions.

As part of the Specific Plan, the City would maintain a community benefits framework that would be continually updated and adjusted over time to meet changing needs. It is possible that on-site private utilities, such as a rainwater recapture and reuse system, could be considered a community benefit. The determination of whether certain aspects of a subsequent development proposal is considered a community benefit would be determined by the City at the time a development is proposed.

Comment A.5: Comments were received regarding the material used to replace underground infrastructure in order to withstand corrosion from saltwater influence.

Response A.5: As discussed under Impact GEO-4 on page 151 of the Draft EIR, future developments would comply with the California Building Code, which requires preparation of site-specific geotechnical investigation reports. Site-specific geotechnical reports would include an analysis of corrosion potential and include recommendations for addressing potential issues. Furthermore, materials used for underground utilities would comply with City Municipal Code 19.38.090 containing design standards for underground systems to withstand corrosion from saltwater influence.

Miscellaneous Comments

Comment A.6: Comments were received regarding the significant and unavoidable impacts identified.

Response A.6: As summarized on pages vii and 348 of the Draft EIR, the implementation of the Specific Plan would result in significant and unavoidable impacts related to project-level operational criteria air pollutant emissions, operational greenhouse gas emissions, and potential construction impacts from expanding the wastewater treatment plant to treat cumulative sewage generation. These impacts are identified under:

- Impact AIR-1, Impact AIR-2, and Impact AIR-C in Section 3.3 of the Draft EIR,
- Impact GHG-1, Impact GHG-2, and Impact GHG-C in Section 3.8 of the Draft EIR, and
- Impact UTL-C in Section 3.19 Utilities and Service Systems of the Draft EIR.

Comment A.7: Comments were received regarding remediation of hazardous materials contamination (including groundwater pollution) on privately-owned and public land.

Response A.7: As discussed in more detail in Section 3.9 Hazards and Hazardous Materials on page 189 of the Draft EIR, hazardous materials could be disturbed at sites in Moffett Park during demolition, construction, or earthmoving activities associated with future development. This disturbance could cause exposure of humans and the environment to contaminated groundwater, soils, and soil vapor. Future projects (including infrastructure improvement projects) would be required to comply with Specific Plan requirements described on pages 190 through 191 of the Draft EIR, which include completion of a Phase I Environmental Site Assessment (ESA), which would identify recognized environmental conditions at the site, a Phase II ESA if known or suspected environmental impacts require additional investigation, a Site Management Plan to establish management practices for handling contaminated soil, soil vapor, groundwater, or other materials during construction activities, and remediation and/or management measures. The implementation of these Specific Plan requirements would be required for future development in Moffett

Park (regardless of whether the land is privately or publicly owned) to reduce impacts from contaminated groundwater, soil, or soil vapor.

Comment A.8: Comments were received regarding transit options for children traveling to schools.

Response A.8: As shown in Table 3.15-2 on page 273 of the Draft EIR, future students in Moffett Park would attend schools within the Sunnyvale School District, Fremont Union High School District, and Santa Clara Unified School District. Pages 292 and 293 and Figure 3.17-4 of the Draft EIR describe and illustrate the existing transit facilities in Moffett Park. These facilities include the Santa Clara Valley Transportation Authority (VTA) Light Rail Transit (LRT) Orange line, Local Bus Route 56, and Rapid Bus Route 523, all of which provide service proximate to existing, local schools. These facilities serve the schools to be attended by future students generated by Moffett Park. The below table shows the schools that will serve Moffett Park, the location of these schools, and transit options to those school. This table has been added to page 292 of the Draft EIR (refer to Section 5.0 Draft EIR Text Revisions). Also, refer to Topic Response 2: School Impacts and Facility Needs.

Transit Options to Local Schools from Moffett Park		
School	**Location**	**Transit Options**
Sunnyvale School District		
Lakewood Elementary School	750 Lakechime Drive	• Local Bus Route 56, approximate 15-minute walk from the nearest stop • VTA LRT Orange Line and transfer to Local Route 55 at Tasman Drive/Reamwood Avenue, approximate seven-minute walk from the nearest stop
Columbia Middle School	739 Morse Avenue	• Local Bus Route 56, approximate 16-minute walk time from the nearest stop
Fremont Union High School District		
Fremont High School	575 West Fremont Avenue	• VTA LRT Orange Line and transfer to Bus Route 523 at Lockheed Martin Transit Center, approximate five-minute walk from the nearest stop
Santa Clara Unified School District		
George Mayne Elementary School	5030 North First Street	• VTA LRT Orange Line and transfer to Bus Route 59 at Old Ironsides station, approximate eight-minute walk time from the nearest stop
Dolores Huerta Middle School and Kathleen MacDonald High School	3556 and 3588 Zanker Road	• Take VTA LRT Orange Line to Baypointe Station, approximate 19-minute walk from nearest stop

Comment A.9: Comments were received regarding the impacts to the salt-marsh harvest mouse and wetlands from the proposed trail in the northwest corner of Moffett Park, noting that the EIR characterized the area nearest to the landfill as freshwater, but it is brackish, and that the groundwater study indicated emergent water. The commenter recommended the trail to be along the perimeter.

Response A.9: The multi-use trail referenced in the above comment would be located in the California annual grassland area along the western edge of Moffett Park along/adjacent to the existing graveled access road and would not transect the emergent wetland area (i.e., salt-marsh harvest mouse habitat). The emergent wetland area that consists of pickleweed is located adjacent to the western edge of Moffett Park, and east of the California annual grassland habitat.

The multi-use trail, including specific alignment, design, and construction details are unknown at this time. Future design could include railings, signage, or other barriers that would keep the public on the pathway. When development of the multi-use trail is proposed, it will be subject to the City's development review process and subsequent environmental review would be required. In addition, the Specific Plan includes requirements to avoid and/or minimize impacts to sensitive habitats and special status species, including requirements 10.3.5-7 to complete habitat surveys and construction work monitoring near salt-marsh harvest mouse habitat and 10.3.5-11 to complete an aquatic resources delineation and avoidance/minimization/compensation measures (as appropriate). The City's development review process and compliance with these requirements would ensure the multi-use trail avoids and/or minimizes impacts to the salt-marsh harvest mouse and wetlands.

Page 25 of the Sea-level Rise Impacts on Shallow Groundwater in Moffett Park report, which is included in Appendix G of the Draft EIR, states that groundwater is shallowest, or emergent, in Moffett Park at the Lockheed Martin stormwater ponds (i.e., the freshwater stormwater basin habitat in the northwestern corner on Figure 3.4-2 of the Draft EIR). This statement does not refer to the emergent wetland habitat on Figure 3.4-2 on page 90 of the Draft EIR. The multi-use trail at the landfill, in the northwestern section of Moffett Park, would not cross the potential wetland or freshwater stormwater basin. The vegetation in the freshwater stormwater basins includes coyote brush, ice plant, cottonwood, coast live oak, willow, elderberry, and fan palm, which are common species in freshwater habitat. In addition, the water source that drains into these basins is freshwater. Therefore, the stormwater basin habitat in the northwestern corner consists of mostly freshwater and, therefore, is not identified as brackish water habitat.

B. Planning Commission Hearing (January 23, 2023)

Comments received during the Planning Commission Hearing on January 23, 2023 are summarized and grouped by topic below. Comments pertaining to the merits of the Specific Plan are not included.

School and Library-Related Comments

Comment B.1: Comments were received regarding student generation, land set aside for future schools, and the number of new schools required.

Response B.1: Refer to Topic Response 2: School Impacts and Facility Needs.

Comment B.2: Comments were received regarding planning for new schools and the relationship and utilization of the Foothill/De Anza campus.

Response B.2: As discussed in Topic Response 2: School Impacts and Facility Needs, no new or expanded school facilities are proposed at this time. No change or expansion of use of the existing Foothill-De Anza Community College campus is proposed as part of the project. The acquisition of new school sites and/or construction of new schools are subject to CEQA as well as additional environmental review requirements. Those additional requirements are summarized in Section 3.15.1.1 Regulatory Framework on pages 262 and 263 of the Draft EIR.

Comment B.3: Comments were received regarding VMT implications if schools are located outside of Moffett Park.

Response B.3: Refer to Response H.2.

Comment B.4: A comment was received about the relationship of school facilities to the project objectives.

Response B.4: The City's objectives for the Specific Plan are disclosed in Section 3.4 on pages 39 through 41 of the Draft EIR and reiterated in Section 7.2.2 on pages 349 through 351 of the Draft EIR. School facilities are not explicitly mentioned in the City's objectives for the Specific Plan.

Comment B.5: Comments were received regarding Lakewood Library and new library facilities in Moffett Park.

Response B.5: Section 3.15 in the Draft EIR discusses impacts to library facilities. Page 270 of the Draft EIR describes existing library facilities and acknowledges that the City is currently in the process of finishing the design for a new branch library located at Lakewood Park at 834 Lakechime Drive, which is south of Moffett Park. Additional detail about the Lakewood Branch Library project is provided on page 276 of the Draft EIR and can also be found on the City's website at https://www.sunnyvale.ca.gov/business-and-development/projects-in-sunnyvale/infrastructure-projects/lakewood-branch-library.

Under CEQA, the impacts to library facilities are focused on whether a project would result in substantial adverse physical impacts associated with the provision of (or need for) new or physically altered library facilities, the construction of which could cause significant environmental impacts. The Specific Plan's impact on library facilities is discussed under Impact PS-5 and Impact PS-C on pages 275 through 278 of the Draft EIR and concluded to be less than significant. As discussed in the Draft EIR, the construction of new or expanded library facilities in Moffett Park would result in less than significant construction-related impacts in conformance with existing regulations and applicable policies. Also, as discussed on page 275 of the Draft EIR, with the implementation of the Specific Plan and the approved Civic Center Modernization project (which considers expanding or replacing the existing 60,800 square foot Sunnyvale Public Library on West Olive Avenue with up to a 120,000 square foot library), the City's library service ratio would increase from 0.39 (under existing conditions) to 0.60 square feet of library space per capita. In addition, future development under the Specific Plan would pay an in-lieu public services fee that could be used for necessary upgrades to libraries.

Parks and Open Space-Related Comments

Comment B.6: Comments were received regarding the identification of the landowner for park/open space area between the developable area and the water, and the landowner for Twin Creeks and Baylands parks and Twin Creeks and Baylands parks were located within the City's limits.

Response B.6: As shown on Figure 2.2-3 on page 7 of the Draft EIR (and other figures in the Draft EIR), the sites between Moffett Park and areas of water are occupied by the closed Sunnyvale landfill, Donald M. Somers Water Pollution Control Plant (WPCP), Sunnyvale Materials Recovery and Transfer (SMaRT) Station®, Stevens Creek Quarry. The lands on which the closed Sunnyvale landfill, WPCP, SMaRT Station are located are owned by the City of Sunnyvale. The site that is occupied by the Stevens Creek Quarry is owned by the Voss family.[3] Figure 2.2-3, with Figure 2.2-2 on page 6 of the Draft EIR, show that Twin Creeks Sports Complex and Baylands Park are located within the City of Sunnyvale limits and on property owned by the City of Sunnyvale and County of Santa Clara, respectively.

Comment B.7: Comments were received regarding the designation and preservation of land for parkland, allowing an interpretive center in the open space designated areas, and the requirement for The Diagonal.

Response B.7: The implementation of the Specific Plan would result in 212 to 230 acres of open space, as described in Section 2.3.5 and Table 2.3-5 on page 18 of the Draft EIR. The Specific Plan details that this amount of open space would be realized through a coordinated effort between the City, property owners, and developers,

[3] Stevens Creek Quarry, Inc. "Home." 2018. Accessed January 30, 2023. Available at: http://www.scqinc.com/.

utilizing land dedication or easement dedication by non-residential and residential developments, transfer of development rights, ecological setback standards, the purchase of land using park dedication fee, and maintenance of parks and open spaces by property owners. This detail has been added to the text on page 18 of the Draft EIR (see Section 5.0 Draft EIR Text Revisions). The Diagonal (which is envisioned as an urban promenade that provides a continuous and car-free path across Moffett Park) would be realized through a coordinated effort between the City, property owners, and developers, much like the open space area.

As stated on page 18 of the Draft EIR: "The Specific Plan defines open space as publicly accessible open spaces, parks, and natural areas which serve the community by providing public access, active transportation, recreational, cultural programs, and ecosystem services. These may include undeveloped natural areas, areas of ecological and ecosystem value, greenbelts and trails, recreation areas, community and neighborhood parks, areas of cultural historic significance, public plazas and squares." While an interpretive center is not explicitly mentioned, it is not precluded.

Development-Related Comments

Comment B.8: Comments were received regarding the allocation of development for different land uses and flexibility for developing uses depending on market conditions.

Response B.8: The Draft EIR evaluates the environmental impacts from the buildout of the Specific Plan. The amount of development assumed at buildout is summarized in Table 2.3-1 on page 9 of the Draft EIR. No phasing of development is proposed, assumed, or required in the Draft EIR.

Comment B.9: A comment was received about the plans for the Lockheed area.

Response B.9: The Lockheed Martin property is outlined on Figure 2.2-3 on page 7 of the Draft EIR. Figure 2.3-1 on page 13 of the Draft EIR shows the proposed land use plan. Most of the Lockheed Martin property is proposed to be designated MP-E2: Mixed Employment 2. A small portion is proposed to be designated MP-E3: Mixed Employment. As summarized in Table 2.3-3 on page 10 of the Draft EIR, these two land use designations allow for a mix of research and development, light industrial, manufacturing, and moderate intensity office uses. Residential uses are not allowed.

Comment B.10: Comments were received regarding the timing and relationship of the Specific Plan with the City's Housing Element.

Response B.10: The City's draft Housing Element identifies a shortage in meeting its Regional Housing Needs Allocation (RHNA) of 4,640 dwelling units.[4] A strategy identified in the draft Housing Element to meet its shortfall is the inclusion of

[4] City of Sunnyvale. *2023-2031 Housing Element.* July 2022, revised public review draft. Page 5-67.

housing in Moffett Park. Additional information about the draft Housing Element is on the City's website at: https://www.sunnyvale.ca.gov/business-and-development/projects-in-sunnyvale/long-range-planning-initiatives/housing-element-update. The Housing Element will be brought to City Council for approval subsequent to the Specific Plan.

Comment B.11: Comments were received about whether 20 percent was the maximum amount of affordable housing that would be required and what incentives were proposed to build affordable housing.

Response B.11: Specific Plan Policy LU-2.1 requires a minimum of 15 percent of all residential units in Moffett Park as deed restricted affordable, consistent with the City's Inclusionary Below Market Rate Ownership Housing Program (Sunnyvale Municipal Code Chapters 19.67 and 19.77). A copy of the Specific Plan is included in Appendix B of the Draft EIR. No maximum amount of affordable housing is stipulated.

The Specific Plan includes incentive-based zoning which allows development to occur at maximum densities (i.e., bonus floor-area-ratio) when community benefits, such as providing affordable housing above the required 15 percent minimum, are provided. Non-residential development in Moffett Park would be required to pay a housing mitigation fee, which would help fund affordable housing development in Moffett Park. Other incentives for affordable housing development include federal grants such as Community Development Block Grant (CDBG) and Home Investment Partnership (HOME) programs.

Comment B.12: Comments were received about the impacts of not developing residential in Moffett Park and if growth would occur elsewhere as a result.

Response B.12: The City's draft Housing Element identifies a shortage in meeting its Regional Housing Needs Allocation (RHNA) of 4,640 dwelling units.[5] A strategy identified in the draft Housing Element to meet its shortfall is the inclusion of housing in Moffett Park. If the Specific Plan proceeds without the proposed residential capacity, the City would need to identify other sites within the City to accommodate its RHNA shortage.

In addition, as discussed in Section 4.0 Growth Inducing on page 343 of the Draft EIR, the Specific Plan is intended to provide a more balanced development with jobs and housing. If the jobs proceed and housing is not allowed, future employees in Moffett Park would likely live farther from their job, thereby increasing Vehicle Miles Traveled (VMT) and associated air pollutants.

[5] City of Sunnyvale. *2023-2031 Housing Element.* July 2022, revised public review draft. Page 5-67.

An analysis of project alternatives is provided in Section 7.0 of the Draft EIR. A project alternative with no residential development was not analyzed in the Draft EIR because it does not meet the City's basic objectives for the project. Text to the Draft EIR has been added to clarify this (refer to Section 5.0 Draft EIR Text Revisions).

Transportation-Related Comments

Comment B.13: Comments were received about what was assumed for the proposed Mary Avenue overcrossing and if it would be funded from future development in Moffett Park.

Response B.13: The Mary Avenue Overcrossing project is identified in the City's citywide Traffic Impact Fee Update Study. The City is currently analyzing different alternatives for the overcrossing. For cumulative year 2040, the traffic analysis for the project assumed the extension of Mary Avenue between Almanor Avenue and 11th Avenue with one High Occupancy Vehicle (HOV) lane with bike/pedestrian facilities in each direction. Future projects within Moffett Park would be required to pay the citywide TIF, which would constitute their fair share contribution towards the Mary Avenue Overcrossing project.

Comment B.14: Comments were received regarding congestion resulting from future development and related mitigation.

Response B.14: Pursuant to Senate Bill 743 (SB 743), vehicle congestion (e.g., Level of Service [LOS]) is no longer an impact under CEQA. As explained on page 285 of the Draft EIR, to be consistent with SB 743 and the updates to the CEQA Guidelines, the City adopted Council Policy 1.2.8 Transportation Analysis Policy on June 30, 2020. The policy also establishes LOS as an operational, non-CEQA measurement of intersection efficiency.

The project's consistency with the non-CEQA LOS aspect of the policy is discussed on pages 299 through 306 of the Draft EIR and in more detail in the technical Transportation Impact Analysis (TIA) in Appendix I of the Draft EIR. As summarized in Draft EIR, the results of the LOS analysis showed that the buildout of the Specific Plan would result in LOS operational deficiencies at a total of 16 study intersections. Per the policy, feasible physical improvements to roadways and/or multi-modal improvements to promote alternatives to single occupancy vehicles trips should be implemented to reduce the intersections' deficiencies. Since LOS impacts are not CEQA impacts, no mitigation can be required under CEQA for LOS deficiencies.

Table 3.17-3 on pages 300 and 301 of the Draft EIR summarizes the LOS of affected intersections. There are no feasible improvements at five of the 16 deficient intersections due to right-of-way constraints. Table 3.17-4 summarizes the feasible improvements at affected intersections. As explained on page 303 of the Draft EIR, the feasible improvements identified would be included in a citywide nexus study, which is expected to be finalized in early 2023. Future projects under the Specific

Plan shall make fair share contributions towards these identified improvements via the nexus study as a condition of approval.

Page 304 and 305 lists freeway segments that would be adversely affected with the implementation of the Specific Plan. As explained on page 306 of the Draft EIR, future development under the Specific Plan would participate in VTA's Voluntary Freeway Contribution Program and contribute their fair share towards freeway express lane projects (which would not resolve the LOS deficiency but would improve traffic flow) via the citywide nexus study.

In addition, it is acknowledged on page 306 of the Draft EIR that VTA is currently studying operations to improve operations along US 101 and SR 237 in the vicinity of Moffett Park and potential improvements to the SR 237 interchanges. If improvements are identified that would improve freeway operations, future projects within Moffett Park may be required to contribute their fair share towards the identified improvements.

Comment B.15: Comments were received regarding limited bicycle and pedestrian connections (e.g., one-sided pedestrian sidewalks) that isolate Moffett Park from the rest of the City.

Response B.15: The existing bicycle and pedestrian facilities serving Moffett Park are described on page 290 through 292 of the Draft EIR. The existing bicycle facilities are shown on Figure 3.17-2 on page 291 of the Draft EIR. Locations where sidewalks and crosswalks are lacking are shown on Figure 3.17-3 on page 294 of the Draft EIR.

Figure 2.3-4 on page 17 of the Draft EIR shows the proposed street network in Moffett Park, which four street typologies: anchor streets, crosstown connectors, neighborhood streets, and laneways. All the street typologies would accommodate pedestrians and bicyclists. Proposed multi-modal off-street paths and pedestrian/bicycle plazas are also shown on Figure 2.3-4.

Chapter 7 of the Specific Plan (which is included in Appendix B of the Draft EIR) further details the proposed mobility network, including pedestrian and bicycle networks, for Moffett Park. Per page 207 of the Specific Plan, the proposed street network would include pedestrian facilities on every street. Pedestrian facilities include crosswalks, protected crossings, prioritize crossings, sidewalks, lighting, and curbside drop off and loading areas. The proposed bicycle network includes several east-west and north-south connections that are supplemented by additional internal bikeways. Figure 57 on page 205 of the Specific Plan shows the proposed bicycle network, including bicycle lanes and multi-use off-street paths to access areas north and south of Moffett Park. The existing Bay Trail provides pedestrian/bicycle access to the west of Moffett Park. This additional detail and figure have been added to the Draft EIR (see Section 5.0 Draft EIR Text Revisions). Because Moffett Federal Airfield and a golf course are located east of Moffett Park, bicycle and pedestrian access to those land uses from Moffett Park is limited.

The analysis in the Draft EIR concluded that the bicycle network and pedestrian facilities proposed by the Specific Plan would improve the existing multi-modal network within Moffett Park and adequately accommodate the estimated bicycle and pedestrian trips generated by the project. The proposed bicycle and pedestrian facilities would build upon the existing available facilities and be consistent with the City's General Plan policies, Active Transportation Plan, Vision Zero, and Roadway Safety Plan.

Miscellaneous Comments

Comment B.16: Sea-level rise-related comments were received pertaining to the presence of salt ponds near Caribbean and mitigation for sea-level rise.

Response B.16: In general, effects of the environment on a project (such as the Specific Plan) are not considered CEQA impacts. For this reason, the effects of sea-level rise are not discussed in the EIR and no CEQA mitigation can be required. Nonetheless, an informational discussion on sea-level rise in Section 3.10.3 on page 214 of the Draft EIR. As discussed in the Draft EIR, managing the City's flood risk from sea-level rise extends beyond the City's boundaries. The City will continue to coordinate adaptation strategies with neighboring entities and consider requiring design and restoration measures (including the ones listed on page 214 of the Draft EIR) that would help future development adapt to inundation with less damage.

Additionally, the salt ponds located north of Caribbean Drive are former salt ponds previously used for salt production. These ponds are currently undergoing restoration through the South Bay Salt Pond Restoration Project (which is a collaboration between the California Department of Fish and Wildlife, California Coastal Conservancy, and US Fish and Wildlife Service) to restore former salt production ponds into wetlands for native plants and animals. The Draft EIR (pages iv and 148, as well as Figures 2.2-3, 2.3-1, 2.3-2, 2.3-3, 2.3-4, 3.7-1, 3.10-1, 3.10-2, 3.13-6, 3.17-1, 3.17-2, 3.17-3, and 3.17-4) has been revised to refer to the salt ponds as former salt ponds (refer to Section 5.0 Draft EIR Text Revisions).

Comment B.17: A comment was received regarding adequate access to water.

Response B.17: The project's impact on water storage, infrastructure, and supply is discussed in Section 3.19 Utilities and Service Systems of the Draft EIR.

Impacts to the City's required water storage per the State Water Resources Control Board Division of Drinking Water (DDW) is discussed on page 329 of the Draft EIR. The City assesses water storage capacity every five years to identify and implement improvements when needed to meet DDW requirements for adequate water storage. Through this process, the City would ensure adequate water storage under cumulative (i.e., General Plan buildout) plus project conditions.

Impacts to water infrastructure (i.e., hydraulic conveyance and fire flow) are discussed on pages 329 and 330 of the Draft EIR. In addition to already identified

Capital Improvement Projects (CIPs) in the City's Water Utility Master Plan (WUMP) and Comprehensive Preliminary Design Study (CPDS), additional CIPs are required to meet fire flow demands resulting from the buildout of the Specific Plan. Those additional CIPs required for the buildout of the Specific Plan are listed in Table 3.19-2 on page 330 of the Draft EIR, as well as shown on Figure 3.19-3 on page 331 of the Draft EIR. Future development under the Specific Plan would pay water connection fees, which fund the CIPs.

Pursuant to Senate Bill 610 (SB 610) a Water Supply Assessment (WSA) for the project was completed. The project's impact on water supply, based on the analysis in the WSA, is summarized on pages 335 and 336 of the Draft EIR. The WSA is included in Appendix J of the Draft EIR. As disclosed in the Draft EIR, the City's available potable and non-potable water supplies are expected to be sufficient to meet demands of existing uses and future uses (including the Specific Plan's) under normal conditions. Under dry and multiple-dry years, the City would likely need to impose water conservation measures, through execution of water contingency shortage plans, to reduce demand. In addition, the Specific Plan includes policies that would further reduce demand and impact. Therefore, the WSA and Draft EIR concluded that there would be sufficient water supply available to serve buildout of the Specific Plan.

Comment B.18: Confirmation if page vii and page 348 of the EIR should state "significant and avoidable" or "significant and unavoidable."

Response B.18: The text on pages vii and 348 of the Draft EIR has been revised to state "significant and unavoidable" (refer to Section 5.0 Draft EIR Text Revisions).

Comment B.19: A comment was received asking if the Planning Commission would be making a formal recommendation to City Council.

Response B.19: A Planning Commission hearing will be held subsequent to the publication of this Final EIR where the Commission will make recommendations to the City Council to 1) certify the EIR and 2) approve the project.

C. City Council Meeting (January 31, 2023)

The comments received on the Draft EIR are summarized and grouped by topic below.

Utility and Infrastructure-Related Comments

Comment C.1: Comments were received regarding the sewer and water infrastructure improvements, improvements to the wastewater treatment plant, and applicable fees.

Response C.1: Impacts to the sewer and water infrastructure is discussed in Section 3.19 under Impact UTL-1 on pages 329 through 334 of the Draft EIR. Planned and new Capital Improvement Projects (CIPs) are required to provide adequate sewer and water infrastructure under cumulative (i.e., General Plan buildout) plus project conditions. These CIPs are listed in Table 3.19-2 and Table 3.19-3 on pages 330 and

332 of the Draft EIR, respectively. The City would update its CIP program to include the identified CIPs in the aforementioned tables. Planned and proposed water and sewer CIPs are funded through connection fees. Developers would be required to pay connection fees prior to development or redevelopment of a property. Also see Response A.4 and Response B.17.

As disclosed on page 339 of the Draft EIR, the City is aware an update to the Donald M. Somers Water Pollution Control Plant (WPCP) Master Plan is needed to plan for adequate wastewater treatment for the buildout of the existing General Plan and other future growth in the City (such as the proposed Specific Plan). Subsequent environmental review will be completed by the City once the specific design and improvements are known.

Comment C.2: Comments were received regarding the Transportation Impact Fee (TIF) and what kind of improvements it funds.

Response C.2: As discussed in Section 3.17 of the Draft EIR, the project would result in non-CEQA intersection Level of Service (LOS) deficiencies. Feasible improvements to address the deficiencies are identified in Table 3.17-4 on pages 302 through 303 of the Draft EIR. The improvements are identified for intersections within and outside of Moffett Park and under the jurisdiction of the City of Sunnyvale, City of Mountain View, and County of Santa Clara. As explained on page 303 of the Draft EIR, the identified feasible improvements would be included in a citywide nexus study, which is expected to be finalized in early 2023. Future projects under the Specific Plan shall make fair share contributions towards these identified improvements via the nexus study as a condition of approval.

The purpose of the TIF is to help provide adequate transportation-related improvements to serve cumulative development within the city. The TIF funds traffic improvement projects specified in the City's Capital Improvement Program and/or Traffic Mitigation Program Study. This includes projects throughout the city that include intersection and multimodal improvements.

Comment C.3: Comments were received regarding the proposed Mary Avenue overcrossing and its funding.

Response C.3: Refer to Response B.13.

Comment C.4: Comments were received about coordination with PG&E regarding electrical infrastructure.

Response C.4: The City sent the Notice of Preparation and Notice of Availability for the Draft EIR to PG&E. In addition, City staff and PG&E's planning division have held several meetings to plan for future electrical needs for the plan area. Page 334 of the Draft EIR describes how future development would include undergrounding of existing electrical power lines and new residential development would not include the use of natural gas. With the implementation of existing regulations and Specific Plan

policies, construction-related impacts from undergrounding existing electrical lines, as well as constructing new or expanded utilities, would be less than significant. Limited uses can qualify for an exception to the City's Reach Code, thereby allowing the use of natural gas. The need for additional or expanded electrical or natural gas infrastructure would be evaluated at the time future development is proposed and be subject to subsequent environmental review. No comments were received from PG&E on the Draft EIR.

Public Facility-Related Comments

Comment C.5: Comments were received regarding the analysis for schools impacts.

Response C.5: Refer to Topic Response 2: School Impacts and Facility Needs.

Comment C.6: Comments were received pertaining to the implementation and realization of open space in Moffett Park, including youth sports facilities.

Response C.6: Chapter 6 of the Specific Plan, which is included in Appendix B of the Draft EIR, includes the following policies that relate to providing youth sports facilities:

- Policy OSE-2.5: Provide a minimum of (1) multiuse/flexible field area, 50 x 100 yards minimum or equivalent to a high school soccer field as defined by the US Youth Soccer Association.
- Policy OSE-2.6: Provide a minimum of (3) open field/flexible recreation areas, 35 x 65 yards minimum or equivalent to a U10 soccer field as defined by the US Youth Soccer Association. Fields may be synthetic or natural turf with grading and drainage to allow for regular use for informal/drop-in, youth sports, and community events.
- Policy OSE-2.7: When and where possible, increase the quantity of multi-use flex fields to include more opportunities for informal and youth athletics.

Per the proposed Specific Plan, the 212 to 230 acres of open space (which could include youth sports facilities) would be realized through a coordinated effort between the City, property owners, and developers, utilizing land dedication or easement dedication by non-residential and residential developments, transfer of development rights, ecological setback standards, the purchase of land using park dedication fee, and maintenance of parks and open spaces by property owners. This text has been added to page 18 of the Draft EIR (refer to Section 5.0 Draft EIR Text Revisions).

Comment C.7: Comments were received regarding the implementation of The Diagonal.

Response C.7: Refer to Response B.7.

Miscellaneous Comments

Comment C.8: Comments were received regarding the number of employees assumed in Moffett Park under existing conditions and with the buildout of the Specific Plan.

Response C.8: The estimated number of jobs/employees is summarized in Table 3.14-1 on page 259 of the Draft EIR. Table 3.14-1 shows that under existing conditions, there are 35,269 jobs/employees. With the buildout of the proposed Specific Plan, it is estimated that there would be a net increase of 60,414 jobs/employees for a total of 95,683 jobs/employees.

When compared to the estimated number of jobs/employees assumed under the adopted Specific Plan and General Plan, the project would result in a net increase of 26,954 jobs/employees. This is shown in Table 3.14-1, as well as Table 3.14-2, on page 259 of the Draft EIR.

Comment C.9: Comments were received about whether impact fees collected from future development would benefit Moffett Park and north Sunnyvale or elsewhere in the City.

Response C.9: Future development in Moffett Park would be subject to several impact fees. A summary of the primary impact fees and what they fund is provided below.

- 15 percent affordable housing in-lieu fee – funds affordable housing development within the city.
- Art in Private Development fee – funds installation of art throughout the city.
- Citywide Transportation Impact Fee (TIF) – funds transportation improvements citywide – within and outside of Moffett Park. Fees collected from development within Moffett Park would fund transportation improvements (some located within Moffett Park and others outside of Moffett Park) that would serve Moffett Park. Also see Response C.2 for a discussion of transportation improvements located within and outside of Moffett Park that would benefit development in Moffett Park.
- Community facilities/public services in-lieu fee – funds construction of new or expanded public facilities (such as fire and police stations community centers and libraries) and equipment purchases.
- Housing Mitigation fee – funds affordable housing development within the city.
- Park in-lieu fee – funds construction of new or expanded park or recreation facilities that would serve residents within Moffett Park.
- School impact fees – funds construction of new or expanded school facilities that would serve Moffett Park.
- Sewer and Water connection fees – funds capital improvement projects citywide. Fees collected from development within Moffett Park would fund CIPs that serve Moffett Park.

- Transportation Management Association (TMA) fee – funds the TMA that serves Moffett Park.

5.3 WRITTEN COMMENTS

FEDERAL AND STATE AGENCIES

D. California Department of Transportation (February 8, 2023)

Comment D.1: Travel Demand Analysis
With the enactment of SB 743, Caltrans is focused on maximizing efficient development patterns, innovative travel demand reduction strategies, and multimodal improvements. For more information on how Caltrans assesses Transportation Impact Studies, please review Caltrans' Transportation Impact Study Guide (link).

The project VMT analysis and significance determination are undertaken in a manner consistent with the Office of Planning and Research's (OPR) Technical Advisory. Per the DEIR, the project is found to have a less than significant impact. Caltrans supports the TDM measures and mitigation strategies proposed to minimize impacts to operations from the proposed project. Caltrans also supports the mitigation measures to increase active transportation mode-share in the project area by creating an accessible network to all transportation users.

> **Response D.1:** The comment does not identify any inadequacies of the Draft EIR; therefore, no further response is required.

Comment D.2: Lead Agency
As the Lead Agency, the City of Sunnyvale is responsible for all project mitigation, including any needed improvements to the State Transportation Network (STN). The project's fair share contribution, financing, scheduling, implementation responsibilities, and lead agency monitoring should be fully discussed for all proposed mitigation measures.

> **Response D.2:** The Specific Plan includes requirements that would reduce or avoid environmental impacts from future development. No mitigation measures such as improvements to the State Transportation Network (STN) were identified in the Draft EIR. While no specific development is proposed at this time, in the future, if analysis of development proposals results in the identification of mitigation measures, a Mitigation Monitoring and Reporting Program would be completed pursuant to CEQA.

Comment D.3: If any Caltrans facilities are impacted by the project, these facilities must meet ADA Standards after project completion. As well, the projects must maintain bicycle and pedestrian access during construction. These access considerations support Caltrans' equity mission to provide a safe, sustainable, and equitable transportation network for all users.

> **Response D.3:** No specific development is proposed at this time. In the event future development implementing the Specific Plan would impact Caltrans facilities, improvements would comply with ADA development standards during design and

construction. In addition, future development would be subject to City conditions of approval requiring developers to submit Traffic Control Plans as part of the Off-Site Improvement Plan. Future development that would be required to develop a bike and/or pedestrian detour plan in cases where existing bike lanes or sidewalks are temporarily impacted.

Comment D.4: Encroachment Permit
Please be advised that any permanent work or temporary traffic control that encroaches onto Caltrans' right of way (ROW) requires a Caltrans-issued encroachment permit. As part of the encroachment permit submittal process, you may be asked by the Office of Encroachment Permits to submit a completed encroachment permit application package, digital set of plans clearly delineating Caltrans' ROW, digital copy of signed, dated and stamped (include stamp expiration date) traffic control plans, this comment letter, your response to the comment letter, and where applicable, the following items: new or amended Maintenance Agreement (MA), approved Design Standard Decision Document (DSDD), approved encroachment exception request, and/or airspace lease agreement. Your application package may be emailed to D4Permits@dot.ca.gov.

Please note that Caltrans is in the process of implementing an online, automated, and milestone-based Caltrans Encroachment Permit System (CEPS) to replace the current permit application submittal process with a fully electronic system, including online payments. The new system is expected to be available during 2023. To obtain information about the most current encroachment permit process and to download the permit application, please visit https://dot.ca.gov/programs/traffic-operations/ep/applications.

Response D.4: No permanent or temporary work within Caltrans' right-of-way is proposed as part of the Specific Plan. In the event future development implementing the Specific Plan requires work within the Caltrans right-of-way, it would complete the encroachment permit submittal and submit the encroachment permit application package (if required) to obtain an encroachment permit from Caltrans.

E. Department of Toxic Substances Control (February 7, 2023)

Comment E.1: DTSC recommends that the following issues be evaluated in the Hazards and Hazardous Materials section of the EIR:

A state of California environmental regulatory agency such as DTSC, a Regional Water Quality Control Board (RWQCB), or a local agency that meets the requirements of Health and Safety Code Section 101480 should provide regulatory concurrence that any Project sites, including those for which Phase I Environmental Site Assessments have been performed, are safe for construction and the proposed used.

Response E.1: Text has been added to Specific Plan requirement 10.3.1-4, which requires remediation and/or management measures on properties with known environmental impacts, on page 191 of the Draft EIR to clarify that applicants are required to demonstrate hazardous materials do not exist on the site or that the proposed construction and use of the site are approved by the environmental oversight agency with jurisdiction that meets the requirements of Health and Safety

Code Section 101480 prior to the issuance of building permits (refer to Section 5.0 Draft EIR Text Revisions).

Comment E.2: Refiners in the United States started adding lead compounds to gasoline in the 1920s in order to boost octane levels and improve engine performance. This practice did not officially end until 1992 when lead was banned as a fuel additive in California. Tailpipe emissions from automobiles using leaded gasoline contained lead and resulted in aerially deposited lead (ADL) being deposited in and along roadways throughout the state. ADL-contaminated soils still exist along roadsides and medians and can also be found underneath some existing road surfaces due to past construction activities. Due to the potential for ADL-contaminated soil, DTSC recommends collecting soil samples for lead analysis prior to performing any intrusive activities for the project described in the EIR.

Response E.2: Text has been added to page 188 of the Draft EIR to clarify that on-site soils closest to SR 237 may be contaminated with Aerially Deposited Lead (ADL) (refer to Section 5.0 Draft EIR Text Revisions). Text has also been added to Specific Plan requirement 10.3.1-3 on page 190 of the Draft EIR, which is specific to Phase II Environmental Site Assessments, to clarify that future development located within proximity to SR 237 address the potential for ADL contamination (refer to Section 5.0 Draft EIR Text Revisions).

Comment E.3: If any projects initiated as part of the proposed project require the importation of soil to backfill any excavated areas, proper sampling should be conducted to ensure that the imported soil is free of contamination. DTSC recommends the imported materials be characterized according to DTSC's 2001 Information Advisory Clean Imported Fill Material.

Response E.3: A new Specific Plan requirement (10.3.1-8) has been added to page 192 of the Draft EIR to clarify that imported soil be free of contaminants and characterized per the guidance referenced in the above comment (refer to Section 5.0 Draft EIR Text Revisions).

Comment E.4: If any sites included as part of the proposed project have been used for agricultural, weed abatement or related activities, proper investigation for organochlorinated pesticides should be discussed in the EIR. DTSC recommends the current and former agricultural lands be evaluated in accordance with DTSC's 2008 Interim Guidance for Sampling Agricultural Properties (Third Revision).

Response E.4: Text has been added to Specific Plan requirement 10.3.1-3 (pertaining to Phase II Environmental Site Assessments) to clarify future development assess and address potential contamination from organochlorinated pesticides as appropriate (refer to Section 5.0 Draft EIR Text Revisions). DTSC's 2008 Interim Guidance for Sampling Agricultural Properties (Third Revision) and any other applicable DTSC guidance documents would be considered during preparation of the Phase II Environmental Site Assessment, as appropriate.

F. United States Department of the Navy (February 9, 2023)

Comment F.1: Section 3.9.1.2, Regulatory Database, Search of the DEIR: The EIR should note that the cleanup of the Sunnyvale Naval Industrial Reserve Ordnance Plant (NIROP) is also being overseen by the United States Department of the Navy as the lead agency under the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), with regulatory agency oversight provided by the San Francisco Bay Regional Water Quality Control Board. The description mentions the proposed plan to remediate groundwater; however, we have progressed to the review of the Record of Decision. The groundwater remediation includes the use of land use controls with the land until the groundwater cleanup goals are achieved. It should also mention that a cleanup plan is being developed to remediate soil and soil vapor at the NIROP site. Once the final plan is approved, the Navy envisions a remedy of land use controls that would run with the land, with the potential for additional cleanup measures such as soil removal and soil vapor mitigations in the event the site is redeveloped.

> **Response F.1:** Text has been added to page 184 of the Draft EIR to include the information provided in the above comment about the cleanup plan (refer to Section 5.0 Draft EIR Text Revisions).

Comment F.2: Section 3.9.2.1, Project Impacts, Impact HAZ-2 of the DEIR: The Specific Plan Project Requirements noted as 10.3.1-1 through 10.3.1-5 do not acknowledge that many of the contaminated sites within the planning area have already been thoroughly investigated. Remedies already have been, or will be, approved by the appropriate regulatory authorities prior to any redevelopment under the plan. Thus, in many cases the types of investigations called for in the Requirements would not be necessary and would be superfluous. In the specific case of the NIROP facility, approved CERCLA remedial action remedies for groundwater, soil, and soil vapor will be in place prior to any redevelopment of the property. Remedies will be documented in formal records of decision, and any ongoing land use controls and requirements will be recorded in the chain of title for the property. The text of the EIR should acknowledge that where remedies are already in place and approved by appropriate regulatory authorities, the additional studies and investigations should not be required.

> **Response F.2:** Text has been added to the Draft EIR to clarify that if project sites proposed for development have met the Specific Plan requirements 10.3.1-1 through 10.3.1-5 on pages 190 through 191 of the Draft EIR through previous environmental work, additional work may not be required unless previously unknown conditions are encountered. It is assumed that sites under regulatory oversight would comply with requirements from regulatory oversight agencies (including those documented in RODs) prior to redevelopment. Refer to Section 5.0 Draft EIR Text Revisions.

REGIONAL AND LOCAL AGENCIES

G. Sunnyvale School District (February 10, 2023)

Comment G.1: On behalf of the Sunnyvale School District ("District"), we are responding to the City of Sunnyvale's recent release of the Draft Moffett Park Specific Plan ("Specific Plan") and related Draft Environmental Impact Report ("DEIR"). As the primary provider of public preschool and elementary school education within the Specific Plan area, the impacts of the Specific Plan on public education in the region is of considerable concern to our District and Board of Education. The District shares many of the community values expressed in the Specific Plan; however, unless we find effective ways to partner with the City and hold developers accountable for ensuring that we have sufficient resources to provide school capacity as residential development occurs, families may begin to look for residential communities outside of the region due to school overcrowding. In addition, as further described in this letter, we believe that some impacts have not been fully or accurately characterized in the DEIR.

The District appreciates the time that City staff has taken to meet and discuss issues of concern, and this letter formalizes and summarizes the items we hope to identify, address and resolve through the Specific Plan EIR process. Enclosed with this comment letter you will also find Resolution #R23-19 adopted by the District Board of Education expressing its concerns with the Specific Plan and DEIR and requesting that the City take more affirmative steps in the Specific Plan to ensure that school facility capacity keeps pace with development.

We offer the following comments on the Specific Plan and the DEIR.

1. School Capacity and Development

About 85% of projected buildout of the Specific Plan area will occur within the boundaries of our District. Based on student generation data and the number and types of anticipated residential and commercial development within the Specific Plan, our District agrees that a realistic estimate of total new students is 1,200 but could be significantly higher depending on type and density of dwelling units.

Currently, the District does not own land or operate any schools within the Specific Plan area. The two schools located closest to that area are Lakewood Elementary School, serving grades TK-5, and Columbia Middle School, serving grades 6-8. As noted in the DEIR, both schools are slightly below capacity at present. Please note that the District recently learned of the likely closure of a local charter school (Summit Denali Charter School) that derives significant enrollment from families in the attendance area of Columbia Middle School. Students returning to Columbia Middle School starting in the 2023-24 school year are likely to absorb and exceed all current capacity at that site, which should be noted in the DEIR.

The DEIR is clear that neither of the two schools have anywhere near sufficient capacity to house anticipated school generation, and we agree. In the short term and on a temporary basis, existing sites will require significant expansion to house students beginning within the next five (5) years. However, over the longer term, a school site of up to 10 acres will have to be acquired and a new school developed to serve the Moffett Park area. Costs to acquire land and build a new TK-8 school

are estimated to be in the range of $160-200 million in today's dollars. School fees are likely to generate about 50% of the total construction costs for a new campus; however, school fees collected by the time the District must start planning a new campus will be far below the amount needed. In addition, this fee collection does not account for funds that will be needed in the short term for existing campus expansion. Early planning is essential, as school financing, site development and construction can easily take ten years to accomplish.

With regard to the District's ultimate need for a TK-8 school site, we appreciate that some thought has been given to school locations in the Specific Plan area. It appears that a potential school site of approximately four acres is identified on page 71 of the Specific Plan in the artist rendering of the Crossman neighborhood, but this site is not reflected or studied in the DEIR. We note that the neither the Crossman parcel nor the parcels identified in the DEIR designated for institutional/school uses (on Bordeaux Drive and Innovation Way) may be approvable by the California Department of Education ("CDE") due to proximity to the Moffett Field airport facility, VTA rail lines and freeways. Because school sites must meet very high safety thresholds, it is critical that the City work with the District directly to locate, reserve and designate in the Specific Plan at least one potential future school site that has a reasonable likelihood of being approved by CDE.

We recognize that high density neighborhoods may require some new approaches to school facility planning, and we are open to considering alternatives that call for less acreage than the state standard of 9-16 acres for an elementary school and 17-22 acres for a middle school. However, the needs created by a TK-8 grade span will necessitate significantly more than four acres of land.

While laying out a myriad of facts about the insufficiency of existing schools to meet capacity needs from anticipated development, the DEIR nevertheless concludes that the implementation of the Specific Plan would not result in significant impacts to schools, based on the conclusion that in accordance with Government Code Section 65995, payment of school impact fees is considered adequate mitigation of impacts associated with the increased demands on school facilities resulting from development; further, the DEIR states that it is the District's responsibility to implement the specific methods for mitigating school impacts.

These conclusions should be re-evaluated. In March 2020, upon the failure of Proposition 13, the last attempted statewide school bond measure, Government Code Section 65996 (quoted in the DEIR) became inoperative and was replaced by Government Code Section 65997 to cover the period of time between approved state bond programs. Government Code Section 65997 expands the power of local agencies to condition environmental approvals of development projects on certain forms of school facility mitigation, such as use of community facility districts under the Mello-Roos Community Facility Act of 1982 (see Gov. Code, § 65997, operative upon failure of Proposition 13 in March, 2020, and replacing Gov. Code,§ 65996, which became inoperative upon failure of Proposition 13.) Government Code Section 65997 is operative for as long as state bond funds for school facilities remain unavailable.

Notwithstanding this legal authority, we encourage and request that the City consider all possible avenues available to set conditions on development for school facility mitigation purposes, and that at a minimum the City consider some additional methods to incentivize developers to voluntarily agree to provide funding or assistance in excess of statutory fee amounts. Developer contributions to costs in excess of school impact fees or agreement to place projects within community facilities

districts are the most common and reliable ways we can assure the availability of funding for a new school when the school is needed to serve the future residents of the Moffett Park area. The District's current general obligation bond authority is dedicated solely to improvement of existing facilities serving current residents. The State of California School Facility Program is out of funding, and even if funds are replenished through a state bond measure in the future, the program requires a local match to be provided by the District.

Response G.1: Refer to Topic Response 2: School Impacts and Facility Needs.

Comment G.2: 2. School Service and Safety

Aside from the impact of the Specific Plan on the school facility capacity, we note the following additional concerns with the DEIR:

Transportation Services - The District provides home-to-school transportation to students living in areas of the District that we identify as safety-zones, which are those areas in which travel to school on foot has been determined to pose a safety hazard to students. Under our safety-zone criteria, the entirety of the Moffett Park Specific Plan area would qualify for such transportation services. To accommodate 1,200+ students with busing support would require an additional 22 buses and drivers on the road daily. For context, the District currently operates only 4 buses. It is not evident that the transportation and traffic impact created by more than 5 times the current environmental baseline for school bus traffic in Sunnyvale was taken into consideration and these impacts must be acknowledged and addressed.

Safe Routes to School (TR7 Table 3.3-2) - The DEIR does not appear to show or address the Safe Routes to School Program that General Plan policies reference.

Traffic/Circulation Impact Analysis -In the short term, students in the project area will be attending school at Lakewood and Columbia. However, there is no evidence that the traffic or air quality analyses take into consideration the increase in traffic to those sites from the Specific Plan area and the accompanying release of pollutants in the region. These impacts must be characterized, addressed and mitigated.

All of the foregoing factors should be considered in the DEIR and squarely acknowledge these problems for decision makers and the public, and, in light of the significant impact of planned growth or increasing residential density on our District, the DEIR should propose mitigation measures to lessen or avoid those impacts.

Response G.2: The Transportation Analysis in Appendix I of the Draft EIR, which includes travel demand forecast model Vehicle Miles Traveled (VMT) results, accounts for the VMT generated from the buildout of the Specific Plan – including vehicle trips to and from local schools. The traffic model uses socioeconomic inputs (i.e., population, income, and employment) aggregated into geographic areas to estimate travel within the model area. Because the model accounts for the entire Bay Area, schools located outside of Moffett Park were coded as destinations within the model. The residential VMT metrics account for home-based trips, which include resident travel from home to work as well as resident travel from home to school.

Therefore, trips to schools located outside of Moffett Park have been accounted for in the VMT results. As discussed in Section 3.17 Transportation, page 307, of the Draft EIR, buildout of the Specific Plan would result in a VMT per capita of 9.47 for residential land uses, which is below the VMT impact threshold of 11.03.

The project's air quality impacts, including air pollutant from project-generated trips and VMT are discussed in Section 3.3 Air Quality on pages 55 through 81 of the Draft EIR. The emissions from project-generated vehicle trips are based on the trip generation and VMT data from the Transportation Analysis. The air quality analysis in the Draft EIR, therefore, accounts for air pollutant emissions from project-generated vehicle trips to and from schools.

If school buses are used to transport students living in Moffett Park to local schools, the VMT (including number of vehicle trips) would be lower than evaluated in the Draft EIR. In addition, school bus trips are typically assessed when a school is proposed. As explained in Topic Response 2: School Impacts and Facility Needs, no school is proposed at this time,

As mentioned on pages 310 through 311 of the Draft EIR, the condition of traffic, school bus safety, and safe routes to a potential school site would need to be evaluated and considered when siting a future school. As shown in Table 3.3-2 of the Draft EIR, in compliance with BAAQMD Control Strategy Measure TR7, future projects under the Specific Plan would be designed to facilitate safe traffic flow and promote school and bicycle safety and safe access to transit. In addition, when future residential development is proposed, the City will evaluate safe routes to schools as part of the development review process.

The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR.

Comment G.3: 3. Specific Plan Strategies/CEQA Mitigation Measures

In order to address the above-described impacts, the District requests that additional strategies be included within the Specific Plan in support of public education, as well as included in the DEIR as mitigation measures to address and reduce the environmental impacts of the City's growth plans. First, please establish an overall Specific Plan goal that is supportive of our District but is more focused and specific than the City's General Plan goals. The General Plan currently states only its vision "to support and work cooperatively with the educational institutions which serve Sunnyvale so as to provide the opportunity for a quality education for all youth, and lifelong learning for all residents."

A goal statement in the Specific Plan that the District would support could be very straightforward, such as:

> "The City seeks to ensure that youth in the Moffett Park Specific Plan area have access to a quality school system with safe, adequate facilities and funding available as homes are built and additional school capacity is needed. Requiring, encouraging and/or incentivizing

landowners and developers through development incentives or otherwise, to provide land, funding or participation in community facilities districts that provide funding in excess of minimum development impact fees, are the primary methods to sustain quality educational services and will be supported by the City as development moves forward."

Second, plan strategies for the Specific Plan and mitigation measures for the impact of the Specific Plan on school facilities, capacity and funding that should be included are the following:

- Provide information to school districts when considering Specific Plan amendments, zone changes, or other legislative land use policy decisions and ensure that information about school capacity contained in development and environmental analysis incorporates current information on school capacity and the cumulative impacts of individual projects on school capacity.
- Review proposed legislative land use decisions in the context of the adequacy of present and future school facilities and require all developers to confirm, prior to receiving any project entitlements from the City, that they have met with affected school districts to discuss the impact of the project on school capacity and consider forms of mitigation, including placing the project into a community facilities district.
- In addition to the Bonus Floor Area Ratio incentives, grant additional density, more flexible setbacks and building heights, and/or reduced parking requirements or other development incentives for projects that voluntarily provide additional financial support for school facility funding; when and as possible, impose conditions on projects requiring school facility mitigation in excess of statutory school fees.
- In conjunction with affected school districts, reserve or provide for the identification and dedication of school sites within the Specific Plan area.
- Support lobbying efforts to expand State funding of the public school system.
- Support school construction bond measures or other financing options, such as the use of community facilities districts, for the construction of new schools in the Specific Plan area.

Response G.3: Refer to Topic Response 2: School Impacts and Facility Needs. The project would not result in significant impacts to schools therefore, no mitigation is required under CEQA. The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

H. Santa Clara Valley Transportation Authority (February 10, 2023)

Comment H.1: Air Quality and Greenhouse Gas Impacts – TDM Mitigation Measures

The DEIR notes that the buildout of the Moffett Park Specific Plan (MPSP) would result in Significant and Unavoidable Impacts in the areas of Air Quality and Greenhouse Gas Emissions (Impact AIR-2, p. 74, and Impact GHG-1, p. 162). The DEIR states that mobile emissions, from project-generated motor vehicle trips, "account for 89 percent of emissions from Specific Plan buildout" and notes that the Specific Plan includes TDM policies to reduce vehicle trips, which would reduce mobile emissions (p. 70).

VTA supports the inclusion of extensive TDM policies in the draft Specific Plan, including establishing a Transportation Management Association (TMA), requiring a TDM plan and TMA membership of new developments, and working with the TMA to achieve a 50 percent single-occupancy vehicle (SOV) rate at full buildout of the Specific Plan. However, VTA believes that these TDM requirements – which translate into mitigation measures in the DEIR – can be strengthened. In particular, VTA recommends that the City establish an SOV rate target for an intermediate year (for instance 2030 or 2035), and consider establishing a more aggressive SOV rate target for buildout. For comparison, the North Bayshore Precise Plan in Mountain View identifies a 45 percent SOV target for office trips, and the Google North Bayshore Master Plan includes an objective to achieve a 35 percent SOV rate at full buildout.

Response H.1: The Transportation Demand Management (TDM) policies TDMP-2.1 through TDMP-2.5 on page 71 of the Draft EIR are part of the proposed Specific Plan and, therefore, assumed as part of the project (rather than mitigation). Page 71 through 72 of the Draft EIR lists supplemental TDM measures that individual projects can implement. The above suggested TDM measure of a single occupancy vehicle (SOV) target of less than 50 percent has been added to this list (refer to Section 5.0 Draft EIR Text Revisions).

The 50 percent SOV rate for the proposed Specific Plan is informed by the vehicle capacity at the district gateways and an assumption that the total number of person trips at full buildout would require a 50 percent SOV mode share to maintain access and functional operations on the surrounding street network. The constrained capacity at the gateways in combination with the extensive TDM policies and a substantial multimodal network in the district would contribute to meeting this target. The City of Sunnyvale acknowledges the City of Mountain North Bayshore Precise Plan identifies a 45 percent SOV target for office development. The Specific Plan's target of an overall 50 percent SOV rate encompasses all uses in the Specific Plan (not just office development as is the case with the North Bayshore Precise Plan). In addition, the stringent 35 percent SOV rate for the proposed single-tenant Google North Bayshore Master Plan (SCH# 2022020712) is not typical of development with multiple owners and tenants as would be the case with the Specific Plan.

Section 10.6 Performance Metrics of the Specific Plan requires regular district trip monitoring by the Transportation Management Agency (TMA). Monitoring of future developments' TDM plans are also required by the Specific Plan. The TMA would be responsible for managing the TDM within Moffett Park and could consider an interim SOV rate target for an interim year as part of its management strategy.

The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR, nor does provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

Comment H.2: Transportation Analysis - Assumptions about Project Trips and Mode Splits

In Table 3.17-2 and accompanying text, the DEIR analysis assumes that 100 percent of internal trips (within Moffett Park) would be accomplished by non-driving modes at project buildout. A footnote states that "With district parking, people coming into Moffett Park would need to park once and use other modes of transport (e.g., walking or biking) to complete their activities within Moffett Park" (p. 297). VTA staff does not completely agree with this assumption. The DEIR does not provide any mitigation measure nor does the MPSP include a policy to incentivize or enforce this "park-once" approach. Given that the MPSP area is more than two miles long (Caribbean Drive/SR 237 to Enterprise Way), it is certainly possible that travelers will chose to drive or take transit for internal trips. The district parking and "park-once" approach in the MPSP will certainly encourage fewer trips to be made by car, but VTA encourages the City to consider adding a policy to establish parking pricing, to further encourage "park-once" and non-single-occupancy vehicle travel.

Response H.2: The proposed Specific Plan calls for a "park-once" policy. As described in Chapter 8 of the Specific Plan, "a 'park-once' environment provides optimally placed shared parking and inviting multimodal connections to encourage non-driving trips within Moffett Park." This is supported with accompanying policies in Section 8.1, which address the importance of parking management in addition to multimodal access.

More details about vehicle parking requirements are introduced in Section 8.3 of the Specific Plan, as follows: "Park Once. Motorists will be able to drive to Moffett Park, park their car, and walk, bike, scoot, or take transit to a variety of destinations. The result is more physical and economic activity, less internal driving, and fewer needed parking spaces." Sections 8.3.1 and 8.2.2 of the Specific Plan include a variety of standards and guidelines related to parking supply, access, and pricing. Section 8.4 of the Specific Plan details management of shared parking and includes additional standards and guidelines, including pricing (which is suggested in the above comment).

Also refer to Response H.1. At full buildout, given the foundation of the Specific Plan that includes complete neighborhoods featuring centralized open space and activity center with all services and necessities needed for daily life within a 15-minute walk or bike ride from places of residence or employment, the capacity constraints of the street network, extensive TDM policies, and substantial multimodal network[6], the choice for people to travel within Moffett Park after arriving by

[6] The Specific Plan calls for extensive investments in multimodal infrastructure to support transit and active transportation mode shares, including: a complete streets network with pedestrian-friendly street designs throughout the district; separated bike and pedestrian facilities; a robust on-street bike network and connections to the surrounding street network at district gateways; an internal circulator with frequent service to locations where public transit is not convenient; mobility hubs to support multimodal trips and expand transit access at activity centers; and substantial TDM requirements for all land uses. These resources and incentives to support non-drive access within the district would be implemented over time as future projects are developed and would be most effective at full build out.

walking, biking, rolling, or taking transit would be more convenient and efficient than by vehicle. These reasons substantiate the mode split assumed for the Specific Plan. In addition, Section 10.6 Performance Metrics in the Specific Plan requires district trip and mode split monitoring on a regular basis.

The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

Comment H.3: It appears to VTA staff that Table 3.17-2 in the DEIR incorrectly translates the percentages of non-driving external trips from Table 4 in the Hexagon memorandum in Appendix I. Table 3.17-2 suggests that just under 2% (10,981) of all project trips would be made by public transit, whereas the Hexagon memo states that "approximately 24% of all external non-driving trips (or 4% of all trips) generated by Moffett Park would use public transit" (Hexagon memo p. 8). While this difference is unlikely to affect the DEIR's conclusions about Transportation impacts, clarifying this will help the City and VTA plan for future transit service to Moffett Park.

Response H.3: The text in Table 3.17-2 on page 297 of the Draft EIR has been revised to show 18 percent of bike/walk non-driving drips, 23 percent of transit non-driving trips, and 59 percent of shuttle non-driving trips. Refer to Section 5.0 Draft EIR Text Revisions.

Comment H.4: Transit Priority Areas Map
The location of the Borregas light rail station is incorrectly shown on the Transit Priority Areas map in the DEIR (Figure 3.1-1, p. 48). However, this does not appear to affect the DEIR's general characterization of which MPSP development areas fall within Transit Priority Areas and which do not.

Response H.4: The location of the Borregas light rail station is approximate on Figure 3.1-1 on page 48 of the Draft EIR. This comment does not change the analysis or conclusions disclosed in the Draft EIR.

Comment H.5: Transit Facilities
Transit facilities information is out of date, p. 292. Precise times are used in the DEIR description which are only accurate at a specific period and then become quickly outdated. VTA recommends updating the Final DEIR to reference more general time intervals to account for future schedule changes. The Orange Line currently runs every 15 minutes on weekdays.

- LR Orange Line, 5a-12a weekdays, every 15 minutes.
- LR Orange Line, 6a-12a weekends, every 30 minutes.
- Express Line 122 does not exist and was discontinued in 2020. It is incorrectly shown on in the DEIR (Figure 3.17-4, p. 305).

Response H.5: The text on page 292 of the Draft EIR has been revised to reflect more general time intervals as suggested by VTA. Figure 3.17-4 on page 295 of the Draft EIR has been revised to exclude reference to Express Line 122 (refer to Section 5.0 Draft EIR Text Revisions).

Comment H.6: VTA recommends that Voluntary Contributions also be identified for transit improvements to support the proposed MPSP Policies M-3.2, M-3.3, M-3.4. The Mathilda and Java Drive corridors will require significant changes and enhancement to support transit. When the Voluntary Contribution program was established, its intent was to provide local jurisdictions with a pathway for developers to contribute funding towards regional transportation facilities. While the early focus of contributions under this program was often to direct funding towards freeway and express lanes projects, VTA encourages local jurisdictions to take a similar contribution approach towards transit expansions and enhancements which can also address travel demand along regional transportation corridors. To achieve the travel mode share splits and goals outlined in the MPSP and DEIR, funding and contributions from private sources will be required to achieve the recommended outcomes. For instance, voluntary contributions should also be identified for transit facilities including the planned reconstruction of the Borregas Light Rail station.

> **Response H.6:** Text to page 298 of the Draft EIR has been added to clarify that, as part of future coordination between the City, VTA, and Moffett Park's Transportation Management Association, future development projects could provide voluntary contributions to VTA for transit expansions and enhancements, as suggested in the above comment. Refer to Section 5.0 Draft EIR Text Revisions.

Comment H.7: Analysis of Congestion Management Program Facilities
VTA staff appreciates that the DEIR and Appendix I include analysis of the project's effects on Congestion Management Program (CMP) facilities including CMP intersections and freeway segments, recognizing that this analysis was performed for City and CMP purposes and the findings to not constitute CEQA impacts. VTA supports the City's statement in the DEIR that "Express lane projects… would improve freeway traffic flow" and that "these express lane projects would be included in the citywide nexus study. Future development under the Specific Plan would participate in VTA's Voluntary Freeway Contribution Program and contribute their fair share towards the identified express lane projects via the nexus study" (p. 306). Before identifying specific projects to fund, Sunnyvale staff should first consult with both the current VTA Planning and Programming Officer and Engineering Program Delivery Officer at the time to best coordinate efforts.

> **Response H.7:** City staff will consult with the VTA Planning and Programming Officer and Engineering Program Delivery Officer, as suggested by the above comment, in order to coordinate projects. The comment does identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

Comment H.8: The DEIR states that the "The results of the TIA showed that the buildout of the Specific Plan would result in LOS operational deficiencies at a total of 16 study intersections under background plus project and/or cumulative plus project conditions" (p. 299). The DEIR also notes that "No feasible improvements were identified at seven of the 16 deficient intersections… due to right of way constraints" and summarizes feasible improvements for the other 11 intersections (p. 302). VTA notes that several of the intersections where LOS operational deficiencies were found are CMP intersections, and that two of these CMP intersections are along the County's Expressway system (Intersections #40 and #45) and one crosses the VTA light rail Orange Line. The City should work with the County and VTA to monitor the Project's effect on these intersections as buildout

occurs, to determine whether the potential improvements in the DEIR (such as depressing light rail tracks at Lawrence Expressway and Tasman Drive) is warranted, and to contribute funds through the citywide nexus study/fee.

Response H.8: The City will coordinate with the County and VTA throughout project buildout to confirm the improvements identified in the Draft EIR are warranted. The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

I. Valley Water (February 10, 2023)

Comment I.1: Within the Plan area Valley Water has fee title property and easement along both the Sunnyvale East and West Channels. Both channels were constructed in the 1960's by Valley Water to serve as storm drains in response to flooding caused by a combination of major storm events, land subsidence, and inadequate drainage to the south San Francisco Bay. The channels should not be referred to as "creeks" or "rivers" as they are not located in the vicinity of a historic creek and have no historical upstream watershed. They were designed for an approximate 10-year storm event and were constructed with a combination of concrete box culverts, concrete lining, sack concrete slope protection, rock slope protection, or earth lined trapezoidal shaped channels where the most downstream sections included earthen levees.

Response I.1: The Draft EIR does not describe the East or West Channels as creeks or rivers. For example, on page 202 of the Draft EIR, these channels are described as hardened channels: "Moffett Park is located in an area where catchments drain to *hardened channels* (e.g., Lockheed Martin, Sunnyvale West Channel and Sunnyvale East Channels [emphasis added] and/or tidal areas (e.g., San Francisco Bay) as described below." Text has been added to page 202 of the Draft EIR to include the design details of the channels provided in the above comment (refer to Section 5.0 Draft EIR Text Revisions).

Comment I.2: Page 28 and page 112 state that mitigation will be provided for impacts to riparian habitat. Please note that no mitigation is allowed on Valley Water property for non-Valley Water projects.

Response I.2: The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

Comment I.3: The DEIR does not include any discussion in the Biological Resources or Hydrology and Water Quality sections regarding impacts on the Sunnyvale East or West Channels due to the proposed the pedestrian bridge crossings. The DEIR should include discussion of how any proposed bridge crossings may impact Sunnyvale East and West Channels. To minimize impacts to these facilities, including operational impacts, the number of new crossings should be minimized and where possible pedestrian crossings should be incorporated into existing road crossings.

Response I.3: The Specific Plan proposes a transportation network that identifies the location of two potential bicycle crossings over the East Channel. Text to page 12 of the Draft EIR has been added to clarify this and Figure 2.3-4a has been added to the

Draft EIR to show the approximate location of these crossings (refer to Section 5.0 Draft EIR Text Revisions). No crossings of the West Channel are proposed as part of the Specific Plan.

Impacts to the East and West Channel are considered in the biological resources and hydrology and water quality sections of the Draft EIR. The analysis on page 112 in Section 3.4 Biological Resources acknowledges that implementation of the Specific Plan could result in infrastructure over waterways (such as the East Channel) that may impact riparian areas. Specific Plan requirement 10.3.5-10 requires future development within 250 feet of riparian areas to evaluate impacts to riparian habitat and avoid impacts. The impact discussion under Impact HYD-1 on page 208 of the Draft EIR concludes that existing water quality regulations would reduce water quality impacts from future construction and development (such as future crossings of the East Channel) to a less than significant level and the impact discussion under Impact HYD-3 on page 210 through 211 of the Draft EIR discusses how the Specific Plan would increase pervious surfaces around the East and West Channels and not substantially alter the drainage of the East and West Channels.

Construction details for the crossings of the East Channel are currently unknown. When the crossings are designed and construction details known, subsequent environmental review would be required and mitigation measures would be identified, as necessary, to reduce the impacts (including impacts to biological resources and water quality) from the construction and operations of the future crossings.

Comment I.4: The discussion on page 86 under Regional and Local Regulatory Framework, should include the Water Resources Protection Collaborative's Guidelines and Standards for Land Use near Streams (Guidelines and Standards), which was adopted by the City, and Valley Water's Water Resources Protection Ordinance and Manual.

Response I.4: Text has been added to page 86 of the Draft EIR to include a description of the Guidelines and Standards for Land Use Near Streams and Water Resources Protection Ordinance and Manual referenced in the above comment (refer to Section 5.0 Draft EIR Text Revisions of this Final EIR.

Comment I.5: Page 92 states that Sunnyvale East appears to be tidally influenced. The document should state that the channel is tidally influenced to approximately Highway 101.

Response I.5: Text has been added to pages 92/93 of the Draft EIR to clarify that the Sunnyvale East Channel is tidally influenced to approximately Highway 101 (refer to Section 5.0 Draft EIR Text Revisions).

Comment I.6: Page 93 states Sunnyvale West channel is tidally influenced. The document should state that the channel is tidally influenced to approximately Mathilda Avenue.

Response I.6: Text has been added to page 93 of the Draft EIR to clarify that the Sunnyvale West Channel is tidally influence to approximately Mathilda Avenue (refer to Section 5.0 Draft EIR Text Revisions)

Comment I.7: The discussion of riparian impacts in the Biological Resources section, including pages 111 (Impact BIO-2) and page 116 (Impact BIO-5) should discuss compliance with the Guidelines and Standards and the Valley Water's Water Resources Protection Manual, including lighting and setbacks to waterways and riparian areas.

Response I.7: Text has been added to the impact discussion under Impact BIO-2 on page 113 of the Draft EIR to clarify that future development under the Specific Plan would be subject to the Guidelines and Standards for Land Use Near Streams and Water Resources Protection Ordinance. Text has also been added to the impact discussion under Impact BIO-5 on page 116 of the Draft EIR to clarify how future development would comply with the Guidelines and Standards for Land Use Near Streams and Water Resources Protection Ordinance and Manual, as applicable. This comment does not provide new information that would change the conclusions disclosed in the Draft EIR.

Comment I.8: The Groundwater and Subsidence section on page 145 notes that local groundwater provides 40 percent of the Bay Area's water supply. While this is accurate for Santa Clara County, California's Groundwater Bulletin 118 (Department of Water Resources, 2020) notes groundwater provides 20% of the water supply for the San Francisco Bay Hydrologic Region. Also, this paragraph uses meters instead of feet as the unit of measure. Meters are not used anywhere else in the DEIR; therefore, for consistency, the document should use feet instead of meters in this paragraph.

Response I.8: Text on page 145 of the Draft EIR has been revised to clarify that local groundwater provides 40 percent of the County's water supply (refer to Section 5.0 Draft EIR Text Revisions). This comment does not provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

Comment I.9: The discussion regarding Valley Water on page 198, should be replaced with the following text:

"Valley Water operates as the flood protection agency for Santa Clara County. Valley Water also provides stream stewardship and is the wholesale water supplier throughout the county, which includes the groundwater recharge program. In accordance with Valley Water's Water Resources Protection Ordinance, any work within Valley Water's fee title right of way or easement or work that impacts Valley Water facilities requires the issuance of a Valley Water permit. Under Valley Water's Well Ordinance 90-1, permits are required for any boring, drilling, deepening, refurbishing, or destroying a water well, cathodic protection well, observation well, monitoring well, exploratory boring (45 feet or deeper), or other deep excavation that intersects the groundwater aquifers of Santa Clara County."

The discussion on page 199 regarding the City's regulatory framework related to water resources should include reference to the Guidelines and Standards.

Response I.9: The text on page 198 has been revised with an updated description of the Water Resources Protection Ordinance and District Well Ordinance as suggested in the above comment and to include a description of the Collaborative's Guidelines and Standards for Land Use Near Streams adopted in 2007 (refer to Section 5.0 Draft EIR Text Revisions).

Comment I.10: The discussion on page 201, Groundwater, should note that due to the long agricultural history of the Santa Clara Subbasin and subsequent land development, there are likely many abandoned wells in the Subbasin. While some of these abandoned wells may have been sealed prior to well permitting requirements, many have open casings and may be discovered during construction. If abandoned wells are encountered during construction, they must be properly destroyed with related work permitted by Valley Water as per Valley Water's Ordinance 90-1 discussed above.

Response I.10: Text has been added to page 183 and 201 of the Draft EIR to clarify that abandoned wells may be present in Moffett Park. Page 198 of the Draft EIR (as revised) discloses that wells encountered during construction must be properly destroyed in accordance with Valley Water's Well Ordinance 90-1. Refer to Section 5.0 Draft EIR Text Revisions. This comment does not provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

Comment I.11: The discussion under Groundwater on page 202, needs to include a reference(s) supporting the statements made in the paragraph starting with the sentence "Studies completed to assess the influence of tides on groundwater elevations at the shallowest aquifers generally concludes that tidal influence was not measurable at the locations monitored."

Response I.11: The source for the above referenced text is the Sea-Level Rise Impacts on Shallow Groundwater in Moffett Park Technical Addendum, which is included in Appendix G of the Draft EIR. A footnote has been added to the text to clarify this (refer to Section 5.0 Draft EIR Text Revisions).

Comment I.12: Page 204, Figure 3.10-2, is titled "Groundwater Depth in Moffett Park" (note – 'depth to groundwater' is the commonly used term) but the figure legend uses the phrase "water table elevation (NAVD)". Depth to groundwater and water table elevation mean two different things. The figure legend and title need to be corrected as noted for accuracy and consistency.

Response I.12: The title for Figure 3.10-2 on page 204 of the Draft EIR has been revised to "Groundwater Elevations in Moffett Park" (refer to Section 5.0 Draft EIR Text Revisions). This comment does not provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

Comment I.13: The discussion on page 206 regarding flooding should note that the Specific Plan area includes areas in a Special Flood Hazard Area (SFHA) AE to the north and east and areas to the south and west are generally located in Zone X, protected by levees. Areas currently designated as Zone X, which is not a SFHA, may in the future be subject to increased flooding due to sea level rise or other changes that impact the levees that currently protect those areas.

Response I.13: Section 3.10.1.2 Existing Conditions, Page 206 of the Draft EIR notes that the northern and eastern portions of Moffett Park and along the East and West Channels are within a SFHA. The Draft EIR text has been updated to clarify that areas to the south and west are generally located in Zone X, protected levees and that areas designated within Zone X (which is not a SFHA) may be subject to increased flooding in the future due to sea level rise or changes that affect levees which currently protect these areas (refer to Section 5.0 Draft EIR Text Revisions).

Comment I.14: The discussion of flooding of Sunnyvale East and West Channels on page 206 needs to be revised for accuracy. Please replace the sentence regarding flooding on these channels with the following:

"The cause of high-water levels on Sunnyvale East and West Channels could stem from multiple factors, including backwater flows from San Tomas Aquino and Calabazas Creeks, coastal flood events, high flows on the creeks themselves and higher roughness in the channel. Flooding could potentially occur from a combination of one or more of these factors."

Response I.14: The text on page 206 of the Draft EIR has been reworded per the above comment (refer to Section 5.0 Draft EIR Text Revisions). This comment does not provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

Comment I.15: The discussion on page 206 under "Flooding and Other Inundation Hazards" states, "The Shoreline Project, a joint effort between Valley Water, Coastal Conservancy, and the United States Army Corps of Engineers (USACE), is planning, designing, and constructing a shoreline levee to replace the protection provided by the salt pond berms." The DEIR should also note that the Shoreline Phase III Feasibility Study will determine the feasibility of implementing various options to protect the low-lying areas along the Santa Clara County shoreline at risk to coastal flooding and sea-level rise as well as identify opportunities for environmental restoration and expanded public access to San Francisco Bay. The outcome of the Shoreline Phase III Feasibility Study must determine that there is a positive benefit to cost ratio of building coastal flood protection in the study area in order for the project to move forward with design and construction. After the completion of the feasibility study, the project must compete nationally for congressional funding. The project partners, including the City of Sunnyvale, must work together throughout the feasibility study and beyond in order to build appropriate shoreline protection. It should also be noted that at this time the feasibility study has not commenced.

Response I.15: The information in the above comment has been added to page 206 of the Draft EIR (refer to Section 5.0 Draft EIR Text Revisions).

Comment I.16: The discussion of impacts related to flooding on pages 210 (Impact HDY-3), 211 (Impact HYD-4) and 212 (Impact HYD-C) do not discuss how new development will be protected from existing flooding or comply with the National Flood Insurance Program requirements and City floodplain policies and requirements. Nor do the discussions address the additional fill proposed to raise the finished floors of non-residential buildings (page 214) as may be required for residential buildings to meet federal and City floodplain ordinances would impact both the extent and depth of existing flooding. While Valley Water is working to make flood protection improvements on both

Sunnyvale East and West Channels as part of our capital improvement program, until these projects are completed and the Flood Insurance Rate Maps (FIRM) are revised, development within existing Special Flood Hazard Areas (SFHA) will need to comply with federal and City flood ordnance requirements. Additionally, Valley Water's projects may not remove all properties currently located within the SFHAs for various reasons including flooding from other sources such as tidal flooding.

Response I.16: As discussed in Section 3.10.3 Non-CEQA Effects, page 214 of the Draft EIR, per the California Building Industry Association versus Bay Area Air Quality Management District, 62 Cal. 4th 369 (BIA v. BAAQMD), effects of the environment on a project or Specific Plan are not considered CEQA impacts. Therefore, the effects of flooding on future development under the Specific Plan were not evaluated as a CEQA impact under Impact HYD-3, Impact HYD-4 or Impact HYD-C of the Draft EIR. Text has been added to page 214 to clarify future development would comply with existing regulations, including the National Flood Insurance Program and City Municipal Code requirements, to avoid and/or minimize flooding effects on future development (refer to Section 5.0 Draft EIR Text Revisions).

Comment I.17: In the second paragraph on page 322 under "Groundwater", please either delete the term "safe yield" regarding groundwater extraction of 8,000 AFY because that term is not used in Valley Water's 2021 Groundwater Management Plan or provide a proper citation if that term is used in a City of Sunnyvale planning document. Additionally, the word "received" should be replaced by "pumped" in the sentence "In fiscal year 2021 to 2022, the City of Sunnyvale received 135 AF of groundwater."

Response I.17: The phrase "safe yield" in the above referenced sentence is referring to the pumping capacity of the City's physical wells that are currently operating. The text on page 322 has been revised to provide the clarification requested in the above comment (refer to Section 5.0 Draft EIR Text Revision).

Comment I.18: The discussion on page 335 regarding water supply and the Water Supply Assessment in Appendix J concludes that the project could increase water demands up to 7,400 acre-feet per year beyond the estimated use in the City's 2020 Urban Water Management Plan. Even before these additional demands the Urban Water Management Plan already assumes a substantial increase in water conservation to allow supplies to meet future demands. Valley Water encourages the City to help meet this water conservation goal by requiring all available water conservation measures in the master plan. Valley Water has been working with jurisdictions throughout the county on a Model Water Efficient New Development Ordinance that the City may consider ensuring that there are sufficient water supplies into the future. Measures from the Model Water Efficient New Development Ordinance include:

- Hot water recirculation systems;
- Alternate water sources collection (like cisterns) and recycled water connections as feasible;
- Encourage non-potable reuse of water like recycled water, graywater and rainwater/stormwater in new development and remodels through installation of dual plumbing for irrigation, toilet flushing, cooling towers, and other non-potable water uses;

- Require dedicated landscape meters where applicable;
- Require installation of separate submeters to each unit in multi-family developments and individual spaces within commercial buildings to encourage efficient water use (Studies have shown that adding submeters can reduce water use 15 to 30 percent); and
- Use of weather- or soil-based irrigation controllers.

Response I.18: The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR, nor does it provide new information that would change the analysis or conclusions in the Draft EIR; therefore, no further response is required.

Comment I.19: Appendix G, Technical Memorandum: Stormwater Management, the first sentence on page 14 states, "…including the reasons for increased groundwater discharge in recent years". It is not clear from the report what, if any, data or technical analysis is used to support that statement. The DEIR should specify what specific years does "recent years" represent in this sentence.

Response I.19: The Sunnyvale Shoreline Resilience Vision Technical Memorandum: Stormwater Management included in Appendix G of the Draft EIR memorializes the conversation at a technical workshop that was held on February 4, 2021 to discuss Sunnyvale's existing stormwater system and brainstorm improvements. Attendees at this workshop included representatives from each key stakeholder organization in the Sunnyvale Shoreline Resilience Vision group: Valley Water, Google, City of Sunnyvale, NASA, Lockheed Martin, South Bay Salt Pond Restoration Project/US Fish and Wildlife Service, and the Midpeninsula Regional Open Space District.

The complete sentence on page 14 of is memorandum that is referenced in the above comment is as follows: "Further exploration is needed to better understand existing groundwater pumping and treatment systems, including the reasons for increased groundwater discharge in recent years." This statement represents an informal observation provided at the workshop about recent conditions in the NASA Ames western and eastern drainage areas.

The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

Comment I.20: Appendix G, Sunnyvale Sea-Level Rise Adaptation Strategy: Background, Groundwater Vulnerability Assessment, page 37, as the Groundwater Sustainability Agency for the Santa Clara Subbasin, Valley Water would be interested in coordinating efforts to supplement the initial assessment of increasing groundwater hazard due to sea-level rise by the Plane et al. (2019) study.

Response I.20: The City will coordinate with Valley Water, as requested in the above comment. This coordination will be separate from the Specific Plan. The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

ORGANIZATIONS, BUSINESSES, AND INDIVIDUALS

J. Brick. (February 10, 2023)

Comment J.1: I hope this letter finds you well. Brick. would like to express its support for the Moffett Park Specific Plan's goals of creating a more connected, inclusive and sustainable built environment. Our thanks goes out to the City staff and the team of consultants who have put together a very thoughtful plan for the future of Moffett Park. As architects currently working in the City, we appreciate the opportunity to contribute to the success of the Moffett Park Specific Plan and to the future of the City of Sunnyvale.

As an architectural firm with a strong interest in sustainable design and urban planning, we are writing to express some of our points of concern regarding the Draft Moffett Park Specific Plan. We believe it is important to provide constructive feedback on proposals that will shape the future of the city, and we believe the Draft Moffett Park Specific Plan could benefit from some revisions.

Firstly, we would like to address the issue of street and infrastructure improvements. While we support the goal of creating a sustainable community, we do not believe that upgrading all infrastructure, regardless of whether it is necessary or not, is an economically sustainable policy. This approach will certainly lead to a significant increase in costs for developers and may jeopardize the feasibility of many projects. Instead, we believe that the city should focus on upgrading infrastructure only when it is necessary and where it will have the greatest impact on sustainability and livability.

Another area of concern is the requirement for green roofs. As architects, we believe that green roofs are an important tool for reducing the urban heat island effect, improving air quality, and providing additional outdoor space. However, we also believe that the requirement for green roofs may limit the feasibility of mass timber projects given the weight requirements and the additional structural support necessary. The sustainable benefits of a green roof, namely stormwater retention and heat island reduction, can be achieved in other ways that do not require increasing the structural capacity of the building.

> **Response J.1:** The Specific Plan does not require upgrading of all infrastructure or require green roofs. The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no response is required.

Comment J.2: Finally, we would like to highlight the requirement for Creation/Innovation spaces in the O-1 and O-2 zones. While we believe that these spaces have the potential to be an important asset to the new district, we have concerns about the specific requirements outlined in the Draft Moffett Park Specific Plan. The tenant market for these types of small spaces is limited, which will result in many empty spaces. Many large corporate tenants cannot share their campuses with other tenants due to security concerns. Additionally, the requirement for redundant infrastructure, such as electrical services and generators, will increase the carbon footprint of the project and place additional demands on the city's infrastructure.

We believe that the Draft Moffett Park Specific Plan has the potential to be a positive step forward for the city of Sunnyvale, but also believe that some revisions are necessary to ensure that it is

sustainable, livable, and economically viable. We would be happy to engage further in this important conversation and provide any additional feedback that may be of assistance.

Response J.2: The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no response is required.

K. D'Souza, Gladwyn (February 10, 2023)

Comment K.1: Because of out of attainment NOX, Ozone, and VMT in Appendix D Air Quality, the project should add feasible measures for AQ public health impact reduction.

1. Charge incoming vehicles via Fastrak or video; and rebate automatically with cashout, those that are electric, including e and other micromobility, and who would participate in the program via rfid or face recognition.

Response K.1: The Bay Area is in non-attainment for ground-level ozone, $PM_{2.5}$, and PM_{10} under the federal and/or state Clean Air Act, as explained on page 59 of the Draft EIR. The precursors to ozone are Reactive Organic Gases (ROG) and nitrogen oxide (NO_x). Pages 69 through 72 of the Draft EIR disclose that buildout of the Specific Plan would result in significant, unavoidable operational air pollutant emissions of ROG, fine particulate matter ($PM_{2.5}$), and coarse particulate matter (PM_{10}). As explained on page 70 of the Draft EIR, the significant operational ROG emissions are attributed to the use of architectural coatings (i.e., paint) for buildings and the significant levels of $PM_{2.5}$ and PM_{10} primarily result from the increase in traffic and associated tailpipe exhaust emissions resulting from implementation of the project. The health effects associated with these emissions are discussed on pages 72 through 74 of the Draft EIR. These impacts are based on the technical Air Quality Analysis included in Appendix D of the Draft EIR.

As discussed on pages 70 through 72, the Specific Plan includes requirements and policies to use of low VOC coatings to reduce ROG emissions and implement Transportation Demand Management (TDM) policies to reduce vehicle trips. Specific Plan policies, specifically Policy TDMP-2.1 to establish a Transportation Management Association (TMA) to oversee mobility improvements, coordinate efforts, and manage a district-wide TDM strategy and Policy TDMP-2.4 to continue to collaborate with Santa Clara Valley Transportation Authority (VTA) to align local development with transit infrastructure improvements, have flexibility and could consider the above suggested measure to promote alternatives to single-occupancy vehicle trips for policy compliance.

This comment does not provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

Comment K.2: 2. The TDM, set a goal of 50% SOV, is excellent but is still out of attainment of PM2.5. Increase mitigation via increased vegetative barriers, indoor air filters, and a stronger target like 25% SOV. CARB in 2005 recommended that housing be located 500 feet away from pollution sources. Recent recommendations in the European Union say the barrier should be 1,000 feet to avoid significant epigenetic effects. Highway vegetative barriers are one way to reduce impacts.

Response K.2: Refer to Response H.1 regarding the Specific Plan's single-occupancy vehicle goal of 50 percent. There is no data to support the feasibility of an SOV rate of 25 percent for the project, as suggested in the above comment. While the implementation of the Specific Plan would result in significant, unavoidable operational emissions of $PM_{2.5}$, a mitigation measure requiring a more aggressive SOV rate (such as 25 percent) is infeasible and, pursuant to CEQA, mitigation must be feasible.

Constructing vegetative barriers could reduce exposure of the population locally; for example, along a busy roadway. The Bay Area Air Quality Management District (BAAQMD) CEQA Air Quality Guidelines recommend this measure for reducing health risk impacts from toxic air contaminants and $PM_{2.5}$ to sensitive receptors. However, there is no specific data or guidance that demonstrates the amount of reduction vegetative barriers provide. Specific Plan policies 10.3.3-1 through 10.3.3-3 (which are described on pages 67 through 69 and 72) require new development to address issues of TAC and $PM_{2.5}$ exposure through proper site design and use of enhanced filtration. Vegetative barriers may be included in future projects on an individual basis. Furthermore, CARB 2005 recommendations are outdated and superseded by BAAQMD CEQA Air Quality Guidelines methodology, which recommend use of site-specific data that represent current and future conditions.

This comment does not provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

Comment K.3: 3. The recommendations in 2 will also reduce GHG. Reduce GHG further feasibly by designing the project as a microgrids for 24/7 renewables similar to the google project in San José at Diridon station and use geothermal for fixed power.

Response K.3: The potential for microgrids and use of geothermal power is allowed per Specific Plan Policy IU-3.3, which is described on page 39 of the Draft EIR as follows: "Encourage sustainable development practices for development projects to reduce the demands on the water supply and sanitary sewer systems, including use of recycled water indoors, installation of localized blackwater systems, regenerative and high efficiency landscape practices that reduce water and energy use, development of private district utility systems, and increased building efficiency beyond City standards."

As described on page 135 of the Draft EIR, Silicon Valley Clean Energy (SVCE) is the electricity provider for the City of Sunnyvale and provides 100 percent GHG emission free electricity. Therefore, requiring future development to include microgrids would not be needed to reduce GHG emissions from electricity use. No

specific development is proposed at this time. In the event future development under the Specific Plan is determined to result in a significant project-level GHG impact (see thresholds and discussion on page 165 through 166 of the Draft EIR), all feasible mitigation measures would be required. If providing geothermal energy is determined to reduce a project's significant GHG emissions, it may be required as mitigation. This comment does not provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

L. Google LLC (February 10, 2023)

Comment L.1: Google LLC appreciates the opportunity to provide public comment on the Draft Environmental Impact Report (DEIR) for the Moffett Park Specific Plan (MPSP), State Clearinghouse No. 2021080338. As set forth in Section 2.3 of the DEIR, the City's vision for Moffett Park is as follows: "Moffett Park is an integral part of Sunnyvale, and a well-connected ecological innovation district with a diverse mix of uses that serves as a model of resilience, climate protection, equity, and economic opportunity." The City's guiding principles for the MPSP include creating a healthy, resilient, and biodiverse environment and integrating innovative and emerging technologies in the district to support the community wide goals. (DEIR, Section 2.3). Consistent with this vision and guiding principles, the MPSP and DEIR contain implementing policies such as IU-3.3, which is specific to utilities and service systems, and provides: "Encourage sustainable development practices for development projects to reduce the demands on the water supply and sanitary sewer systems, including use of recycled water indoors, installation of localized blackwater systems, regenerative and high efficiency landscape practices that reduce water and energy use, development of private district utility systems, and increased building efficiency beyond City standards."

Google LLC supports the City's vision for Moffett Park as an ecological innovation district, and specifically supports any future proposals for private district utility systems (District Systems) consistent with the MPSP and DEIR's policies and analysis. This letter describes District Systems, including the components necessary to enable District Systems and the service options; the benefits of District Systems compared to business-as-usual; and the most accurate way for District Systems to be studied and assessed in a future project context.

Projects within Moffett Park could construct and operate private District Systems that could serve certain buildings within the Master Plan with wastewater, recycled water, thermal energy (heating and cooling), centralized waste management and local renewable energy generation. The District Systems would include two primary components: (1) one or more Central Plants (CP), and (2) a network of underground pipe connections that connect multiple buildings to the CP.

The particular District Systems that could be implemented in Moffett Park could include:

- Local renewable energy generation and battery storage.
- District Thermal with all-electric heating and cooling systems.
- Water Reuse Facility that treats wastewater to create recycled water for non-potable reuse. This could include the use of pyrolysis or anaerobic digestion (including best management practices for odor control) for onsite solids management.
- Centralized Waste Management opportunities to manage waste at the source to become a resource.

Associated with a District Thermal System, there are a number of integrated technology opportunities to increase energy efficiency and reliability, such as:

- Thermal Storage tanks or materials with high thermal capacity.
- Waste Heat Recovery Systems including heat recovery from sewer lines (related to Water Reuse and District Thermal).
- Ground-Source Heat Exchange Field (i.e., geofield): where possible, geofields would be implemented to leverage renewable, seasonal thermal energy storage. Geofields could consist of energy piles either integrated with a structural pile foundation or as drilled bores underneath a mat slab foundation. Energy bores could also be implemented in open space (i.e., not as part of a building's foundation system). The energy bores could have a maximum depth of 500 feet.

District Systems provide significant benefits compared to business-as-usual utility connections. For example, District Systems can provide the following:

- Increased environmental performance through energy efficiency, reduced carbon footprint, reduced potable water use, increased reliability,
- Reduced burden on city infrastructure,
- Improved urban outcomes through significantly reduced building equipment footprints, resultant noise and pollutants, and
- Circular economy and innovation by providing local opportunities to innovate through reusing resources and addressing the City's targets of carbon neutrality and climate action goals.

Any environmental review of future projects with proposed District Systems (or with the option for District Systems) should not consider District Systems as additive to business-as-usual (i.e., additive to a baseline project with conventional utility connections). Rather, any future environmental review of projects with District Systems should analyze the impacts of District Systems, which is anticipated to be below the impacts of business-as-usual.

> **Response L.1:** The City will review development applications and operational details for district systems and determine the appropriate analysis for such systems at the time submitted. The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

M. Lockheed Martin Corporation Properties, Inc. (January 12, 2023)

Comment M.1: PG 138: New natural gas services to be prohibited in Moffett Park? Is this an issue for our continuing industrial operations! Can exemption for industrial uses be incorporated?

> **Response M.1:** The City's Reach Code does not apply to existing development. Page 138 of the Draft EIR states: "… the City's Reach Code prohibits natural gas use for residential uses…." Natural gas use may be permitted for industrial uses. Pages 133 and 134 summarizes that the City's Reach Code prohibits gas appliances with the exception of certain non-residential uses such as factories, hazardous materials

manufacturing, and laboratory facilities, as well as emergency operation centers and commercial dryers in large hotels.

Comment M.2: PG 296: District Parking Strategy: Mostly centralized in series of shared parking garages. Additional detail on how this would work?

Response M.2: Page 296 of the Draft EIR states: "Under full buildout conditions, the Specific Plan would implement a district parking strategy, where parking is mostly centralized in a series of shared parking garages. With district parking, people coming into Moffett Park would park once and use other modes of transport (e.g., walking or biking) to complete their activities within Moffett Park." This described as the "park-once" environment on pages 59 and 231 of the draft Specific Plan, which is included as Appendix B to the Draft EIR. All future development would be required to submit a Site Master Plan application. As part of future master plans, the need for district parking facilities or contributions towards development of district parking facilities will be assessed by the City. Refer to Response H.2 for a description of parking management facilitated by the Specific Plan's park-once policy. This comment does not identify any specific CEQA issues or inadequacies of the Draft EIR.

N. Miramar Capital (February 10, 2023 email)

Comment N.1: In the BKF Waste Water Master Plan Report (October 2022) Section 6.0- Existing System Evaluation (BKF Report), it indicates there was an evaluation of the "Cumulative Impact Evaluation and Cumulative Impact Improvements. If this evaluation includes off site flows + the flows created by the Moffett Park Specific Plan (MPSP) full build out, the proposed new sanitary sewer system is overbuilt to accommodate sanitary sewage for the entire City of Sunnyvale (City). The builders and developers in the MPSP should not be held entirely responsible for the cost of this City-wide system upgrade. Accordingly, a careful nexus study must be completed to determine the level of incremental responsibility to the MPSP development should contribute to the new City-wide system. Under the total cost estimates in the BKF Report, there is only a $600,000 difference ($17.9 million vs. $18.5 million) between the total cost for the MPSP improvements versus the cost to remedy existing deficiencies. This indicates that the MPSP projects are responsible for the lion's share of the City-wide upgrade. These significant improvement costs not only add to the cost of housing, but appear to be disproportionate to the actual MSPSP impacts to the sewer system.

Response N.1: As explained on page 42 of the Draft EIR, CEQA requires an EIR to discuss cumulative impacts of a project when the project's incremental effect is cumulatively considerable. The October 2022 Wastewater Master Plan Report by BKF Engineers referenced in the above comment and included in Appendix K of the Draft EIR evaluates the project's impact on the sewer system under existing and cumulative conditions.

A summary of the analysis is included on pages 332 through 334 and pages 340 through 341 of the Draft EIR. Capital Improvement Projects (CIPs) listed in Table 3.19-3 on page 332 of the Draft EIR are required to provide adequate sewer system capacity to serve the project under existing and cumulative conditions. The cumulative analysis assumes sanitary sewage flows from the buildout of the General

Plan and Specific Plan. All cumulative projects, including development in Moffett Park, would be required to fund the CIPs. As explained on page 340 of the Draft EIR, improvements needed to the City's sewer system (including the CIPs listed in Table 3.19-3 of the Draft EIR) are funded through the collection of sewer connection fees. Developers citywide (not just in Moffett Park) are required to pay the sewer connection fee prior to development or redevelopment of a property.

The cost for the improvements identified in Appendix K of the Draft EIR and referenced in the above comment are for CIPs necessary to serve the project under existing and cumulative conditions. The analysis does not evaluate or identify other CIPs that may be needed independent of the Specific Plan development.

The comment does not provide new information that would change the analysis or conclusions in the Draft EIR.

Comment N.2: Moreover, the BKF report calls for upping the size of the primarily 12" water main system to 16" and 18" mains. This upsizing seems very conservative and may be setting up the overbuilding of the water system to a level that is not needed or necessary. Again, we are concerned about the significant cost of providing new infrastructure that seems to be over engineered for the actual needs in the MPSP, which will result in higher cost for the much-needed housing in the City that the MPSP seeks to unlock.

Response N.2: The project's impact to the water system is summarized on pages 329 through 331 of the Draft EIR and is based on the October 2022 Water Master Plan Report by BKF, which is included in Appendix L of the Draft EIR. The identified improvements referenced in the above comment and listed in Table 3.19-2 on page 330 of the Draft EIR are required to provide adequate fire flow service (i.e., meet the City's minimum allowable pressure levels under Maximum Day Demand with Fire Flow and Peak Hour Demand scenarios) for the project under existing and cumulative conditions. The comment does not provide new information that would change the analysis or conclusions in the Draft EIR.

O. Miramar Capital (February 10, 2023 letter)

Comment O.1: Miramar Capital has submitted to the City a development concept design for a 300+ unit residential project on a +/- 2.0-acre site located at 352 E. Java Drive, the SE corner of Java Drive and Geneva Drive, to inform the drafting of the policies and standards for the South Java area of the Moffett Park Specific Plan (MPSP). The recently released Draft MPSP appears to have changed dramatically since the last public presentation. We are concerned that certain new policies and development standards of the draft MPSP will make it infeasible and impractical to accomplish the goals of the MPSP to develop high-density residential in the South Java Area which is critical to achieve the jobs and housing balance and support the CEQA Analysis for the MPSP. Below is a synopsis of our concerns.

1. We have studied and optimized our design for the highest residential density possible that is viable and feasible on our site. The design would include parking above grade at 0.82 spaces/unit. Soil conditions in that area of Moffett Park are poor, mostly due to a high groundwater table, and a

subterranean parking and deep foundations for Type I (concrete) high-rise construction at that location are not viable. The maximum density we can achieve for a marketable and feasible product on that 2 ac. Site is a Type III (5-story wood over 2 story concrete) building with 330 units. Type I (concrete) high-rise construction, even with ideal soil conditions, is not viable due to construction costs and interest rates. We are not aware of many, if any, Type I high-rise residential projects under development in the market.

2. Most critically, the proposed 50-foot diagonal bike/ped (The Diagonal) path would bisect our site and many other parcels in the area and drastically reduce our developable site and render development of any building on the parcel infeasible by dramatically increasing costs and causing design inefficiencies. A 50-ft wide path through the middle of the site would create 2 small and irregular shape parcel that could not be developed practically and feasible. The 330 units shown on our concept plan are possible only if we utilized our parcel fully and optimally as shown on our submitted concept plan. We are aware that the City would need us to maximize density on our site in order to make Moffett Park walkable and dense and make the jobs/housing ratio work for the CEQA Analysis. However, the changes to the MPSP render our parcel, and other residential land use designated parcels, incapable of supporting any development and density above their current uses. We believe that there are viable alternatives to provide bike and pedestrian access on the perimeter of our site, as proposed on our concept plan, to ultimately link to the Java Drive LRT station.

3. Limiting lot coverage to 70% (+15% for additional hardscape elements) and excluding publicly accessible open space from the net site area, further impedes the ability to develop sites utilizing podium courtyards and/or Type V or Type III construction which is the only construction type viable for residential construction in this market. No type of residential construction will be possible on that site with these lot coverage development standards.

4. “Floor Plate Reduction” and “Façade Step-Back” above the 7th story are not compatible with high density mid-rise residential apartment design. Efficient multi-family residential projects rely on stacked floor plates for continuity of building systems and acoustical relationships of adjoining uses. These development standards will further reduce density and feasibility and increase costs of residential construction.

5. The “Major Break” requirement as part of the building modulation within the Fine Grain Core Area currently requires a 20’ deep recess into the building massing. This requirement will further reduce the potential residential density of the project. Alternatively, a 5-foot deep recess would allow for substantial and meaningful massing break while still accommodating a reduced depth unit design and maintaining the project’s density goals.

6. The requirement for 4” offset from glazing to the exterior building finish will require the use of more complicated framing and waterproofing and will cause the project to incur significant cost above and beyond what is seen elsewhere in the market.

7. Requiring transformers to be located inside of buildings or underground is another development standard which make construction of residential projects impractical and infeasible. As PG&E and other utilities have routinely prohibited the installation of underground transformers with their jurisdiction, this language will force transformers inside of buildings into areas that are already scarce and in high demand in high-density buildings in order to accommodate other uses and

program such as storage and trash and parking access. Given that these transformer rooms have strict exterior access requirements, the addition of these rooms will add larger areas of solid walls and doors to project façades at the street level where activation and glazing is the most desired and will make it difficult to provide storage, parking access or trash areas.

The use of terms like “shall” in the MPSP provides no flexibility or alternatives compliance for projects. We suggest that alternative terms such as “encouraged” or “considered” be used to meet the intent of a design requirement and provide flexibility to staff and applicants to achieve the goals of the MPSP.

The objections stated above are not exhaustive and highlight many of the critically concerning features, conditions and standards which render development of a residential project on our site infeasible. In order for the city to achieve the desired goals of 7,500 dwelling units in the South Java District, we would need development standards that accommodate and support the maximum and optimally feasible development of the residentially designated parcels. We look forward to scheduling further meetings with you and staff to discuss our concerns and propose alternative standards.

Response O.1: The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no response is required.

P. Price, Mitch (January 17, 2023)

Comment P.1: I have a few silly questions about table 3.17-2 on page 297 of the draft EIR:

1. I checked the referenced table (page 9 of "Moffett Park Specific Plan CEQA Transportation Analysis" in Appendix I), and it shows a different mode share for non-driving external trips. It looks like the "Total" mode split on Table 4 of the Transportation Analysis has accidentally been transposed into the draft EIR as "External" mode split at build out, resulting in the "Bike-Walk" percentage being over-inflated.

Response P.1: The text in Table 3.17-2 on page 297 of the Draft EIR for external non-driving trips has been revised to show 18 percent bike/walk, 23 percent transit, and 59 percent shuttle. Refer to Section 5.0 Draft EIR Text Revisions.

Comment P.2: Additionally, I am confused as to where the 587,222 average daily trips being generated comes from and was unable to find it in the Transportation Analysis report - is there an explanation of where this is calculated somewhere?

Response P.2: The 587,222 average daily trips were calculated using the trip generation model. The number of trips was inadvertently omitted from the table in the Transportation Analysis report included in Appendix B of the Draft EIR. The Transportation Analysis report has been revised to include the 587,222 average daily trips. Refer to Section 5.0 Draft EIR Text Revisions.

Q. Reuben, Junius & Rose, LLP (February 9, 2023)

Comment Q.1: Chapter 4.4, pg. 82 (General Land Use) *Land Use Controls for MP-R District.* The Draft Plan states that allowable land uses in the future MP-R District are listed in the Sunnyvale Zoning Code. However, there is no existing MP-R District to draw from in the Sunnyvale Zoning Code. Please provide proposed allowable land uses the future MP-R district within or as an attachment to the Draft MPSP.

> **Response Q.1:** Table 2.3-3 on pages 10 through 12 of the Draft EIR includes the land use districts and their description, allowed uses, and location and gross acreage. As shown on page 11 of the Draft EIR, the allowed uses in the MP-R: Residential land use district are residential, day care, group homes, parks and open space, schools and community facilities. The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

Comment Q.2: Chapter 4.4 Chapter 10 *Plan Area Permitting Requirements.* The Draft Plan states that all development will be required to submit a Site Master Plan for review, and that neighborhood-serving commercial uses will be subject to permitting requirements in the City's Zoning Code.

However, the current zoning code does not identify commercial permitting requirements for the future MP-R District, and the Draft Plan does not provides little additional detail on entitlement process for Plan area redevelopment. Draft Plan Section 10.3 states that Site Master Plan requirements are established in a separate set of guidelines.

Please provide commercial use permitting requirements for the future MP-R district within or as an attachment to the Draft MPSP.

Please provide additional detail regarding the proposed Site Master Plan review and approval process, and if additional entitlements are anticipated to be required for residential development within the MPSP area. Please also provide a reference to the Site Master Plan requirement guidelines.

Chapter 4.4, pg. 82-83 (General Land Use) *Residential FAR in the MP-R District*. The Draft Plan states that residential development in the MP-R District will be subject to a Total Maximum FAR of 350%, but indicates that no Base or Bonus FAR applies to residential development in this area. The Draft Plan also states that residential development is not subject to maximum density controls, and that instead maximum density is limited through detailed form-based design standards.

Application of a Total Maximum FAR functions as a de-facto residential density control by capping total allowable residential floor area within a given property.

Please confirm that above grade parking levels would not count towards Total Maximum FAR.

Please also confirm that community service Retail/Commercial space (not required on the Property would not count towards Total Maximum FAR.

As the Plan aims to encourage high-density residential development and already incorporates detailed form-based density design controls (height/bulk/setback/open space), we suggest potentially

eliminating the additional Total Maximum FAR limit in this district. Alternately, we suggest the following:

- For purposes of calculating Total Maximum FAR, please clarify that Total Maximum FAR is to be based upon total, current gross parcel areas.

- Allowing development that proposes a high-rise development of 85' in height or greater to achieve an additional FAR bonus (potentially 0.5:1) for areas above the 8th floor of buildings, with no associated requirement to obtain transfer of development rights from the Development Reserve; increased entitlement process (i.e. Development Agreement) associated with this bonus; or requirement for additional community benefits. This would incentivize development of the high-rise typology encouraged by form-based design controls within the district by allowing for additional residential area to offset increased development costs.

Section 5.2 (Site Design) Figure 32 (Parks and Open Space Framework) *Certainty of Laneway Location.* The Draft Plan states that block breaks will be accomplished via creation of laneways equivalent to with a minimum width of 50' which may or may not be open to vehicular access. The Draft Plan states that the location of these laneways on Draft Plan figures are diagrammatic, flexible and will be determined through the Site Master Plan review process for proposed redevelopments. However, location of laneways is also to be determined to some extent through maximum lot size and dimensional restrictions.

As properties within the plan area are anticipated to be redeveloped over time, there is a potential that the first site design to be approved will result in precedential laneway placement that negatively impacts the potential for future residential development on adjacent sites, or that the first site to be developed would be required to absorb a disproportionate burden of full laneway area dedication within their own parcel.

In order to ensure equitable division of existing land parcels, increase certainty in the future redevelopment process, and ensure a well-coordinated transportation network consistent with the Draft Plan's vision, the Owner requests that the Draft Plan provide a fixed location for future laneways and their operation.

On the Property's block, the Owner suggests the following guiding principles:

- A single east-west laneway be required at approximately the centerline of the block with vehicular access.
- Laneways straddle existing property lines (e.g. a 52-ft wide laneway encroach no more than 26-ft inward from each existing property lines.
- Laneways not be required in a manner that splits exiting parcels.

Section 4.9 (Dedication and Easement Requirements) *Indeterminate Encroachment through Existing ROW Widening.* The Draft Plan requires redeveloped properties to make substantial public area dedications through easements or other means, including the area required to widen certain Plan area streets adjacent to private parcels. However, little information is provided on the existing width of

public ROW and improvements within the Plan area, which is necessary for owners to confirm the extent of public land dedication that will be required on their frontages.

Please indicate the existing street and right of way widths throughout the plan area to enable existing owners to confirm the extent of additional public land dedication required along their frontages. For Java and Geneva (amongst other streets) the Owner suggests having the suggested ROW be overlaid relative to existing street surveys, to understand the encroachment/easement being required.

Section 5.2.3 (Lot Coverage) *Lot Coverage.* The Draft Plan states that development in the MP-R District will be subject to a maximum lot coverage area of 70%. However, the term "lot coverage" is not clearly defined, and is controlled through other detailed form-based density restrictions such a public area dedication and minimum building setback requirements along public streets and future laneways.

From the team's preliminary discussion with Planning staff on 2/1/23, it is our understanding that the intent is for this lot coverage restriction to apply above a building base of up to two levels (or 25 feet) high.

Please clarify that this 70% lot coverage requirement would begin Lot coverage be measured above a 'podium', at least two levels (or 25-feet) high.

We further request either that:

- the lot coverage requirement be increased to 80% of Net Parcel Area; or
- for purposes of Total Maximum FAR and maximum lot coverage, the Net Parcel Area be based upon existing parcel dimensions (prior to open space dedications).

Section 5.3.4 (Usable Open Space) Section 5.4.3 (Green Roofs) *Open Space – Amount and Credit*. Under the Draft Plan, public open space dedication reduces Net Parcel Area, but despite the practical function of providing usable open space for both building residents and the community at large these areas are not credited against project usable open space requirements.

Under the Draft Plan, building setback areas in addition to public open space dedication areas may not count toward project usable open space requirements.

Under the Draft Plan, certain minimum green roof requirements apply.

We suggest allowing development to credit the area of public open space provided through required easements to be credited toward private usable open space requirements.

We suggest allowing the area of required ground-level setbacks on a property to be credited toward private usable open space requirements of development on that property, regardless of minimum width dimensions.

We suggest allowing development to provide additional publicly-accessible-private-open-space ("POPOS") areas beyond the public easement areas required by the Plan, and to credit the area of

POPOS toward private open space requirements of the development at a reduced ratio (i.e., every square credited as 2 square feet of common usable open space).

Please clarify that the area of Green Roof provided may count toward usable open space requirements.

Chapter 4, pg. 85. Section 5.3.4 *Potential Usable Open Space Conflict Language*. The Draft Plan states that "all development must comply with the SMC Title 19 with regard to usable open space and landscaping." However, the Draft Plan provides usable open space and landscaping requirements under Section 5.3.4, and the existing zoning code does not have usable open space requirements specific to MP-R Districts.

Please clarify the specific usable open space and landscaping requirements applicable to development in the MP-R District under both the Draft Plan and Sunnyvale Municipal Code.

Section 5.3 (Building Design) Figure 30 *Clarification of Maximum Building Height*. Figure 30 shows maximum building heights throughout the Draft Plan area. This figure indicates that the Property is largely within a 160' height district, with a portion along the west edge shown as 170'.

Please clarify the map is accurately reflecting the proposed heigh limits on this Property, and clarify the proposed dimensions of split height district intended for the Property.

Section 8.3.1 (Vehicle Parking Maximums) Table 24 *Parking Ratio – Phasing*. The Draft Plan indicates that maximum parking amounts will be phased.

Please provide more information regarding the proposed phasing methodology. Would this be determined by set time periods within the overall Plan period or triggered by percentage of Plan area build-out?

Section 8.2.1 (Vehicle Parking Maximums) *Parking Ratio – Shared Parking Bonus*. The Draft Plan allows development to exceed otherwise permitted maximum parking limits by up to 50%, provided that all of the additional spaces over the maximum "shall be shared with the public at all times."

Please clarify that this 50% bonus is tied to the per-unit maximum parking ratio in effect at the time the development is approved. (ex: At plan adoption, the residential maximum of 1 space per unit would increase to 1.5 spaces per unit).

We request that the Draft Plan language be amended to allow shared public parking spaces to be made available to the public only during daylight hours or fixed hours (ex: from 7 a.m.-10 p.m.) rather than "at all times." This is to address security concerns that arise with public access to private residential development 24/7.

Global *Economic Feasibility*. Creation of the Plan's vibrant new communities and ecological innovation district would be accomplished through the establishment of public easements, creation of ROW widening, open space and landscape improvements undertaken through redevelopment of individual parcels within the Plan Area. Accordingly, it is critical that the zoning and design controls adopted in connection with the Plan facilitate future residential redevelopment of existing sites under

current and reasonably anticipated future market conditions. If development of these sites does not "pencil" for property owners, they will not proceed with redevelopment and the associated community benefits and exactions necessary to finance public improvements within the Plan Area would not be achieved.

We request that the Department evaluate the economic feasibility of residential development within the Plan area based upon typical building typologies incorporating the Draft Plan's detailed form-based density design requirements, horizontal site area restrictions, public opens space obligations, and proposed increases to development impact fee exactions for plan-area development.

We further suggest that the Department conduct a workshop to coordinate and share comments specifically amongst potential residential developers within the Draft Plan area and to explore current incentives and barriers to the form of high-density residential development proposed by the Draft Plan.

Project and Alternatives Selected This section discusses the scope of development under the proposed project analyzed by the EIR and describes various alternative projects considered by the City during review.

The Owner strongly urges City adoption of the proposed project and rejection of all other alternatives discussed in this section, as the full project scope is most closely aligned with the goals and policies evaluated under the MPSP.

> **Response Q.2:** CEQA requires the analysis of the environmental impacts of a project. CEQA does not require the analysis of other effects, such economic feasibility of a project. The City prepared a separate response to comments on the merits of the Specific Plan, which is available at: https://www.moffettparksp.com/. The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

R. Sierra Club Loma Prieta Chapter (February 10, 2023)

Comment R.1: Sierra Club Loma Prieta Chapter, Santa Clara Valley Audubon Society and the Citizens Committee to Complete the Refuge are environmental organizations with interest in the San Francisco Bay and our region's wildlife and natural resources. Due to the Moffett Park Specific Plan area's proximity to San Francisco Bay, new development in the Plan area raises significant concern. We therefore participated in every opportunity to provide public comment on the Moffett Park Specific Plan (MPSP) as it developed. We appreciate the efforts to address our wishes and concerns and thank the City for including "Non-CEQA effects" since the analysis of climate change and sea level rise on the project is important for planning where regulatory statutes come short. We submit the following comments on the MPSP and the associated Draft Environmental Impact Report (DEIR).

3.3 Air Quality

Please discuss the health effects of air pollution, such as gaseous emissions and particulate matter, and analyze cumulative impacts on air quality. Please include large projects in Sunnyvale and in

nearby jurisdictions (Santa Clara, North Bayshore and East Whisman in Mountain View, Peery Park in Sunnyvale, Development in Moffett Field and the Salt Pond Restoration Project).

Response R.1: Potential health effects of air pollutants (including gaseous emissions – like ozone, nitrogen dioxide, and toxic air contaminants – and particulate matter) are summarized in Section 3.3.1.1 Background Information on pages 55 and 56 of the Draft EIR and described in more detail in Appendix D of the Draft EIR.

Cumulative air quality impacts are discussed in Section 3.3.2.2 Cumulative Impacts on pages 80 and 81 of the Draft EIR. Page 80 of the Draft EIR states: "The geographic area for consistency with the 2017 CAP and criteria air pollutants is the San Francisco Bay Air Basin. Past, present, and future development projects contribute to the region's adverse air quality impacts on a cumulative basis." Text has been added to this page to clarify that past, present, and future development projects in the San Francisco Bay Area Air Basin include development projects in the cities of Santa Clara and Mountain View, and elsewhere in the City of Sunnyvale, as noted in the above comment (refer to Section 5.0 Draft EIR Text Revisions).

Comment R.2: 3.4 Biological Resources

Consultations with Wildlife Agencies

The Biological Resources analysis identifies a number of special-status species (Burrowing owls, bees, western pond turtles, roosting bats, salt marsh harvest mouse, dusky-footed woodrat) with the potential or likelihood to be present in the MPSP area and its vicinity. Standards for analysis of impacts and for avoidance and mitigation measures should be specified, and permitting and reporting requirements for these species should be clear.

Response R.2: The impact analysis for special status species is included in Section 3.4.2 Impact Discussion, specifically under Impact BIO-1 on pages 102 through 111 of the Draft EIR. The discussion identifies requirements of future development pertaining to special status species, including standards for presence/absence surveys, avoidance measures, compensatory measures, and reporting. Text has been added to page 104 of the Draft EIR to clarify that future development projects would be required to obtain necessary permits (refer to Section 5.0 Draft EIR Text Revisions).

Comment R.3:

- The DEIR should identify and describe the regulatory responsibility of both wildlife permitting agencies, including the United States Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW). For each special-status species or biological resource, please identify which wildlife agency(s) should be consulted.

Response R.3: The regulatory agency for special status species and biological resources varies. Section 3.4.1.1 Regulatory Framework on pages 85 through 88 of the Draft EIR summarizes the existing regulations pertaining to biological resources and identifies the regulatory agencies, including the United States Fish and Wildlife

Service (USFWS), California Department of Fish and Game (CDFW), United States Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and City of Sunnyvale.

Regarding special status animal species, Table 3.4.1 on pages 96 through 100 of the Draft EIR summarizes the special status animal species that occur or could occur in Moffett Park. The first column of the table identifies whether the species is federally protected and/or state protected. The regulatory agency for state listed plant and animal species is CDFW. The regulatory agency for federally listed plant and animal species is USFWS. All non-listed special status plant and animal species fall under the framework of CEQA; in other words, the EIR must evaluate whether the project would result in an adverse impact to them, and if so, propose feasible mitigation to reduce the impact to a less than significant level. Text has been added to the Draft EIR to provide this clarification (refer to Section 5.0 Draft EIR Text Revisions).

As discussed on pages 85 through 86, 112, and 113 of the Draft EIR, the regulatory and permitting agencies for wetlands and riparian habitat could include the USACE, CDFW, and/or RWQCB.

Comment R.4:

- The DEIR requires surveys and/or special-status Species Plans to be prepared for subsequent developments. However, the DEIR erroneously assigns City staff to review and approve such Species Plans, reports, and outcomes from surveys. Sunnyvale is not a qualified agency to approve avoidance and/or mitigation measures and special-status Species Plans for endangered, threatened or Species of Special Concern. Consultation with the responsible wildlife agencies is the appropriate level of protective action. The EIR should describe the consultation process and responsible agencies for each special-status species.

Response R.4: At the time future development is proposed, project-specific biological evaluation shall be required by the City to determine if the proposed project would result in significant impacts to special status species. The project-specific biological evaluations would be completed by a qualified biologist to determine if the development would impact special status species and be submitted to the City for review and approval. If potential impacts are identified, the project would follow the species information and protocol in the Draft EIR and Specific Plan requirements. Depending on the species and the level of potential impact, this may require coordination with responsible agencies to obtain necessary permits. If no potential impacts to special status species are identified, no coordination with (or permits from) responsible agencies is required. Refer to Response R.3 regarding regulatory agencies for special status species.

Comment R.5:

- For all subsequent projects that are planned on undeveloped parcels, or on any parcels located near open space or water features (wetlands, creeks) and other habitat areas, for each special-status species that has the potential to occur, additional environmental review should require consultation with CDFW and include:

- Criteria for the selection of qualified biologists,
- Criteria for evaluating potential disturbance or "take",
- Criteria clarifying and directing survey protocols,
- Avoidance periods and buffer distances,
- Criteria for requiring Biologist supervision of construction activities,
- Reporting requirements,
- Reporting of incidents that impact the habitat and/or special status species in question.

Response R.5: A qualified biologist is a person with a minimum of a four-year degree in wildlife sciences, biology, environmental sciences, or equivalent experience in the biological sciences. This definition has been added to page 103 of the Draft EIR (refer to Section 5.0 Draft EIR Text Revisions).

The determination of whether a future development proposal would result in an impact (such as the "take" of a special status species as defined by the federal and state Endangered Species Acts) would be made during the project-specific evaluation when each individual development is proposed. Pursuant to CEQA, the project-specific evaluation would include an impact determination is based on existing conditions at the time the development is proposed and the construction and operational details of the development.

The criteria for surveys for special status species are identified as Special Species Project Requirements in Section 3.4.2.1 Project Impacts under Impact BIO-1 on pages 102 through 111 of the Draft EIR. The requirements include completing surveys for the special status species (including details about how and when the surveys would be done), avoidance measures (including buffer distances and monitoring by a qualified biologist), and reporting requirements. Refer to Response R.4 regarding coordination with regulatory agencies.

The purpose of the EIR and the potential for streamlined environmental review for subsequent development projects is explained in Section 1.1 on pages 1 through 2 of the Draft EIR. When specific development is proposed, it will be subject to the City's development review process and subsequent CEQA review. In the event a development proposal is determined by the City to result in new or substantially more severe significant impacts to special status species (or any other environmental resource area) than disclosed in the Draft EIR, a supplemental or subsequent Initial Study/Mitigated Negative Declaration or Environmental Impact Report may be required.

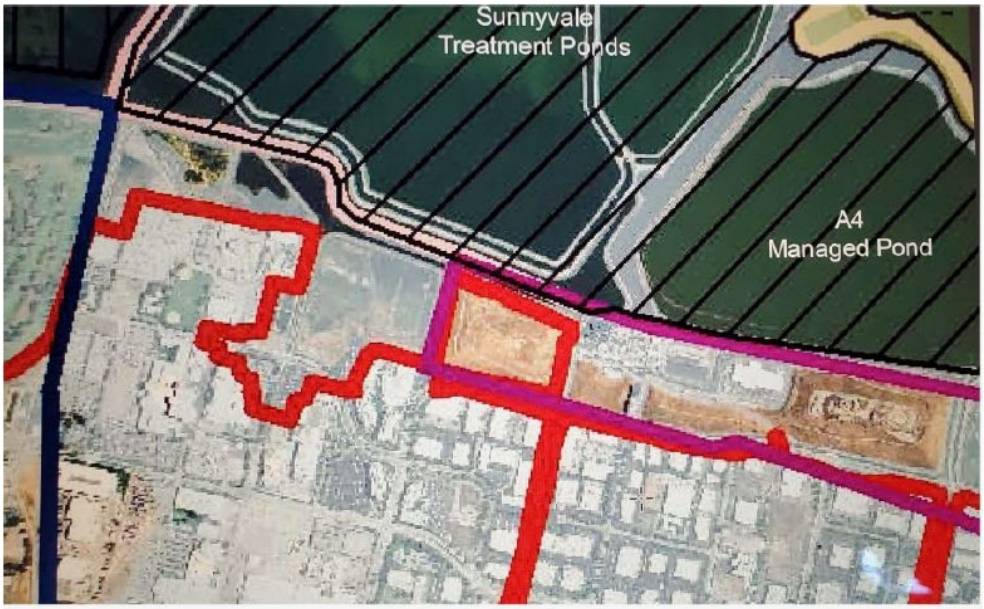
Comment R.6: 3.4 Biological Resources

Recovery Plans

The DEIR and Appendix F should include reference to USFWS plans that guide recovery of the following federally listed species: the salt marsh harvest mouse, the Ridgway's rail (formerly California clapper rail) and the western snowy plover.

- Salt marsh harvest mouse (SMHM), Ridgway's rail (RIRA): the 2013 USFWS Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California was prepared and approved to guide the habitat recovery of five federally endangered species, inclusive of the salt marsh harvest mouse and Ridgway's rail and certain other species of concern. The plan was largely constructed around the biology of the target species. It includes maps that broadly identify areas of sensitive habitat and lands of potential restoration to habitat for the target species. The entirety of the ECD and other lowland portions of the MPSP are within the boundary for consideration for actions aiding recovery (Figure 1).
- Western Snowy Plover (SNPL): The DEIR's Special Status Animals map (p.104, Figure 3.4-4) should include the closest nesting location of SNPL on the Stevens Creek Shoreline Nature Study Area of the Midpeninsula Regional Open Space District (Midpen). The DEIR should refer to the USFWS 2007 Recovery Plan for the Western Snowy Plover for guidance for potential recovery actions in the MPSP Area.

Figure 1



Excerpt of Segment O, USFWS Recovery Plan for Tidal Marsh Ecosystems, Figure 111-21. Red line marks approximate inland limit for potential restoration.

Response R.6: The Draft EIR evaluated current conditions and all species in the comment were identified as having a possibility of occurring on-site. This Specific Plan does not negate the potential for restoration or recovery activities within the areas defined by the above referenced Recovery Plans; however, it does provide a guide for all potential projects within the Specific Plan area, including restoration projects.

The Recovery Plans set goals for species and habitat protection. In the case of the western snowy plover and Ridgway's rail, these species have not been observed in Moffett Park, but have the potential to use vegetation for nesting during the migratory season. Specific Plan requirement 10.3.5-9 requires pre-construction surveys and the establishment of construction-free buffers (as appropriate) in order to protect these species during construction of future projects. In the case of the salt-marsh harvest

mouse, the Draft EIR assumed presence for the salt-marsh harvest mouse for the small area of suitable habitat (pickleweed) in the northwestern corner of the site. Specific Plan requirement 10.3.5-7 requires habitat surveys, establishment of construction-free buffer zones, and population monitoring (as appropriate) in order to protect this species and its habitat. Additionally, pages 112 through 113 of the Draft EIR includes a list of design standards established for the Ecological Combining District that would protect sensitive habitat. Thus, the project is consistent with the goals of the Recovery Plans.

Page 94 of the Draft EIR introduces Figure 3.4-4 as: "a map showing special status animals within and in the vicinity of Moffett Park, based on findings of the CNDDB." CNDDB stands for the California Natural Diversity Database. Figure 3.4-4 on page 101 of the Draft EIR, therefore, is not meant to be a map showing all locations of special status animals within and in the vicinity of Moffett Park. The title of Figure 3.4-4 has been revised to clarify this and text has been added to page 94 of the Draft EIR about the nesting location noted in the above comment (refer to Section 5.0 Draft EIR Text Revisions).

Comment R.7: 3.4 Biological Resources

Western Burrowing owl

The Burrowing owl population in the south Bay Area has suffered a significant decline and the breeding population is at a risk of extirpation. In the past four years, the Burrowing owl population of the South Bay Area has been sustained by deliberate conservation actions implemented primarily by the Santa Clara Valley Habitat Agency in an effort to accomplish the conservation goals of this adopted Valley Habitat Plan. Burrowing owls have not bred in Sunnyvale in recent years, but wintering migratory owls use ground squirrel burrows at the landfill and along the levees (including observations by SCVAS staff and volunteers in January 2023), and may use undeveloped parcels within the MPSP area as well as marginal habitat areas along roads and in parking lots.

Sunnyvale's 2019 "Burrowing Owl Habitat Suitability and Opportunities Report" should be consulted in mitigating impacts to this species. The MPSP should also consider Burrowing owl conservation actions as part of public benefits allocation.

For Requirement 10.3.5-2:

- Please specify in Requirement 10.3.5-2: Qualified Biologist must have at least 2 years experience conducting surveys for burrowing owls
- A pre-construction survey 14 days prior to construction is too long an interval for both migratory and nesting Burrowing owls. Migratory owls may stay at a burrow for only a few days. Breeding burrowing owls may select a burrow, start a nest and lay eggs within 10-days. Surveys must take place no longer than a week before ground disturbance, and repeat if construction activities are halted or paused for more than a week.

Response R.7: The Burrowing Owls Habitat Suitability and Opportunities Report provides a good background on the adjacent lands; however, this does not change the

evaluation and potential impacts to burrowing owls in Moffett Park as preconstruction surveys and appropriate avoidance measures are already included.

The biological report referenced the *Staff Report on Burrowing Owl Mitigation* (CDFG 2012) for appropriate methods. This report includes two surveys for take avoidance: one within 14 days prior to ground disturbance and a second one within 24 hours prior to ground disturbance. The text on page 105 of the Draft EIR has been revised to clarify the timing of the second survey, need to complete additional preconstruction surveys if construction work is halted or paused for more than a week, and qualifications for the surveying biologist.

Comment R.8: 3.4 Biological Resources

Impacts of increased human presence and activities in natural areas

We remain concerned with potential impacts to special-status species, migratory birds and other wildlife species that is likely to result from the inevitable increase in human and pet activity on trails and levees, wetlands, and stormwater features, as well as at Baylands Park and the landfill hills. Science shows unequivocally that increased human presence and activity in wildlife habitat impacts wildlife. Human activity can flush birds, or deter birds and special-status species from using important resources along the bay, and disrupt basking behavior that is critical to the survival of the Western pond turtle. Even low impact human recreation can change the timing and spatial use of habitat by mammals.

The DEIR implies the expectation - which we find difficult to comprehend - that residents and new employees will not substantially increase the use of trails, levees and other recreational facilities outside the MPSP (see discussion in section 3.16 Recreation).

To the contrary, with 42,000 additional residents and 60,000 new employees, and the tremendous public interest in development at MPSP because of its proximity to the Bay, it is reasonable to expect here will be a significant surge in use of trails and levees adjacent to migratory birds habitat (including Burrowing owls) and wildlife habitat all along the Bay - a surge that will significantly exacerbate conditions stemming from existing encroachment and disturbance.

Response R.8: Refer to Topic Response 3: Park and Recreation Impacts regarding the increase in population in Moffett Park and its effects on existing parks and open space, such as Baylands Park and San Francisco Bay Trail.

As discussed on page 18 of the Draft EIR, the Specific Plan establishes an Ecological Combining District (ECD) that covers the existing emergent wetland, potential wetland, and riparian habitat in the northwest corner of Moffett Park, as well as most of the California annual grassland. While Moffett Park is approximately 1,270 acres, only approximately 93 acres (or seven percent) of the northwest corner of Moffett Park contains sensitive habitat. The existing habitat and habitat maps are provided in Section 3.4.1.2 on pages 88 through 93 of the Draft EIR.

A map showing the location of the ECD is provided on Figure 2.3-1 on page 13 of the Draft EIR. The ECD restricts new private development within the ECD and special design standards regulate development within and adjacent to the ECD boundary. The design standards are outlined in Chapter 6 of the Specific Plan (which is included in Appendix B of the Draft EIR), as well as on pages 112 through 113 of the Draft EIR, and pertain to limiting development within the ECD, and requiring no new impervious surface be constructed closer to the delineated wetlands than existing impervious surfaces and no net increase in impervious surface can occur within the ECD. Other standards pertaining to landscaping, lighting, and raptor perch deterrents are also included.

Evaluation of the Specific Plan's impact to special status species and sensitive habitat is provided under Impact BIO-1 and Impact BIO-2 in Section 3.4.2.1 Project Impacts on pages 102 through 114 and determined that conformance with Specific Plan requirements would reduce impacts to a less than significant level. The ECD further reduces the impact. When future development is proposed, it shall be reviewed for conformance with the Specific Plan (including the ECD standards) and project-specific evaluation shall be required pursuant to CEQA to confirm whether the development would result in impacts to biological resources.

Comment R.9: A 2020 book published by the California Fish and Wildlife Journal and the scientific resources cited in footnotes 8-19, show that even low human use can have impacts, but seem to indicate that level of disturbance is directly associated with faster speed of movement. In addition, lighting interferes with wildlife movement and migratory behavior, and must be avoided in natural areas.

The impact of increased population to wildlife in the natural areas in and around the MPSP should be recognized and mitigation measures should be developed. We propose the following mitigation measures:

- Ensure that night lighting is avoided, and not added to trails on levees, near wetlands, or on and around the landfill hills,

Response R.9: A copy of the Specific Plan is included in Appendix B of the Draft EIR. Chapter 6.6.9 of the Specific Plan includes the standards for exterior lighting and future development shall comply with these standards, as explained on pages 112 through 113 of the Draft EIR. Standard 3 Full cutoff – lighting shielding requires all exterior lighting be shielded from the top, directed downward, and avoid excessive light trespass. Uplighting of buildings and landscaping is prohibited. Standard 4 on page 178 of the Specific Plan specifically pertains to lighting near habitat areas and states: "Exterior light design shall minimize the potential to impact open spaces intended to provide wildlife habitat as identified in this Chapter, including the Ecological Combining District ECD, areas within 150 feet of the ECD boundary, habitat areas within Greenbelts- Ecological Corridors and Natural Areas-Habitat Patches, and the East and West Channels. Within these areas the following standards shall apply.

a. Light fixtures shall be designed and maintained to only illuminate pathways and other surfaces or features necessary for safety, building entrances, and circulation. Light shall be diverted away from wildlife habitat. Light fixtures shall meet the Backlight-Uplight-Glare (BUG) rating system requirements for Lighting Zone 1 (LZ1) under the International Dark-Sky Association's model lighting ordinance.
b. Interior and exterior lighting that is not necessary for safety, building entrances, and circulation shall be automatically shut off from 10 pm to sunrise.
c. All light fixtures near habitat areas shall have a light temperature of ≤ 2,700 kelvin."

In addition, page 179 of the Specific Plan includes a guideline to conduct lighting studies and modeling during the exterior lighting design process to confirm that the development proposal would minimize the addition of indirect artificial light at night to habitat areas.

The above Specific Plan standard would minimize night lighting near sensitive habitats and not result in impacts to sensitive habitat or special status species in those habitats due to nighttime lighting. Mitigation, therefore, is not required.

Comment R.10:

- With the exception of commute trails (Such as Bay Trail and the East and West Channels trails), limit access to human-powered-only, and prohibit electronic or motorized mobility devices,

Response R.10: Refer to Response A.9 for a discussion of future environmental review requirements required for multi-use trails. Further, the development of future multi-use trails in the Specific Plan area would be required to meet ADA requirements, which may not allow for prohibition of electronic or motorized mobility devices. In addition, all persons operating motorized mobility devices would be subject to City Municipal Code 9.62.040 which sets forth safety regulations.

Comment R.11:

- Limit public access to some of the Baylands Levees. Sunnyvale resident and naturalist Kira Od provided the attached report in which she identifies parallel levees that can be closed to public access with no impact to mobility and circulation (Figure 2). Ms. Od's comments and recommendations can be integrated into the EIR to mitigate some of the impacts of human encroachment and disturbance of wildlife and habitat.

Figure 2 **PROPOSED SEASONAL LEVEE CLOSURES**

Response R.11: The project does not propose any changes to the bayland levees, also refer to Topic Response 3: Park and Recreation Impacts regarding how the current use, operations, and restrictions at existing recreational facilities would not change as part of the project. No significant impacts were identified to special status species wildlife or sensitive habitat; therefore, no mitigation is required.

Comment R.12: 3.4 Biological Resources

Environmental Impacts Caused by Shading

The setbacks from the East channel are missing in Table 5 Building Setback Requirements.

Response R.12: Refer to Response R.13 for discussion about environmental impacts caused by shading. Page 164 of the Specific Plan shows the minimum setback from the East Channel is 65 feet average (from new parcel line or public access easement defining publicly accessible open space).

Comment R.13: The MPSP places the tallest buildings (Chesapeake) with allowable heights of 250', 275' and 250' near the East Channel and Baylands park. We believe this placement may have significant impacts including shading during the day and introducing Artificial Light at Night. Tall buildings adjacent to open space should be required to step-back in height to reduce visual impact on valuable open space, to reduce shadows cast by the building and reduce impacts of light at night on the environment.

Response R.13: The aesthetic impacts (including light and glare) from implementing the Specific Plan are evaluated in Section 3.1 Aesthetics on pages 44 through 51 of the Draft EIR and are concluded to be less than significant. Refer to Response R.9 regarding the Specific Plan's exterior lighting standard to minimize lighting impacts near habitat areas, including the East and West Channels.

Comment R.14: Height of buildings can also have a significant impact on riparian corridors, wetlands, open space, and recreation. Light is necessary for photosynthesis by riparian and aquatic vegetation. Water temperature in creeks is also affected and in turn, it influences pH and dissolved oxygen concentration, which affects the species composition and abundance of invertebrates and fish. The effect of shading on the structure and function of wetland ecosystems is greatest in small wetlands.

Response R.14: The Draft EIR discusses the impacts to riparian habitat and wetlands under Impact BIO-2 and Impact BIO-3 on pages 111 through 114 of the Draft EIR and concludes that with the implementation of the Specific Plan requirements identified (which including requiring project-specific analysis of impacts if development is proposed within 250 feet of riparian areas and wetland delineation if wetland or potential wetlands may be present and mitigation for any impacts) would not result in significant impacts. In addition, refer to Response R.8 which discusses how the existing wetland and riparian habitats in the northwest corner of Moffett Park are within the ECD and private development is prohibited in the ECD and Response R.9 regarding the Specific Plan's exterior lighting standard to minimize lighting impacts to riparian and wetland habitats. Furthermore, when specific development is proposed, it will be subject to the City's development review process and subsequent CEQA review.

Comment R.15: Sunlight is important in parks and open space, and in the urban landscape.

Response R.15: The City does not have a policy or standard pertaining to sunlight in parks, open space, or urban landscape. The comment does not refer to any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

Comment R.16: Chapter 6 Open Space and Urban Ecology, Table 15 defines the setbacks required along the East and West Channels. Section 5.3.2 defines the "step-backs." However the building step-backs are not clear for all facades and may not be adequate for reducing shading of open space and waterways.

- Please clarify the step-backs of building facades along the East Channel and West Channel and fronting on Baylands Park.

Response R.16: Step backs of building facades would not result in environmental impacts. Refer to Responses R.14 and R.15 regarding shading impacts to open space and waterways.

Comment R.17: 3.6 Energy

Life Sciences Energy Use

- Has the DEIR analyzed projected energy use for different projects and facilities that are likely to be constructed as R&D uses? Our concern is that Life Science labs have unique requirements. and use significantly more resources than office buildings (in the order of two to ten times more energy.)

> **Response R.17:** The estimated energy use from buildout of the Specific Plan is discussed under Impact EN-1 in Section 3.6.2.1 on pages 137 through 139 of the Draft EIR. The energy use for the various land uses in the Specific Plan, including R&D uses, was based on CalEEMod model defaults. Pursuant to the CEQA Guidelines, an energy impact is determined based on whether the project would: 1) result in a significant impact due to wasteful, inefficient, or unnecessary consumption of energy, 2) conflict with or obstruct state or local plans for renewable energy or energy efficiency, or 3) result in substantial increase in demand upon energy resources. These questions are more fully stated in Section 3.6.2 on pages 136 through 137 of the Draft EIR. The Draft EIR concluded that the energy impacts from the buildout of the Specific Plan would be less than significant due to compliance with Specific Plan policies and existing regulations and energy efficient standards (see pages 137 through 141 of the Draft EIR).
>
> No specific development is proposed at this time. Future development, including life science labs, would be subject to subsequent review by the City to confirm the development does not result in impacts due to wasteful, inefficient, or unnecessary energy consumption, conflict with plans for renewable energy or energy efficiency, or result in a substantial increase in demand upon energy resources. consistency with the Specific Plan (including its policies pertaining to energy efficiency, which are listed on pages 138 through 139 of the Draft EIR), current regulations, and assumptions in the Draft EIR.

Comment R.18: 3.9 Hazards and Hazardous Materials

The DEIR has not adequately mitigated for the potentially significant adverse impacts posed by hazards and hazardous materials within the Plan area. We disagree with the findings and maintain that Impacts HAZ-2, HAZ-4 and HAZ-C remain significant, and there is substantial concern that the proposed mitigation is not feasible, therefore the impacts will remain significant, unmitigated, reasonably expected to occur.

> **Response R.18:** This comment letter does not provide substantial evidence that the impact discussion and conclusions in the Draft EIR, including Section 3.9 Hazards and Hazardous Materials, are inadequate or the requirements are infeasible, as explained in the responses to this comment letter provided below.

Comment R.19: The MPSP addresses hazards through the following seven requirements for future projects:

- Environmental Site Assessments (ESA)
- Site Management Plan
- Phase II Environmental Site Assessment (ESA)
- Remediation and/or Management Measures
- Dewatering Management Plan
- Asbestos Survey
- Lead-based Paint Survey

These requirements are vague. The MPSP bases the determination whether or not an ESA should be prepared on "evaluation of the property history to determine if the property has been or is likely to have environmental impacts."

Response R.19: The Specific Plan requirements listed in the above comment are not vague. The description of the requirements, which are included on pages 190 through 192 of the Draft EIR (as well as in the Specific Plan in Appendix B of the Draft EIR) include detail about what the requirement is, the purpose of the requirement, the elements of the requirement, and reviewing/reporting requirements. Additionally, this list covers the standard forms of investigation and management of environmental issues accepted and required by regulatory agencies with jurisdiction in California, i.e., the Environmental Protection Agency, Department of Toxic Substances Control, Regional Water Quality Control Boards, and local oversight programs. There are extensive guidance documents issued by these agencies and the American Society for Testing and Materials (ASTM) that present requirements and professional standards that must be met for each bulleted item.

Further, the above comment incorrectly summarizes the requirement for the Environmental Site Assessment (ESA) identified as a Specific Plan requirement under Impact HAZ-2 on page 190 of the Draft EIR. Per Specific Plan requirement 10.3.1-1 (which is stated on page 190 of the Draft EIR), an ESA is required for any renovation, modification, or redevelopment of a property. Specifically, Specific Plan requirement 10.3.1-1 states: "Environmental Site Assessment. *For any renovation, modification, or redevelopment of a property within Moffett Park* [emphasis added] that includes subsurface disturbance and requires City review, *a property-specific Phase I Environmental Site Assessment (ESA) shall be completed* [emphasis added] in accordance with ASTM Standard Designation E 1527-13 (or the standard that is effective at the time the Phase I ESA is completed) to identify Recognized Environmental Conditions, evaluate the property history, and establish if the property has been or is likely to have environmental impacts…."

Comment R.20: However, considering only historical data, which in many cases may not be up- to-date and in some cases, quite old, is not sufficient to determine if contaminants remain on the surface or underground at a particular site. Project-specific sampling must be performed by independent qualified personnel in order to determine if a Site Management Plan should be required. In addition, thresholds for what is deemed "minor environmental impact" must be made by independent qualified

personnel to determine if a Site Management Plan will be required. The conclusions made in the original ESA for a site are critical to determining if a Site Management Plan, a Phase II ESA, Remediation and/or Management Measures, and a Dewatering Management Plan are required. For this reason, the ESA must be based on current, project specific data as to what toxins and at what levels exist on each property in the Specific Plan area and what cleanup standards must be used.

Response R.20: A review of a site's history is only one component of the ESA. The ESA shall be completed in accordance with ASTM E 1527-13 standards (as stated in Specific Plan requirement 10.3.1-1) by a qualified environmental professional, which is defined by ASTM standards as a person who either 1) holds a current Professional Engineer's or Professional Geologist's license or registration from a state, tribe, or U.S. territory and has the equivalent of three years of full-time relevant experience, or 2) is licensed or certified by the federal government, a state, tribe, or U.S. territory to perform environmental inquiries as defined by Section 312.10 of the Code of Federal Regulations and has the equivalent of three years full-time experience, or 3) has a Baccalaureate or higher degree from an accredited institution of higher education in a discipline of engineering or science and the equivalent of five years of full-time experience; or 4) has the equivalent of 10 years of full-time relevant experience.

In addition, the City or its designated environmental professional shall review the ESA to confirm its adequacy. Per ASTM E 1527-E standards, the ESA is also required to identify any Recognized Environmental Conditions (RECs), Historical Recognized Environmental Conditions (HRECs), and Controlled Recognized Environmental Conditions (CRECs). RECs are defined by ASTM E 1527-13 as the presence or likely presence of any hazardous substances or petroleum projects in, on, or at a property. ASTM E 1527-13 standards also require review of hazardous materials databases for existing contamination on- and off-site that may affect the development. Additionally, Phase I ESAs are typically considered outdated after 180 days. If a development project relies on a Phase I ESA older than 180 days, the City may require the project prepare a new one.

A Site Management Plan (as required by Specific Plan requirement 10.3.1-2 and described on page 190 of the Draft EIR) and sampling (as required in Specific Plan requirement 10.3.1-3 and described on pages 190 through 191 of the Draft EIR) are both required to be completed to the satisfaction of the regulatory agency (e.g., California Department of Toxic Substances Control, San Francisco Bay Regional Water Quality Control Board, or Santa Clara County Department of Environmental Health).

Comment R.21: The following aspects of the MPSP and the DEIR are of concern:

Hazard Assessment

A groundwater solvent plume is present at the Lockheed Plant One/Naval Industrial Reserve Ordnance Plant (NIROP) site, which is identified as a Cortese List site by the California Environmental Protection Agency. Soil gas samples above the plume have concentrations greater than USEPA Regional Screening Levels (SLs) for the carcinogens TCE, vinyl chloride (VC),

benzene, and chloroform, contributing to an estimated lifetime excess cancer risk for residential use of greater than one in one million. The Record of Decision (ROD) for the site has not been finalized; thus, it is unknown whether the yet-to-be-selected remedy will reduce hazard levels for specific populations. The finding of no significance for Impact HAZ- 4 is premature and cannot be supported at this time.

Response R.21: The Draft EIR summarizes known contamination in Moffett Park, including the contamination on the Lockheed Sunnyvale – Plant One Facility and Sunnyvale Navel Industrial Reserve Ordnance Plant (NIROP) sites on pages 183 through 188 of the Draft EIR, and in more detail in Appendix F of the Draft EIR.

In the Specific Plan, the Lockheed Sunnyvale – Plant One Facility site has a land use district designation of MP-E2: Mixed Employment 2 and MP-O1: Office 1. The NIROP site is designated as MP-E1: Mixed Employment 1. Residential uses are prohibited in these land use district designations. A map of the land use districts is shown on Figure 2.3-1 on page 13 of the Draft EIR.

While the groundwater Record of Decision (ROD) for the NIROP site has not been finalized, the draft ROD identifies feasible methods to remediate the contamination, including use of in situ bioremediation, chemical reaction and extraction and treatment of the groundwater contamination, and land use controls. These possible remediation measures identified as possible remediation and management measures that could be implemented per Specific Plan requirement 10.3.1.4 described on page 191 of the Draft EIR.

No specific redevelopment of the Lockheed Sunnyvale – Plant One Facility or the NIROP sites is proposed at this time. When a specific development is proposed, it would comply with Specific Plan requirements 10.3.1-1, 10.3.1-2, 10.3.1-3, 10.3.1-4, and 10.3.1-5 described on pages 190 through 191 of the Draft EIR to reduce impacts from soil, soil vapor, and/or groundwater contamination by requiring sampling for contaminants, proper handling of hazardous materials contamination, and remediation of contamination under regulatory agency oversight. Specific Plan requirement 10.3.1-4 on page 191, as revised in Section 5.0 Draft EIR Text Revisions, requires future project applicants to demonstrate hazardous materials do not exist on the site prior to the issuance of building permit.

Comment R.22: Environmental Screening Levels (ESLs) from the SF Bay RWQCB are much more stringent and address more exposure routes and human and ecological receptors than the USEPA SLs used in the NIROP report. We request that the EIR and Specific Plan incorporate the requirement to use the latest California methodology in assessing hazards at proposed project developments.

Response R.22: The commenter is correct in stating that the San Francisco Regional Water Quality Control Board environmental screening levels (ESLs) are more conservative or stringent than the EPA's. The ESLs are intended as guidance and are not definitive indications of risk to human health or the environment. ESLs are not a hazard assessment methodology or cleanup goal; rather, they are used as a screening

tool to identify potential issues at a site. Furthermore, the Specific Plan and Draft EIR are not able to impose requirements on agencies with jurisdiction over a site.

Comment R.23: We request that the DEIR accept the recommendation in Appendix G to expand the existing network of monitoring wells into the eastern part of the project area, to better characterize historical contamination. Figure 15 of Appendix G shows existing well locations listed in the Santa Clara County (Valley Water) Well Database that could possibly be used to extend the network. There is no indication that any chemical measurements from these wells are publicly available, as the wells are not shown on the California Water Board's Groundwater Information System (GAMA) interactive map. New wells should also be placed along the southern boundary of the project area to detect upgradient sources of groundwater contamination that could migrate onsite and impact future developments.

Response R.23: The above recommendation to expand the existing network of monitoring wells into the eastern part of the project area is beyond the scope of the EIR. In addition, information about the referenced wells is available on the GeoTracker or Envirostor database websites. This comment does not identify any specific CEQA issues or inadequacies of the Draft EIR, nor does this comment provide new information that would change the analysis or conclusions disclosed in the Draft EIR. Therefore, no further response is required.

Comment R.24: As previously stated, site investigations conducted under IMPACT HAZ-2 should not rely solely on historical records such as are typically used in Phase I/Phase II investigations to determine the need for sampling and analysis.

Response R.24: The above assumption is incorrect. Phase I/Phase II investigations do not solely rely on historic records, refer to Response R.20.

Comment R.25: Due to the extensive military and industrial use of the project area, it is likely that contaminants are present that have not been tested for in the past. In particular, the EIR should include provisions to require proposed developments to sample for the following.

- Per-and-polyfluorinated alkyl substances (PFAS) are ubiquitous in the environment, but significant contamination is often associated with municipal waste landfills, biosolids operations, and firefighting or fire training on military bases. Soil and shallow groundwater should be tested along the northern border of the project area across from the former Sunnyvale Landfill, and along the western boundary of the project area where the Navy has identified releases at the former Hanger 4 on Moffett Field Air Base.
- Polychlorinated biphenyls (PCBs) have multiple historical uses and may be present in soil or groundwater from electrical equipment dielectric fluid spills, weathering of PCB-containing paints or building materials, and many other sources. Testing should be conducted on soils in any areas of the site with past industrial or military use. The City of Sunnyvale requirements to test building materials during demolition will not detect this environmental contamination.
- Polycyclic aromatic hydrocarbons (PAHs) are common soil contaminants due to releases from petroleum spills and vehicle exhaust. Testing for those chemicals was recommended in Appendix G of the DEIR.

Response R.25: Sampling of known or suspected contaminants (which could include the above contaminants if deemed appropriate) is required per Specific Plan requirement 10.3.1-3, which is described on page 190 of the Draft EIR.

Comment R.26: Cumulative Impact of Hazardous Materials (Impact HAZ-C)

The cumulative impacts of hazardous materials on residents and workers within the Plan area have not been adequately identified, assessed or mitigated to levels that are less than significant. Existing contamination identified on the site exceeds USEPA SLs for both residential and commercial exposures. More of the Project Area is likely to exceed SF Bay RWQCB ESLs, which are more health-protective than USEPAs ESLs. Because the identified and potential contamination sites have not been fully investigated, and a ROD has not been finalized for the extensive Plant One/NIROP solvent plume, there is no factual basis to state that the cumulative impact after mitigation will be less than significant.

Response R.26: As discussed under Response R.22, the San Francisco Regional Water Quality Control Board environmental screening levels (ESLs) are more conservative than the EPA's. However, the ESLs are intended as guidance and are not definitive indications of risk to human health or the environment. Additionally, no specific development is proposed at this time. When development projects are proposed, site-specific investigation is required to identify any necessary measures to ensure no significant hazards and hazardous materials impacts occur to the environment (including off-site residents and workers) due to the proposed construction or use. The site-specific investigation requirements are outlined and detailed on pages 190 through 192 of the Draft EIR and are the mechanisms in place to ensure investigation and appropriate remediation is implemented to reduce impacts to a less than significant level. Further, the Specific Plan requirements identified are standard forms of investigation and management employed to mitigate hazardous materials impacts.

Comment R.27: DEIR Appendix F (5), Impact Haz-C concludes there will be no significant cumulative impact of existing site contamination because "*Existing regulations are in place to reduce hazardous materials impacts to acceptable levels, preventing cumulative impacts…. Projects resulting in hazardous materials impacts would be mitigated to a less than significant level through compliance with existing regulations and implementation of project-specific measures (such as those identified in the Specific Plan Project Requirements identified under Impact HAZ-2)*." This statement ignores features of the site and the planned development.

Response R.27: The above comment omits text from the quoted discussion that pertains to site-specific investigations. The discussion does not ignore features of a site or the planned development. Page 195 of the Draft EIR states: "Existing regulations are in place to reduce hazardous materials impacts to acceptable levels, preventing cumulative impacts. Future development projects within and outside Moffett Park are subject to existing regulations, including the ones summarized in Section 3.9.1.1 Regulatory Framework, that ensure the safe storage, management, and disposal of hazardous materials. *Future development projects are also subject to the*

City's development review process, which requires site-specific evaluation of impacts under CEQA. Development in adjacent jurisdictions, such as the City of Mountain View, are subject to a similar development review process. [emphasis added] Projects resulting in hazardous materials impacts would be mitigated to a less than significant level through compliance with existing regulations and implementation of project-specific measures (such as those identified in the Specific Plan Project Requirements identified under Impact HAZ-2)."

No specific development is proposed at this time. Site-specific investigations and analyses are identified as Specific Plan requirements for future development to complete and confirm impacts (if any) are mitigated. Refer to Response R.20 regarding the mechanisms in place to ensure future development does not result in significant hazardous materials impacts.

Comment R.28: The project requirements for Impact HAZ-2 through HAZ-4 apply to individual development proposals, but residents and workers in the commercial and industrial facilities may be exposed to contamination from multiple sources within the project area. Since many of the residents are expected to also work and recreate in the project area, the cumulative impact should be evaluated on a project area-wide basis.

Response R.28: For hazardous materials impacts, the thresholds and screening levels for contamination set by regulatory agencies reduce risk on an individual and cumulative basis. If a site is redeveloped and remediated to acceptable levels and does not exacerbate conditions off-site, the impact to occupants and visitors on-site and occupants off-site are considered less than significant and not cumulatively considerable.

Comment R.29: Mitigation of Hazardous Conditions

The DEIR conclusion of no significant impact from future resident or worker exposure to VOCs in groundwater and soil gas is based on unrealistic assumptions as to the efficacy and timeframe of the mitigation actions. To this point, guidance from both the SF Bay RWQCB and Santa Clara County indicate that the use of a VIMS to reduce hazards cannot be allowed until active mitigation is complete.

Santa Clara County: *"SMP [Site Mitigation Program] typically requires cleanup (i.e., remediation) of the source of contamination, instead of mitigation (ex. VIMS). VIMS are considered short-term solutions to provide protection while active cleanup is ongoing."*

SF Bay RWQCB: *"In most cases, for new construction where a VIMS is needed to protect building occupants, we will not approve the VIMS until remediation to the extent feasible has been implemented. This could affect the local agency's permitting decision for occupancy."*

Response R.29: Specific Plan requirement 10.3.1-4 on page 191 identifies vapor intrusion mitigation systems (VIMS) as a potential management measure, along with other control measures. Additionally, Specific Plan requirement 10.3.1-4 on page 191 of the Draft EIR (as revised, see Section 5.0 Draft EIR Text Revisions) requires

applicants to demonstrate that hazardous materials do not exist on the site or that the proposed construction and use of the site are approved by the environmental oversight agency with jurisdiction prior to the issuance of building permit.

Comment R.30: The timeframe for remediation of halogenated solvent plumes is typically many decades. The required monitoring and treatment infrastructure may preclude future development in project areas above VOC plumes.

We request that the DEIR and Specific Plan add the SF Bay RWQCB and Santa Clara County VIMS guidance as project requirements for all future developments in the project area.

Response R.30: The suggested measure is unnecessary as regulatory agencies would review and approve development on sites with known impacts. Regulatory agencies apply guidance that is current at the time a project is developed. Further, the regulatory guidance on vapor intrusion is revised on a regular basis. Guidance will likely become more stringent over the next 20 years (the expected timeframe of buildout of Moffett Park). Tying development to a current guidance document would preclude future development from complying with future guidance that may prove more protective of human health and the environment in the future.

Comment R.31: Impacts of Sea Level Rise on Subsurface Contamination

The SFEI et al. report of groundwater conditions at the project area concluded that SLR could lead to groundwater reaching the surface in portions of the site by the end of the century, which could mobilize subsurface contamination. The report also states that "Changes to remediation strategies at individual sites may be required to ensure public safety if groundwater levels rise and cause contaminants to spread to new locations." We worry that the contamination could potentially spread to areas outside of the MPSP boundary and to the Bay.

The DEIR does not address the potential increase in transport of contaminants in soil vapors as groundwater elevations increase over time, which may occur earlier than the end of the century. Mobilization of contaminated groundwater plumes is also not analyzed. And the DEIR does not address recommendations A through D from the SFEI report for measures designed to adapt to groundwater rise, or the steps that were identified to fill data gaps that prevent adequate evaluation of site hydrology and contaminant migration. We recommend that the final EIR incorporate the proposed mitigation measures into the project's design.

Response R.31: No specific development is proposed at this time. Refer to Response R.20 for the mechanisms in place to evaluate and remediate contamination (such as contamination from migrating groundwater plumes) during redevelopment of sites within Moffett Park.

It is assumed that the "recommendations A through D from the SFEI report" are the adaptation strategies identified in Chapter 6 of the Sea-level Rise Impacts on Shallow Groundwater in Moffett Park by SFEI included in Appendix G of the Draft EIR. The adaptation strategies are considerations for future development that could minimize the risk of rising groundwater, including adding three feet to groundwater design

levels, accounting for higher groundwater levels in stormwater system upgrades, and designing site open spaces to allow more groundwater and stormwater detention. Per California Building Industry Association v. Bay Area Air Quality Management District, 62 Cal 4th 369 (BIA v. BAAQMD), effects of the environment on a project (e.g., groundwater level effects to the development of the Specific Plan) are not considered CEQA impacts. This does not, however, preclude the City from considering the adaptation strategies outside of the CEQA process. When future development is proposed, the City will consider the applicability of the adaptation strategies identified during the planning (not CEQA) process.

Comment R.32: 3.10 Hydrology and Water Quality

The DEIR discussion of Existing Conditions, Groundwater, pp.201-202, inadequately informs the reader and decision-makers about the existing groundwater status in the Plan area. We recommend that you improve that discussion with the following.

- Differentiate between shallow groundwater and deep groundwater.
- Replace Figure 3.10-2 "Groundwater Depth in Moffett Park" with Figure 10 "Estimated depth to water in Moffett Park, based on an interpolation between measured values in the Geotracker database". The latter, in the City's Groundwater and Sea Level Rise Addendum, provides the reader with a more site-specific overview of the shallow groundwater landscape relative to the proposed plan and includes references to sources and dates of data used.

Response R.32: The description of existing groundwater conditions on pages 201 through 202 of the Draft EIR provides a general description of groundwater conditions. Valley Water, the groundwater management agency for Santa Clara County, has reviewed the Draft EIR and did not comment that the groundwater description was inadequate. The description on page 202 of the Draft EIR mentions the depth of shallow aquifers and text has been added to page 202 of the Draft EIR to clarify the depth of deeper aquifers. In addition, Figure 10 in Appendix G of the Draft EIR, which is referenced in the above comment, has been added to the Draft EIR as an additional figure, Figure 3.10-2a. Refer to Section 5.0 Draft EIR Text Revisions.

Comment R.33: The DEIR discussion of Existing Conditions, Flood Hazards on p. 206 makes the following statement: "There are several projects in the process that would reduce the risk of flooding within Moffett Park, including: South San Francisco Bay Shoreline Phase III Feasibility Study – undertaken by the USACE, Valley Water, and the California Coastal Conservancy that is evaluating the feasibility of implementing levee improvements and habitat restoration that would benefit Moffett Park. The design and construction of improvements is unknown at this time."

This statement about the Shoreline Phase 3 Feasibility Study is inaccurate and thereby misleading.

- Before a Feasibility Study can begin, Valley Water and the USACE must sign a cost-share agreement. That action has not occurred nor is there any agreement that it will at any time soon. No Feasibility Study is underway. There is no Phase 3 Project.
- Unlike nearby cities (Palo Alto and Mountain View), Sunnyvale has not prepared a technical shoreline vulnerability study. While the City has had multiple reports prepared on sea level

strategy and resilience, none provide the technical analysis that assesses vulnerability as a starting point for a Phase 3 project.

- The USACE has now reassessed Phase 2 (Palo Alto, part of Mountain View) to target the year 2060 for completion. Phase 2 is prioritized ahead of Phase 3.
    - Please correct the Existing Condition discussion in the EIR
    - Discussion and impact analysis in the DEIR that refers to the Shoreline Phase 3 Project as an existing condition should be re-evaluated.
    - Since the timing for design and construction of Phase 3 levee improvements has not been ascertained, and funding is not reasonably foreseeable, the MPSP and the DEIR should rely upon the levee in considerations of flood risk reduction.

Response R.33: The description of the South San Francisco Bay Shoreline Phase III Feasibility Study, including the statement that the design and construction of improvements are unknown, on page 206 of the Draft EIR is correct. Additional text to the description of the South San Francisco Bay Shoreline Phase III Feasibility Study has been added to page 206 of the Draft EIR (refer to Section 5.0 Draft EIR Text Revisions). Valley Water and the California State Coastal Conservancy are currently working with U.S. Army Corps of Engineers on the terms of the feasibility cost share agreement (FCSA). Once the FCSA is finalized, the Shoreline Phase III Feasibility Study will be initiated.

The projects identified on page 206 through 207 of the Draft EIR include the South San Francisco Bay Shoreline Phase III Feasibility Study (which the above comment references), South Bay Salt Ponds Restoration Project, Sunnyvale East and West Channel Flood Protection Project, and Water Pollution Control Plant Master Plan project. These projects are briefly discussed further in Section 3.10.3 Non-CEQA Effects as examples for future flood risk reduction in anticipation of sea-level rise. In general, effects of the environment on a project are not CEQA impacts. For this reason, a discussion of these projects was included in the Draft EIR for informational purposes only and do not shape the CEQA analysis or impact discussion.

This comment does not provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

Comment R.34: 3.11 Land Use and Planning

Residential Use

Residential use is not advisable for project parcels that have volatile organic compounds (VOCs) in groundwater or soil vapor far in excess of California Environmental Screening Levels (ESLs). The Proposed Land Use Map (MPSP DEIR Figure 2.3.1) shows a residential area between Lockheed Martin Way, 1st Avenue and Bordeaux Drive. A portion of this parcel is located above a groundwater solvent plume from the Lockheed Plant One/Naval Industrial Reserve Ordnance Plant (NIROP) military cleanup site. Figure 1 shows the trichloroethene (TCE) groundwater plume from the Figure 2-15 of the NIROP report, overlaid on the Project Land Use Map. Soil gas samples within the proposed residential area have concentrations greater than USEPA ESLs for the carcinogens

TCE, vinyl chloride (VC), benzene, and chloroform, contributing to an estimated lifetime excess cancer risk for residential use of greater than one in one million.

> **Response R.34:** No specific development is proposed at this time. Site-specific investigations and analysis are identified as Specific Plan requirements for future development. Refer to Responses R.20, R.21, and R.26 regarding clarification about Specific Plan requirements and the mechanisms in place to ensure future development does not result in significant hazardous materials impacts.

Comment R.35: Commercial Use

Subslab soil gas and indoor air sampling has found VOC concentrations in excess of USEPA commercial use SLs at multiple vacuum degreaser facilities within the Lockheed Plant One site and within the boundaries of the NIROP solvent plume, and in the vicinity of the Google Caribbean Campus. This is not a complete list of sites in the project area that could potentially have soil gas contamination. Other potential areas with known or suspected hazardous chemical releases were identified in the Farallon Consulting report, Appendix F to the Draft EIR. Subsequent projects should perform soil gas sampling at potential contamination sites.

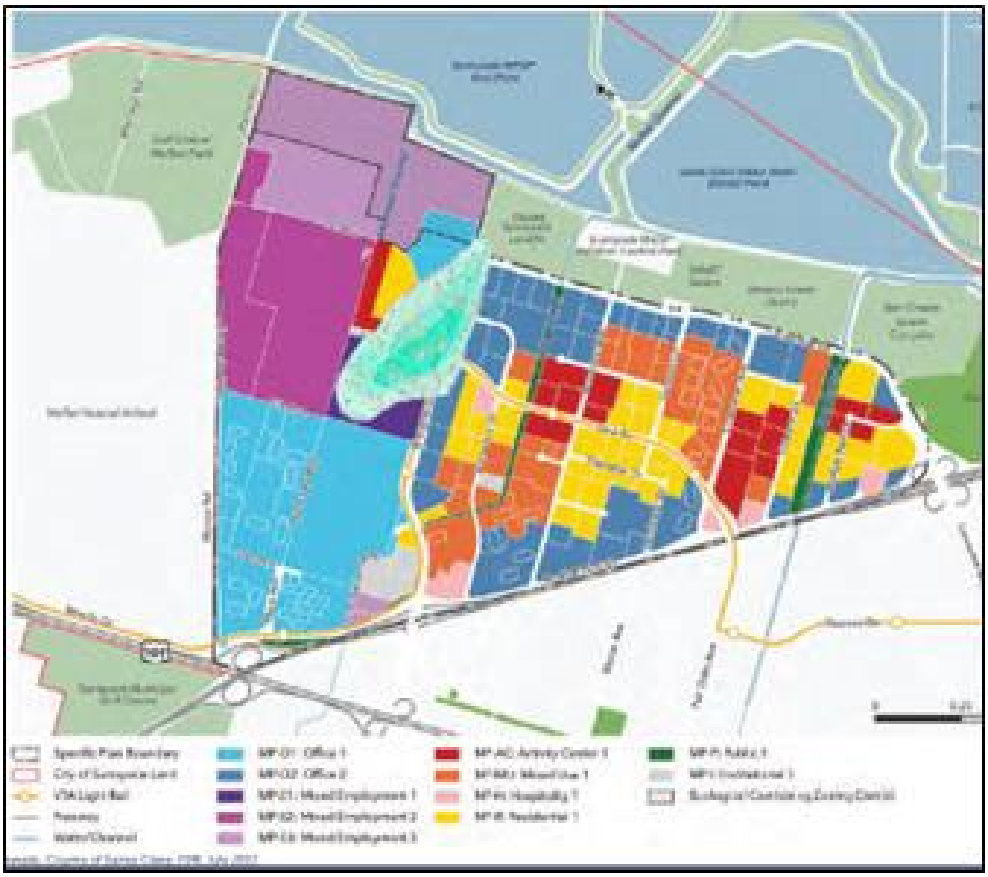


Figure 3. TCE shallow groundwater plume overlaid on DEIR Proposed Land Use Map

Response R.35: Future development under the Specific Plan is required to complete site-specific investigations and analysis, including soil vapor sampling as warranted per Specific Plan requirement 10.3.1-3 described on pages 190 through 191 of the Draft EIR.

Comment R.36: Landscape Area and Open Space

We have consistently expressed the importance of open space in the "Ecological Innovation District," so we are pleased that the MPSP proposes 200-plus new acres of parks and open space. However, it is not clear to us that the MPSP provides adequate mechanisms for acquisition or dedication of public open space. Even the Bonus FAR mechanism, which requires community benefits, does not assure that any new open space would be produced. Therefore, we are concerned that the DEIR makes findings of significance based on the presumed addition and availability to the public of these parks and open space. If 200 acres of open space are not acquired or deeded for public use, project impacts on existing environmental resources (for example, recreation and biological impacts) may prove significant and unavoidable.

Response R.36: Refer to Topic Response 3: Park and Recreation Impacts.

Comment R.37: We are also concerned about the minimal landscape areas delineated in the proposed Plan and also that the MPSP's Lot Coverage and Paving Area requirements will severely constrain the greenscape benefits of landscape areas. The MPSP does not require ANY landscape area in the Activity Core MP-AC. In the Residential area MP-R, only 15% of the site is a landscape area. In Non-Residential areas only 5% landscape area (in the Fine Grain Core). Figure 28, pg 104 shows that the "fine grain core" area (referenced in Table 6) covers approximately 50% of the MPSP (excluding the Lockheed campus). We note that there is no requirement for any "landscape area" in this zone though there are guidelines for planting areas located in sidewalk and paved areas for this zone. Outside the "fine grain core" there is a requirement for 20% minimum lot area for landscape area. However, it is not clear whether surface parking and driveways (Paving Area) are allowed in this "landscape area."

Please consider the following Plan amendments to ensure that open space will be a required part of the ecological innovation district.

- Require that 50% of all community benefits for bonus FAR be for open space, with priority for ecologically beneficial open space. This is also important because as buildings get taller, the open spaces between them need to be larger in proportion.
- Please reduce the 25% of lot area for "paving area" allowed for non-residential development outside the "fine grain core" so that paved area and surface parking are minimized and landscape area is increased in the "eco-innovation district."

Response R.37: The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

Comment R.38: Life Science Land Use

Permitting of Life Sciences Land Use in R&D requires additional discussion and clarification in the EIR. Life Sciences lab buildings are categorized into four Biosafety Levels. These reflect levels of bio-containment of infectious diseases and pathogens.

Moffett Park is located on a fill area with a high groundwater table and flooding risk, as well as liquefaction potential in major earthquake events. In the event of a major earthquake, soils are predicted to liquefy resulting in rupturing and damage to underground utilities as well as potential major structural damage to the buildings. In the event of a major disaster, back-up systems may not be operable and containment may not be possible for biohazards.

Proposed mitigation: Require that emergency equipment and back-up systems be located higher than the 100-year flood level and preferably on the second floor or the roof so as to be safe from flooding.

- Please clarify which districts will be available for biotech labs.
- Will BSL-3 labs be allowed in the MPSP?
- Will there be separation requirements for BSL labs from housing in the MPSP? Cities have instituted separation requirements ranging from 250 feet to 500 feet for public health and safety.
- Will there be special setback requirements for BSL labs from the East and West Channels which are connected by tidal flows to San Francisco Bay and ecologically sensitive wetlands?

Suggested mitigations.

- Limit Life Sciences labs to BSL-1 and BSL-2. Consider allowing BSL-1 and BSL-2 labs with minimum setbacks of 500’ from any parks and open space as well as residential, school or day-care sites.
- Site lab buildings out of low lying ground levels to avoid flooding.

We disagree that implementation of the Plan would not include any new or uniquely hazardous uses. See Section 3.11 Land Use and Planning for a discussion about the NEW potential for environmental accidents from biohazards. These are uniquely hazardous uses with the potential to affect the public and are not addressed in the MPSP or in the Sunnyvale General Plan.

Response R.38: Life science and biotech labs are types of Research and Development (R&D) uses, which are currently allowed under the existing Moffett Park – General Industrial (MP-I) and Moffett Park – Transit Oriented Development (MP-TOD) zoning subdistricts and there are existing biotech labs currently operating in Moffett Park. Biotech labs would continue to be allowed under the proposed Mixed Office (MP-O1 and MP-O2), Mixed Employment (MP-E1, MP-E2, and MP-E3), and Mixed Use (MP-MU) land use districts shown on Figure 2.3-1 on page 13 of the Draft EIR and described on pages 10 through 11 of the Draft EIR. R&D uses, including life science labs and biotech labs, are not new uses in Moffett Park.

No specific development, including life science or biotech labs, is currently proposed. If life science or biotech labs are proposed in the future, subsequent project- and site-specific analyses are required to evaluate if the specific life science or biotech lab use would result in new or substantially greater environmental impacts than disclosed in the EIR. Subsequent analyses include a site-specific geotechnical investigation report per the California Building Code to evaluate seismic and geological conditions and implement recommendations to avoid/minimize risk due to seismic and seismic-related hazards (including liquefaction) to acceptable levels (as discussed on page 149 of the Draft EIR) and compliance with federal, state, and local regulations for the safe storage, use, handling, generation, transportation, and disposal of hazardous materials during operations (as discussed on page 189 of the Draft EIR). In addition, future development (including life science and biotech lab uses) are required to comply with the Specific Plan requirement and standards to protect sensitive habitats (including wetland habitats) that are described on pages 112 through 113 of the Draft EIR. The project's impact on flooding and inundation is discussed under Impact HYD-3 and Impact HYD-4 on pages 210 through 211 of the Draft EIR and concluded to be less than significant. Also, future development is required to comply with City Municipal Code Chapter 16.62 regulations including standards for construction to prevent flood damage. If impacts are identified during project-specific review, setbacks (as suggested in the above comment) may be considered by the City to reduce impacts.

This comment does not provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

Comment R.39: Maximum Height Limits

Clarify that the maximum heights are to the top of the tallest structures on a building. Usually, heights are set to the top of the roof parapet, or the top of the roof level, or the top of the mechanical equipment structure on the rooftop. However, exhaust stacks may be even taller than the intake and exhaust air from single-pass HVAC equipment. Therefore TOTAL height needs to be specified as the maximum allowable height, to the top of all equipment including exhaust stacks.

Response R.39: Per page 110 of the Specific Plan: "'Building height' means the vertical distance measured from the top of the curb closest to the main building, or if there is no curb, from the highest point of the street adjacent to the main building, to the *highest point of the main building* [emphasis added]. Regardless of maximum building heights allowed on Figure 30, all buildings shall meet the height standards set forth by the Moffett Field Comprehensive Land Use Plan." The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

Comment R.40: Population and Housing

The CEQA Appendix G Guidelines do not include analysis of jobs/housing balance in the checklist of environmental factors that must be evaluated for all projects in California. Nevertheless, the intensity of the housing crisis in California and the Bay Area has made jobs/housing balance an issue

of critical public concern. Rapid jobs growth that outpaces housing production is seen as a significant contributor to housing disruption and inequality in the region. The failure to analyze, describe, and mitigate the direct and indirect impacts of the proposed MPSP on the city-wide or regional jobs/housing balance is a significant omission.

New state laws, and a doubling of Sunnyvale's RHNA allocation from the 5th to the 6th Cycle, strive to spur housing production. However, recent studies suggest that housing production alone may be insufficient to reverse the trends pushing workers and jobs farther apart. In order to reduce housing inequity and displacement, better alignment between jobs and housing and also between jobs and workers are important parts of the puzzle.

The MPSP's Guiding Principle 2 envisions "improving the local as well as regional jobs-housing ratio." Objective 2 in the DEIR uses similar language, but focuses only on "improving the regional jobs-housing balance." Neither document makes any further mention of jobs-housing balance or ratio and the limited data provided appears inconsistent. Table 3.14.2: Projected Growth Citywide on DEIR page 259 indicates that General Plan Buildout will produce 43,865 jobs/employees, 203,985 residents and 82,122 households whereas the narrative above that table states that buildout of the General Plan is estimated to result in 121,689 jobs/employees and 197,785 residents (with no number of households specified). That inconsistency makes it impossible for the public to estimate the city-wide jobs-housing balance likely to result from the MPSP. Additionally, there is no data provided regarding the current city wide or regional jobs/housing balance, making it difficult to evaluate any improvement consistent with Objective 2 or Guiding Principle 2.

We ask that the DEIR provide accurate data about the current local and regional jobs/housing balance and the projected delta resulting from the proposed MPSP, analyze the city-wide job/housing fit with and without the proposed MPSP, and reduce or mitigate any significant impacts on job/housing balance and fit.

Response R.40: The number of existing, projected citywide and regionwide, and Specific Plan jobs/employees, housing units, and residents is identified and associated impacts are discussed in Section 3.17 Population and Housing on pages 256 through 261 and Section 4.0 Growth-Inducing Impacts on pages 343 through 345 of the Draft EIR, as revised (refer to Section 5.0 Draft EIR Text Revisions). The text in Table 3.14-2 on page 259 of the Draft EIR has been revised to reflect the correct number of residents/population and jobs/employees projected to result from the buildout of the City's adopted General Plan (197,785 residents/population and 121,689 jobs/employees) (refer to Section 5.0 Draft EIR Text Revisions). Based on the information and data provided in the Draft EIR, citywide jobs to housing ratio under existing conditions is 1.64, adopted General Plan is 1.48, and adopted General Plan with the proposed Specific Plan would be 1.45. Text has been added to pages 257 and 259 of the Draft EIR to explicitly state these existing, General Plan buildout, and General Plan buildout with Specific Plan jobs to housing ratios. These text revisions do not change the analysis or conclusions in the Draft EIR. As discussed in Sections 3.17 Population and Housing and 4.0 Growth-Inducing Impacts, the growth resulting from the proposed Specific Plan is consistent with projected growth for the North Santa Clara County area (which includes the City of Sunnyvale and portions of the cities of Santa Clara, Mountain View, Milpitas, San Jose, and Palo Alto) in Plan

Bay Area 2050. No significant population and housing or growth inducing impacts were identified in the Draft EIR, therefore, no mitigation is required.

Comment R.41: Recreation

We dispute the contention in Impact REC-1 that the eventual addition of 200 new acres of park and open space in the Plan area would offset the project's demand on nearby park and recreational facilities and thereby avoid contributing to or accelerating substantial physical deterioration of nearby park and recreation facilities. The DEIR specifies that a determination of the project's impact on recreation depends on whether the project would "increase the use of existing … parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated." By conflating "demand" with "use" in its conclusory recreation impact assessment, the DEIR provides inadequate analysis, fails to substantiate the conclusion that there will be less than significant impact regarding physical deterioration of existing regional parks and other recreation facilities, and fails to propose appropriate mitigation of impacts.

Significant park and recreation facilities currently located on the Bay shoreline (just outside of the Plan area), including Baylands Park and the Bay Trail, are of a character and function distinct from the parks and recreation facilities planned within the Plan area. As a result, any increase in their use due to proposed net population and employee growth is unlikely to be offset by the eventual addition of parks and facilities proposed in the MPSP.

- The recreational facilities along the Bay include commute trails that provide access to destinations outside the Plan area, primarily the Bay Trail. The Bay Trail transverses the Don Edwards National Wildlife Refuge. The acknowledged and intended increase in use of the Bay Trail by residents and employees originating in the MPSP area, both for commute and recreation, will very likely increase degradation and increase maintenance requirements for the Bay Trail. The cost of maintenance would thus fall on the refuge, a federal jurisdiction.
- Sunnyvale Baylands Park also provides recreation opportunities that are different in character from the parks and open space proposed within the plan area, including seasonal wetlands, reservable picnic and event areas for large groups, a ropes course, an area for flying drones and model airplanes, and a petting zoo open to the public for limited hours.

The City has repeatedly emphasized the benefits of connections to the Bay and nearby open space, trails, parkland, and recreation facilities to the new Moffett Park community. Additionally, in the 2020 Community Visioning Survey, the highest-ranked key priority was "Connect people too nature and the Bay." Thus it is likely and anticipated that the proposed 42,000 new residents and 60,414 new employees will use the Bay Trail or other existing recreation facilities *in addition* to new facilities within the Plan Area. The DEIR's narrow and conclusory approach, focused on a generalized demand for parks and open space rather than likely usage, has resulted in an inadequate analysis that is inconsistent with both expectations and intentions.

Further analysis is needed to identify existing conditions in these nearby facilities, evaluate the impacts (including physical degradation of facilities, overcrowding and excessive noise) of additional use by the net new residents and employees proposed in the MPSP as well as cumulative impacts

with other developments along the bay, such as the North Bayshore Precise Plan and the Bayview Campus, and identify mitigations to minimize degradation of the facilities.

The existing conditions description should include such factors as daily use (including, for Baylands Park, the number of visitors, picnic and event space reservations, and drone operators) as well as maintenance conditions and requirements, and the adequacy of parking facilities. Mitigations could include such things as limiting open hours, daily capacity limits, a reservation system to regulate the volume of drone activity, and signage and fencing to limit off-trail intrusion, especially into sensitive habitat areas.

Response R.41: Refer to Topic Response 3: Park and Recreation Impacts.

Comment R.42: 3.17 Transportation

Moffett Park is isolated from the rest of Sunnyvale by Highway 237. There are three overpasses that serve the area and these "gateways" are already at a Level of Service (LOS) of E or F during commute periods (DEIR Table 3.17-3 Intersection Level of Service Summary). Several other intersections within the MPSP are also impacted according to this summary. The Mary Avenue Overpass is currently not planned for auto traffic and there is no clear path to its being built in the near future.

We dispute the assumptions of Table 3.17-2: Project Trips and Mode Split at Buildout. While we are supportive of reducing driving within the plan area, it is not practical to assume that there would be ZERO internal trips using automobiles. Please revise this assumption to a more realistic scenario where a certain percentage of trips within the plan area will be made using an automobile.

Response R.42: Refer to Response B.13 for the lane assumptions for the separate, proposed Mary Avenue Overcrossing project. Table 3.17-2 on page 297 of the Draft EIR has been revised to clarify the types of internal, non-driving trips (refer to Section 5.0 Draft EIR Text Revisions. The internal trips include all non-driving modes, which comprise of transit trips, internal circulator trips, and all active transportation modes, inclusive of biking, walking, and rolling. The Specific Plan calls for extensive investments in multimodal infrastructure to support transit and active transportation mode shares, including: a complete streets network with pedestrian-friendly street designs throughout the district; separated bike and pedestrian facilities; a robust on-street bike network and connections to the surrounding street network at district gateways; an internal circulator with frequent service to locations where public transit is not convenient; mobility hubs to support multimodal trips and expand transit access at activity centers; and substantial TDM requirements for all land uses. These resources and incentives to support non-drive access within the district would be implemented over time as future projects are developed and would be most effective at full build out. Also refer to Response H.2 for more context about the mode split at build out.

This comment does not identify any inadequacies of the Draft EIR, nor does it provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

Comment R.43: We maintain that *Impact TRN-4: The project would not result in inadequate emergency access* remains significant. The MPSP has limited roadway access points for emergency vehicles and personnel. The existing “gateway" access roads are already impacted and additional development will further impact these points and severely limit emergency access. The planned Mary Crossing overpass may allow emergency vehicles, however, there is no clear path ahead to realizing this project.

Suggested mitigation: In section 10.6 Performance metrics, in the MPSP, add Item 8: Gateway Capacity: A traffic analysis should be conducted annually, with reporting to the City Council, on the traffic at each gateway, in both directions (incoming and outgoing) during commute hours. Future development should be made conditional to the gateways being able to accept the additional traffic. This should be used to make an informed decision on permitting additional development, guide future decisions on development and emphasize the importance of emergency access to the plan area.

Response R.43: Emergency access, services, and/or response are discussed in several places in the Draft EIR, including Sections 3.9 Hazards and Hazardous Materials, 3.15 Public Services, and 3.17 Transportation. Moffett Park is within the existing service area of the Sunnyvale Department of Public Safety (DPS) and currently served by DPS. DPS provides fire, emergency medical, and police protection services and is staffed by officers who are cross trained as police officers, firefighters, and emergency medical technicians. Fire Station #5 is relatively centrally located within Moffett Park at 1210 Bordeaux Drive and police services regularly patrol Moffett Park. Additional details about DPS are provided on page 265 of the Draft EIR.

The Draft EIR was prepared in coordination with DPS. The Draft EIR concluded that implementation of Moffett Park would not impair implementation of or physically interfere with the City’s Local Hazard Mitigation Plan, which provides comprehensive, detailed instructions and procedures to ensure the safety of Sunnyvale citizens in the event of an emergency (e.g., fire, geologic, or other hazardous occurrence). No major modification to U.S. Highway 101 or Central Expressway (which are designated major evacuation routes for the City) are proposed as part of the project (see discussion under Impact HAZ-6 on pages 194 through 195 of the Draft EIR).

In addition, DPS and the City Council evaluate service levels during the annual budget process to balance resources and ensure and maintain adequate service. As the Specific Plan is implemented, a new or expanded DPS facility may be required. The environmental impacts of constructing such facilities in Moffett Park would be less than significant, as explained on pages 271 through 272 of the Draft EIR. Further, as explained on pages 271 and 309 of the Draft EIR, the proposed street network would increase mobility and access within Moffett Park compared to existing conditions and future development would be designed to meet current building and fire code standards to ensure adequate emergency vehicle access.

As referenced in the above comment, there are several gateways to Moffett Park. Although no longer an impact under CEQA, the level of service (LOS) of

intersections (including intersections along the gateways) was analyzed and the results summarized in Section 3.17 Transportation of the Draft EIR. Improvements at deficient intersections, including North Mary Avenue/Central Expressway, Crossman Avenue/Moffett Park Drive, and various intersections on Lawrence Expressway, were identified and future development shall pay their fair-share towards these LOS improvements. In addition, the Specific Plan includes Goal M-4 and supporting policies (policies M-3.1 through M-4.2) to increase transit, bicycle, and pedestrian capacity at the gateways. In addition, Section 10.6 Performance Metrics of the Specific Plan requires regular district trip monitoring to be implemented by the TMA with the City's regulatory oversight. Furthermore, in an emergency, vehicles traveling on roadways are required to move over and pull over to let emergency response vehicles (e.g., fire, emergency medical, and police) pass.

For these reasons, the project would not result in significant impacts to emergency access and no mitigation is required. The comment does not identify any inadequacies of the Draft EIR.

Comment R.44: Parking

The MPSP parking policies may not achieve the required reduction in driving that is needed to support the anticipated intensification of land use. We have the following suggested changes to the MPSP.

Parking structures should accommodate change of use in the future, from parking cars to housing people. This flexibility of re-purpose should be the model for all parking structures.

- New parking structures should be built to allow future re-purposing such as housing. In addition, new parking structures should be built so as to be able to respond immediately to crisis needs (shelter during major weather events, shelter post earthquake).
- Please consider using feasible strategies like parking cash-out which Stanford, Lockheed, and Genentech used to avoid building additional parking lots and to reduce automobile use. Please require paid parking by all employees. Please install a traffic cap. Traffic caps work if enforced (for example, using pavement sensors that count vehicles throughput) and controlled (via pricing) and feedback systems, such as increasing pricing and fines for exceeding the cap).
- Include the use of electronic toll payment, like FasTrak transponders for all parking and in garages in MPSP.
- Allow or encourage parking in-lieu fees to help pay for shared parking structures. The cost of the structures can be partially covered by revenue generated by parking fees.
- Add a requirement to include car-sharing spaces in residential buildings and require bike-sharing and micromobility-sharing in mobility hubs.
- Prior to building each parking structure, please study overall parking demand to evaluate how multi-modal behaviors evolve, and ensure that the added parking is indeed needed.

Response R.44: Pursuant to Specific Plan Policy TDMP-2.1, a Transportation Management Association (TMA) is to be established to oversee mobility improvements, coordinate efforts, and manage a district-wide TDM strategy. New

development under the Specific Plan is required to implement Transportation Demand Management (TDM) plans to reduce single-occupancy vehicle trips and incentivize multi-modal trips. The standards and guidelines for TDM plans are outlined in Chapter 8.2 of the Specific Plan and identify required TDM measures including unbundled parking; carpool/vanpool parking; bike parking, showers, and lockers; parking cash out program; monitoring; and new metrics as needed and determined by the TMA. Therefore, the above suggestions could be identified in TDM plans for future development as applicable. This comment does not provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

Comment R.45: 3.19 Utilities and Service Systems

Water Supply Assessment

In Appendix J, water supply was assessed through 2040 and "The City is projected to experience Supply shortfalls under single dry-year conditions and multiple dry-year conditions due to the anticipated water supply shortfalls from the SFPUC due to the Bay Delta Plan." Please analyze the cumulative impacts of increased water usage from the MPSP and other large master planning efforts in Sunnyvale such as Peery Park past the year 2040. Also include the water use estimates for anticipated Life Sciences Lab facilities (since Life Sciences Lab buildings require large quantities of water.)

Response R.45: The project's impact on water supply was evaluated in the Draft EIR pursuant to existing regulations including Senate Bill (SB) 610 and California Water Code. Per these regulations, a water supply assessment for a qualifying project must (1) state whether the water supply needs of the development can be met by the supplies available to the water provider as described in its Urban Water Management Plan (UWMP) and (2) determine if the water provider's available water supplies are capable of meeting the development's needs during single-dry and multiple-dry water years as described in the City's Urban Water Management Plan (UWMP) 20-year projection.

As described on page 318 of the Draft EIR, the City's current UWMP projected demands for 20 years through the year 2040 based on General Plan growth estimates. Accordingly, the WSA for the project assessed water supply through 2040 and accounts for the water demand from buildout of the General Plan (including growth from the Peery Park Specific Plan) in combination with the water demand from the proposed project. The WSA, therefore, represents a cumulative analysis of water supply and demand.

As discussed under Impact UTL-2 on pages 335 through 336 of the Draft EIR, and detailed in the WSA included in Appendix J of the Draft EIR, the City has sufficient water supply to serve the buildout of the General Plan and the project under normal years and would meet demands during single-dry and multiple-dry years with the implementation of its Water Shortage Contingency Plan. Per the state water code, the City's UWMP must be updated every five years.

No life sciences lab facilities are proposed at this time. The WSA prepared for the project assumed representative water usage rates for each land use category. These rates are listed on page 10 of the WSA in Appendix J of the Draft EIR. In the event a use is proposed that would result in substantially different water demand than assumed in the WSA, a subsequent WSA may be required.

The comment does not provide new information that would change the analysis or conclusions disclosed in the Draft EIR.

S. SV@Home, Greenbelt Alliance, Housing Action Coalition, Friends of Caltrain, Seamless Bay Area, SPUR, Bay Area Council, TransForm (February 10, 2023)

Comment S.1: Affordable Housing

- Because the City's Inclusionary Housing Program does not guarantee that affordable units will be built on site or within Moffett Park, include an explicit requirement that a minimum of 15 percent of the residential units in the plan area be income-restricted housing affordable to moderate, low, very-low and extremely-low income households, with a 20 percent goal.
- Include explicit language acknowledging that expanding access to people of all incomes will require deed-restricted units integrated into both market-rate development and stand-alone 100 percent affordable developments. This will require additional public and private resources to achieve deeper levels of affordability.
- Consider other tools that would generate additional resources, reduce costs, and incentivize affordable housing development.
- One potential tool to consider could be to allow all or some of the Housing Mitigation Fees collected from commercial development within Moffett Park be dedicated to affordable housing development within each master plan area. Another tool could be to reduce city development fees for affordable housing within the plan area.
- Incorporate concrete language in the Community Benefits Program that affordable housing be prioritized to expand opportunities for very-low and extremely-low income households.
- Include details in the Community Benefits Program on how affordable housing is valued, relative to other benefits.

Environmental Resilience and Equitable Open Space

- Pursue more extensive efforts to stave off urban heat island effects and predicted flooding issues by specifying and incorporating additional nature based solutions and green infrastructure (bioswales, wetland restoration and creation, urban greening requirements, etc.) into the MPSP.
- Ensure spatial equity by committing to going above and beyond the minimum 44 acres of high habitat value eco patches recommended in the San Francisco Estuary Institute Technical Report, with emphasis in areas and neighborhoods slated for affordable housing development.
- Consider the establishment of a climate resilience task force focused on guidance of longer term resilience planning efforts.

Shared Economic Opportunity

- The establishment of a small business advocate office that serves as a single point of contact for existing Sunnyvale small business owners and non-profits, or through a small business alliance, to support the proposed retention/expansion policy currently included in the Community Benefits Program list.

Equitable Transit Commitments

- Require increased investment in Transportation Demand Management measures that seek to attain the goals before assessing penalties for non-attainment.
- Include an explicit commitment to engage in regional transit integration plans to expand equitable access to Moffett Park including: Metropolitan Transportation Commission (MTC) Connected Network Plan, Valley Transportation Authority's Visionary Network, and an MTC-convened regional initiative laying the groundwork for a regional funding measures for public transportation.
- Adjust the MPSP to be consistent with MTC's recently adopted Transit Oriented Communities Policy, wherever relevant.

Community Participation

- Include public participation in developing and implementing the administrative guidelines and expected value of contributions for the Community Benefits Program.
- Provide the Sunnyvale community an ongoing role as equity stakeholders in the Collaborative Entity for Infrastructure, the Transportation Management Authority, and the Community Benefits Program's community benefits guidelines and contributions.

> **Response S.1:** The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

T. Wickham, Kristel (February 10, 2023)

Comment T.1: Two suggested items: 1) add something to the plan that would somewhat synchronize the building of housing with other uses like office. Since the plan will cover multiple decades the office space could get built much faster than housing without safeguards.

> **Response T.1:** The comment does not identify any specific CEQA issues or inadequacies of the Draft EIR; therefore, no further response is required.

Comment T.2: 2) with significant and unavoidable GHG impacts and construction over decades it would be good to address/encourage low carbon construction materials and use of zero emission construction equipment. Although these are not yet mandated, the requirement for 85% GHG reduction by 2045 will necessitate many changes such as these. Meanwhile, cost and availability of these materials and methods will continue to improve.

Response T.2: The project's construction-related greenhouse gas (GHG) impact is discussed on page 162 of the Draft EIR and concluded to be less than significant. For this reason, no mitigation (such as the suggestion above for low carbon construction materials and use of zero emission construction equipment) is required. The Specific Plan does include Policy 10.3.3-2, described on pages 68 and 69 in Section 3.3 Air Quality of the Draft EIR, which identifies use of zero emission construction equipment by future development if needed to reduce significant construction criteria air pollutant emissions.

The state's goal to reduce anthropogenic GHG emissions by 85 percent below the 1990 levels by the year 2045 and achieve net zero GHG emissions by 2045 pursuant to Assembly Bill 1279 is described on page 156 of the Draft EIR. The current GHG operational threshold for plan-level projects per the Bay Area Air Quality Management District (BAAQMD) is meeting state goals (or being consistent with a qualified greenhouse gas reduction strategy). The analysis of the project's ability to meet state goals is provided on pages 162 through 165 of the Draft EIR and explains how achieving carbon neutrality will rely on multiple factors outside of the City's control, including future state regulations and technologies and changes to human behavior. As discussed in the Draft EIR, the Specific Plan includes an adaptive requirement that requires the Specific Plan policies and implementing measures be updated on a regular basis to measure progress and incorporate new measures to progress towards achieving carbon neutrality (see requirement 10.6 on page 164 of the Draft EIR).

SECTION 5.0 DRAFT EIR TEXT REVISIONS

This section contains revisions to the text of the Moffett Park Specific Plan Draft EIR dated December 19, 2022. Revised or new language is underlined. All deletions are shown with a ~~line through the text~~.

Master Edit **ADD** text to all references of the Sunnyvale WPCP salt ponds on figures as follows:

Former salt ponds

Cover **REVISE** the text as follows:

~~File~~ SCH No.: 2021088~~0~~0338

Page vi **ADD** the following text to the first paragraph:

The approximately 1,270-acre Specific Plan area (hereinafter referred to as "Moffett Park") is located in the northernmost portion of the City. Moffett Park is generally bounded by State Route (SR) 237 to the south, Moffett Federal Airfield and a golf course to the west; San Francisco Bay, a former/closed Sunnyvale landfill, Sunnyvale Materials Recovery and Transfer (SMaRT) Station®, Donald M. Somers Water Pollution Control Plant (WPCP), WPCP former salt ponds for wastewater treatment, an open-water pond, and Caribbean Drive to the north; and Caribbean Drive, Twin Creeks Sports Complex, and Baylands Park to the east.

Page vii **REVISE** the first paragraph and **ADD** a bullet as follows:

The EIR includes a detailed discussion of the existing setting, impacts, and Specific Plan policies proposed to protect environmental resources and avoid and/or reduce impacts. The analysis in the EIR concluded that the implementation of the Specific Plan would result in significant and unavoidable impacts from 1) project-level operational criteria air pollutant emissions, ~~and~~ 2) operational greenhouse gas emissions, and 3) potential construction-related impacts from expanding the WPCP to treat cumulative sewage generation. These impacts are identified in the EIR as follows:

- **Impact AIR-1:** The project would conflict with or obstruct implementation of the applicable air quality plan. **(Significant and Unavoidable Impact)**

Page 10 **REVISE** the text in the last column of the (1) MP -O1: Office 1 and (2) MP-O2: Office 2 row in Table 2.3-3 as follows:

(1) MP-O1: Office 1 (2) MP-O2: Office 2	A mix of moderate and high intensity[7] office and R&D uses, with hotels, retail, and other general commercial allowed. Residential uses are not allowed.	• Office • R&D/Flex • Light Industrial • Manufacturing • Retail • General Commercial • Eating/Drinking Establishments • Hospitality • Healthcare • Parks and Open Space	Throughout Moffett Park, totaling 417.5 acres • MP-O1: 225 acres • MP-O2: <u>179</u> ~~189~~ acres

Page 11 **REVISE** the text in the last column of the (7) MP -MU: Mixed Use row in Table 2.3-3 as follows:

(7) MP-MU: Mixed Use	A mix of single use residential or office uses. These areas provide a transition from mixed-use activity centers and residential areas to other land use types in Moffett Park.	• Retail, Restaurants, Entertainment • Museums, Galleries • Residential • Office • R&D • General Commercial • Hospitality • Healthcare • Group Homes • Parks and Open Space	Throughout Moffett Park, totaling <u>146</u>~~136~~ acres

[7] Moderate intensity is defined as office/R&D buildings with an FAR less than 1.0 and buildings less than 75 feet in height. High intensity is defined as office/R&D buildings with a finished floor greater than 75 feet in height.

Page 12 **REVISE** the text in the last column of the (10) P: Public row in Table 2.3-3 as follows:

(1) P: Public	Public open space areas include ponds, channels, and riparian areas adjacent to the East and West Channels.	• Restoration/ wastewater treatment plant ponds • Channels • Riparian areas • Parks and Open Space • Trails • Public/community Facilities	Throughout Moffett Park, 41 acres Note that additional open space would be required in other land use designations, which would result in a total of ~~215 to 240~~ 212 to 230 acres of park and open space areas.

Page 12 **REVISE** the following text in Section 2.3.2 Maximum Building Heights

2.3.2 Maximum Building Heights

The Specific Plan includes maximum building heights allowed for future developments in Moffett Park. The tallest buildings would primarily be allowed in the central and eastern areas of Moffett Park, with maximum building heights ranging from 160 to 275 feet above the ground surface. The maximum building heights in other areas of Moffett Park would be ~~130~~ 145 to 150 feet above the ground surface. The maximum building heights allowed under the Specific Plan are shown on Figure 2.3 2.

Page 12 **ADD** the following text to Section 2.3.3 Neighborhoods:

2.3.3 Neighborhoods

The Specific Plan divides Moffett Park into the following six complete neighborhoods that define future districts: (1) North Java, (2) South Java, (3) Crossman, (4) Chesapeake, (5) West Mathilda, and (6) Discovery. As described in the Specific Plan (which is included in Appendix A), each neighborhood is distinct with a unique mix of land uses to create a complete walkable neighborhood oriented around a centralized public open space and activity center and featuring all the services and necessities needed for daily life within a 15-minute walk or bike ride from places of residence or employment. Moffett Park's complete neighborhoods offer workers, residents, and visitors alike with a range of commercial options, recreational opportunities, and transit within a convenient distance of their place of employment or homes. The neighborhoods are shown on Figure 2.3-3 and a summary of the proposed land uses by neighborhood is provided in Table 2.3-4.

Page 12 **REVISE** the heading and discussion for Section 2.3.4 as follows:

2.3.4 Transportation~~Streets~~ Network

The proposed street network for Moffett Park would consist of existing streets (public and private) and new streets for vehicles and/or people who would walk or bike in Moffett Park. The proposed street network is shown on Figure 2.3-4. The proposed street network includes four street typologies: anchor streets, crosstown connectors, neighborhood streets, and laneways. The location and alignment of new streets may be adjusted to meet specific requirements of future development projects as they occur subject to City approval and dependent on site and property conditions. All the street typologies would accommodate pedestrians and bicyclists.

The proposed street network would include pedestrian facilities on every street. Pedestrian facilities include crosswalks, protected crossings, prioritize crossings, sidewalks, lighting, and curbside drop off and loading areas. The proposed bicycle network includes several east-west and north-south connections that are supplemented by additional internal bikeways. The proposed bicycle network is shown on Figure 2.3-4a. Several bicycle enhancements are proposed at key crossings, which are notated with letters A through H on Figure 2.3-4a. The enhancements considered as part of the Specific Plan are two crossings at East Channel shown as "D" and "E" on Figure 2.3-4a. Future bicycle enhancements would be subject to subsequent environmental review when proposed and designed. Chapter 7 of the Specific Plan includes more details about the mobility network, including bicycle and pedestrian networks, for Moffett Park.

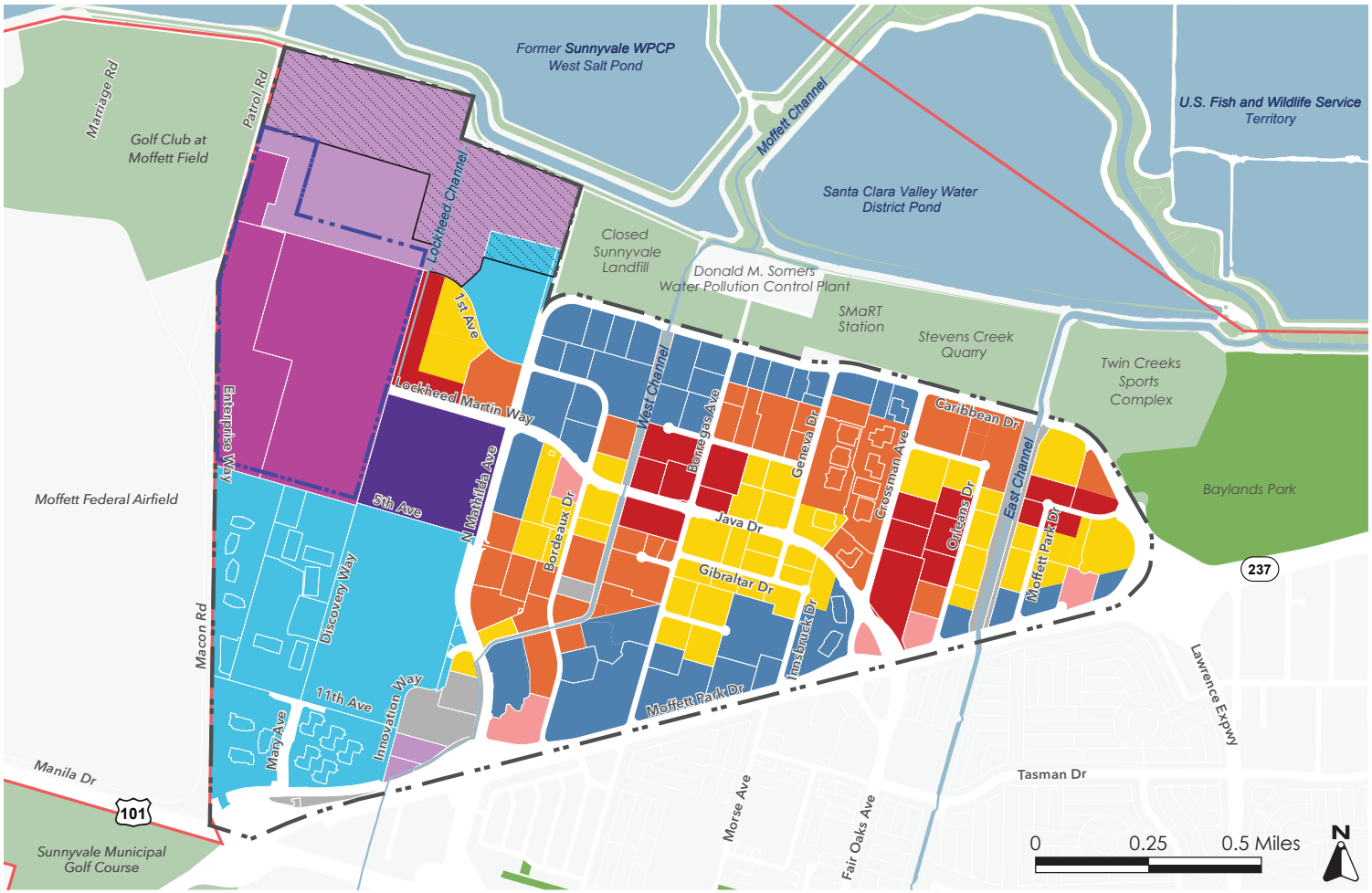
To reduce the overall number of vehicle trips in Moffett Park, there would be a substantial increase in both public and private transit service. Chapter 7.6 of the Specific Plan discusses future transit investments, standards, and guidelines pertaining to the transit network. To optimize transit service in Moffett Park, the Specific Plan identifies the need to reconfigure VTA bus service to better serve increased demand, prioritize light rail on Java Drive and reconfigure pedestrian access to the Java/Borregas light rail station, accommodate an internal circulator, and provide bus layover stations at specified locations. Refer to Chapter 7.6 of the Specific Plan for additional details.

The Specific Plan's Transportation Demand Management (TDM) strategies aim to reduce Single-Occupancy Vehicle (SOV) travel, minimize daily vehicle trips, and shift trips to transit, biking, walking, scooting, or rideshare. A key element of the Moffett Park TDM strategy is parking management, prioritizing a reduction in the overall parking supply while providing well-managed access for people who choose to drive. Parking maximums, unbundling, and shared parking reduce parking demand, minimize the number of vehicle trips, optimize the use of the existing and future parking supply, and support enhanced urban design and placemaking. The approach for parking is anchored by two key concepts: park once and shared parking. The park once concept is where motorist who drive to Moffett Park would park their car and walk, bike, scoot, or take transit to a variety of destinations. Shared parking facilities would be located proximate to key destinations to optimize the use of parking supply, and limit the number of vehicle trips and local congestion. These concepts are described in more detail in the Specific Plan included in Appendix A.

As part of the Specific Plan, a Transportation Management Authority (TMA) would be formed. The TMA would provide a coordinated framework for designing, administering, operating, and marketing transportation services or programs that reduce SOV trips (such as the internal connector). The TMA

would also be responsible for on-going coordination with local transit agencies to maintain frequent service, and implement station area improvements. The Specific Plan has a goal of 50 percent SOV at full buildout (Policy TDMP-2.5).

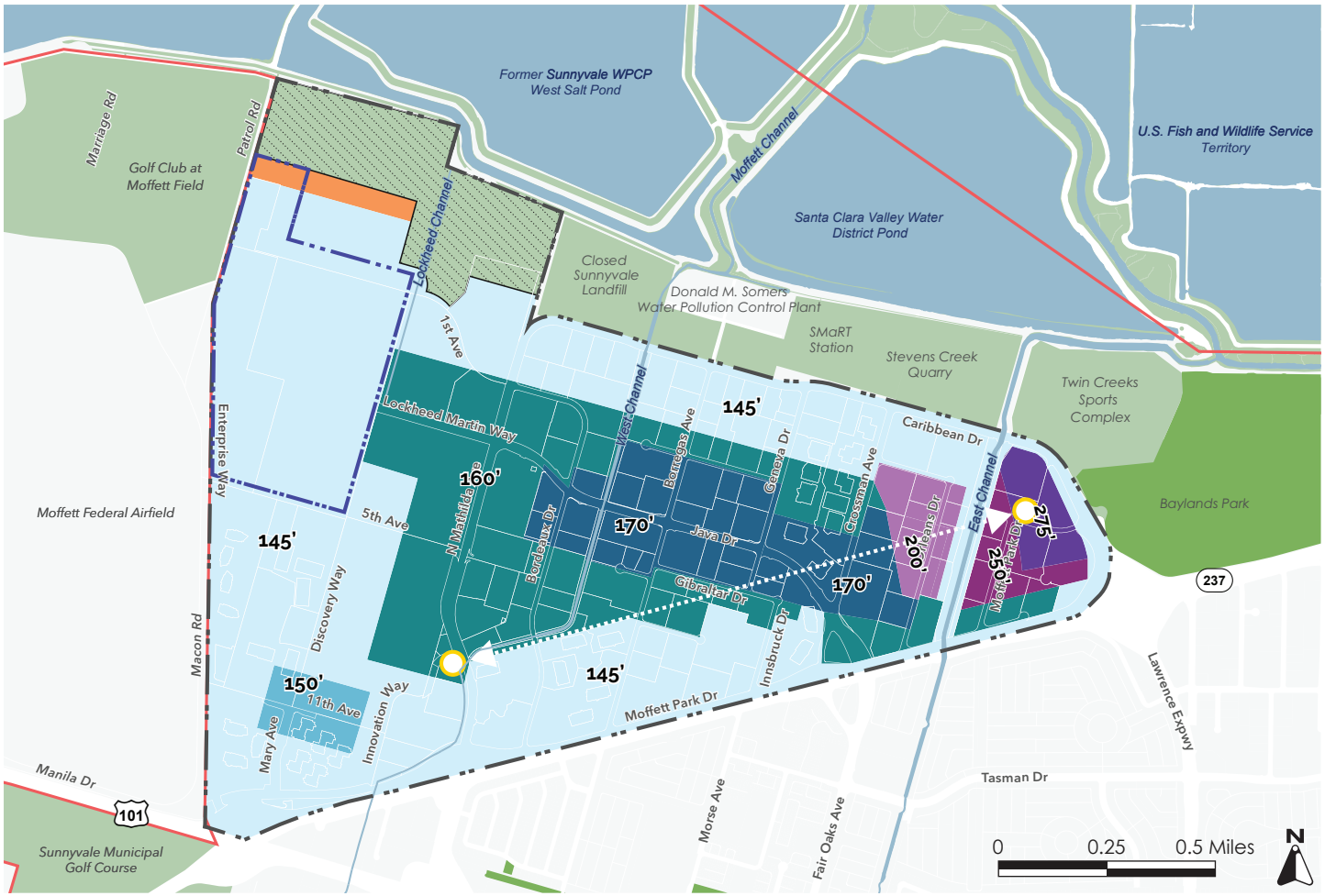
Pages 13-15 **REPLACE** Figure 2.3-1 Proposed Land Use Map, Figure 2.3-2 Maximum Building Heights, and Figure 2.3-3 Neighborhoods Map with the following:



Source: Raimi & Associates, April 2023.

PROPOSED LAND USE MAP

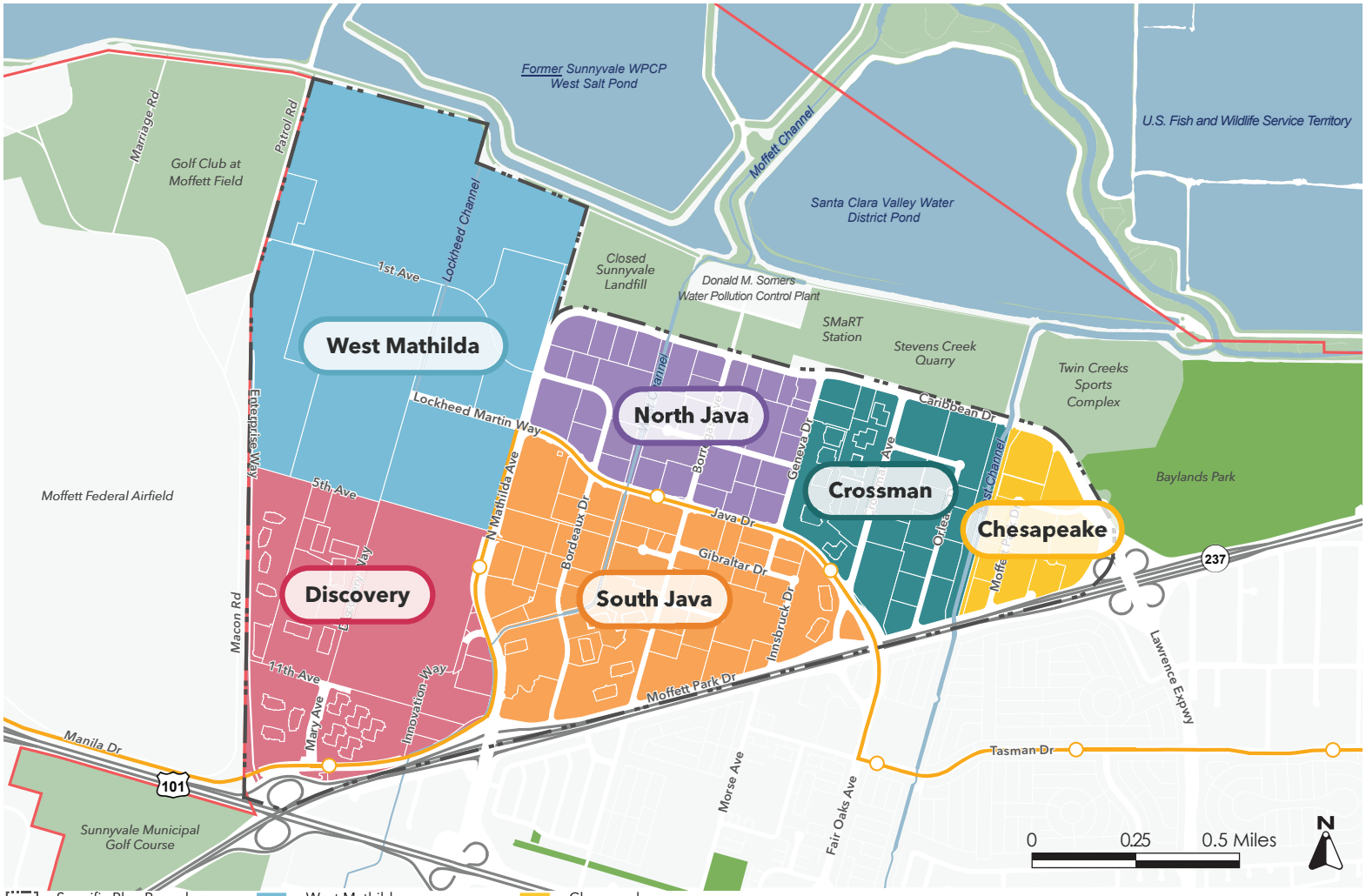
FIGURE 2.3-1



Source: Raimi & Associates, April 2023.

MAXIMUM BUILDING HEIGHTS IN MOFFETT PARK

FIGURE 2.3-2

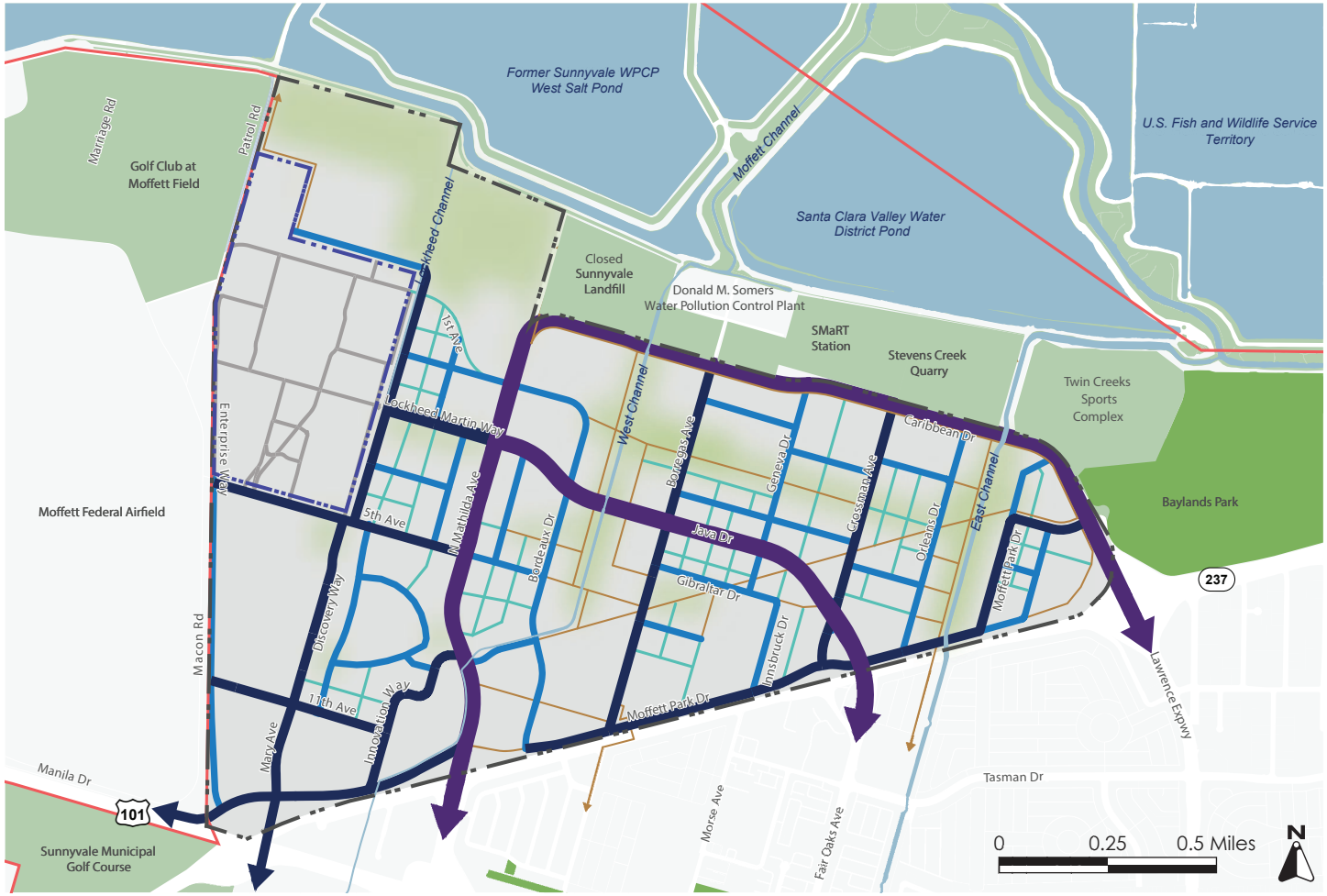


Source: Raimi & Associates, March 2023.

PROPOSED NEIGHBORHOODS MAP

FIGURE 2.3-3

Page 17 **REPLACE** Figure 2.3-4 Street Network with the following:

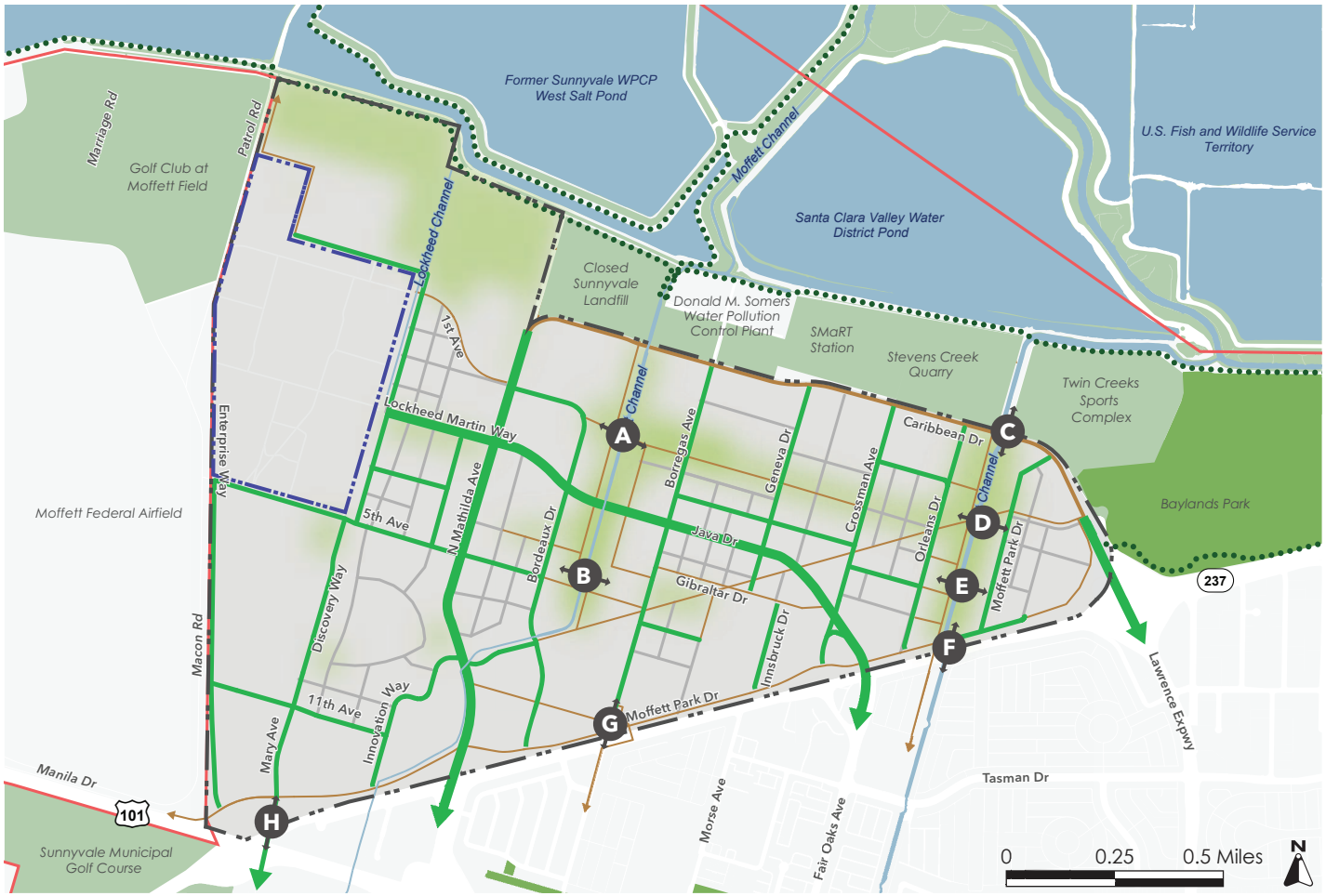


Source: Raimi & Associates, April 2023.

STREET NETWORK

FIGURE 2.3-4

Page 17 **ADD** the following figure after Figure 2.3-4 on page 17:



Source: Raimi & Associates, April 2023.

PROPOSED BICYCLE NETWORK

FIGURE 2.3-4a

Page 18 **ADD** the following text after the first paragraph and before Table 2.3-5:

Per the proposed Specific Plan, the 212 to 230 acres of open space would be realized through a coordinated effort between the City, property owners, and developers, utilizing land dedication or easement dedication by non-residential and residential developments, transfer of development rights, ecological setback standards, the purchase of land using park dedication fee, and maintenance of parks and open spaces by property owners.

Page 22 **ADD** the following text to Specific Plan requirement 10.3.5-1 listed under Special-Status Plants in Table 2.3-6:

- **Requirement 10.3.5-1:** Special Status Plants. At the time development is proposed, focused special status plant surveys shall be completed by a qualified biologist (defined as a person with a minimum of a four-year degree in wildlife sciences, biology, environmental sciences, or equivalent experience in the biological sciences) for alkali milk-vetch and Congdon's tarplant in the grasslands and vernally mesic areas (e.g., areas with a moderate supply of moisture) of Moffett Park's northwestern corner.

Page 23 **ADD** the following text to Specific Plan requirement 10.3.5-2 listed under Burrowing Owl in Table 2.3-6:

- **Requirement 10.3.5-2:** Burrowing Owl Survey. Preconstruction surveys shall be completed by a qualified biologist in areas where burrowing owl habitat occurs such as ruderal lots (not including impervious surfaces). Each preconstruction survey shall consist of two surveys: an initial survey no more than 14 days in advance of the on-set of ground-disturbing activity and a follow-up survey occurring within 24 hours prior to the start of construction. These surveys shall be conducted in accordance with the methods described in the Staff Report on Burrowing Owl Mitigation or the most recent California Department of Fish and Wildlife (CDFW) guidelines at the time development is proposed. The surveys shall cover all areas of suitable burrowing owl habitat within the construction zones.

    - If preconstruction surveys are undertaken during the non-breeding season (September 1 through January 31), any burrows occupied by resident owls in areas planned for construction shall be protected by a construction-free buffer with a radius of 150 to 250 feet around each active burrow, with the required buffer distance to be determined in each case by a qualified biologist with at least two years of experience surveying for burrowing owls. Passive relocation of resident owls is not recommended by the CDFW where it can be avoided. If passive relocation is unavoidable, resident owls may be passively relocated according to a relocation plan prepared by a qualified biologist.

    - If preconstruction surveys are undertaken during the breeding season (February 1 through August 31) and active nest burrows are located within or near construction zones, a construction-free buffer of 250 feet shall be established around all active owl

nests. The buffer areas shall be enclosed with temporary fencing, and construction equipment and workers shall not be allowed to enter the enclosed setback areas. Buffers shall remain in place for the duration of the breeding season. Should construction work be halted or paused for more than one week, new preconstruction surveys shall be prepared meeting the same requirements. After the breeding season (i.e., once all young have left the nest), passive relocation of any remaining owls may take place but only under the conditions described below.

Page 28 **ADD** the following text to the second paragraph of Specific Plan requirement 10.3.5-11 listed under State or Federally Protected Wetlands in Table 2.3-6:

Future development must comply with all state and federal laws and regulations related to disturbance to jurisdictional waters. If it is determined that wetlands within Moffett Park under the USACE's and/or RWQCB's jurisdiction, future project developers would be required to obtain a Section 404 Clean Water Act permit from the USACE, Section 401 water quality certification from the RWQCB, and/or Section 1602 Streambed Alteration Agreement from the CDFW or demonstrate that such permits are not necessary prior to initiating any construction-related activities within jurisdictional waters. Future project developers shall satisfy all agency requirements to mitigate aquatic impacts. These may include avoidance of aquatic resources, measures to minimize impacts, or compensation (e.g., habitat enhancement) for impacts at a minimum of 1:1. Mitigation for the permanent loss of waters of the US and/or state shall be required by either purchasing appropriate mitigation credits from an approved mitigation bank (currently mitigation banks do not exist for this location, but should one become available this would become an option) or via permittee responsible mitigation for which the applicant would need to provide a project-specific Wetland/Riparian Mitigation and Monitoring Plan (MMP) prepared by a qualified wetland restoration ecologist. The MMP would form the basis of the applicants permit package to the USACE, CDFW, and/or RWQCB and shall also be submitted to the City of Sunnyvale for review and approval. At a minimum this plan shall include:

- A description of the impacted water;
- A map depicting the location of the mitigation site(s) and a description of existing site conditions;
- A detailed description of the mitigation design that includes: (i) the location of the created wetlands; (ii) proposed construction schedule; (iii) a planting/vegetation plan; (iv) specific monitoring metrics, and objective performance and success criteria, such as delineation of created area as jurisdictional waters using USACE published methods; and (v) contingency measures if the created wetlands do not achieve the specified success criteria; and
- Short-term and long-term management and monitoring methods.

Page 31 **ADD** the following text to Specific Plan requirement 10.3.1-2 listed under Contaminated Groundwater, Soil, and Soil Vapor in Table 2.3-6:

- **10.3.1-2:** Site Management Plan. At properties with known or suspected minor environmental impacts that can be addressed safely and effectively during subsurface disturbance activities, a Site Management Plan (SMP) shall be prepared prior to development

activities to establish management practices for handling contaminated soil, soil vapor, groundwater, or other materials during construction activities. Subsurface sampling shall be compared to then-current DTSC, Water Board, or U.S. EPA screening levels for the proposed land use and background levels to determine if risk is present. The SMP shall also address management of site risks and previously unknown conditions during earthwork activities in areas where impacted soil, soil vapor, and/or groundwater are present or suspected. Recommendations for elements to be included in site-specific Health and Safety Plans (HSPs), to be prepared by individual contractors for their employees' safety based on their work scope, may also be included in the SMP. Worker training requirements and health and safety shall be described in the SMP. The SMP shall be reviewed and approved by a qualified environmental regulatory agency such as California Department of Toxic Substances Control (DTSC), San Francisco Bay Regional Water Quality Control Board (RWQCB), or Santa Clara County Department of Environmental Health (SCCDEH*)*.

Page 31 **ADD** the following text to the first paragraph of the bullet for Specific Plan requirement 10.3.1-3 listed under Contaminated Groundwater, Soil, and Soil Vapor in Table 2.3-6:

- **10.3.1-3:** Phase II Environmental Site Assessment. At properties with known or suspected environmental impacts that require additional investigation prior to subsurface disturbance activities, a Phase II ESA shall be prepared and implemented prior to development activities to determine the nature and extent of impacts. The Phase II ESA shall be reviewed and approved by a qualified environmental regulatory agency such as DTSC, RWQCB, or SCCDEH. Consideration should be given to obtaining approval for an investigation plan from the oversight agency prior to completing the Phase II investigation. The scope of work shall include soil, groundwater, and/or soil vapor sampling in areas of potential concern to evaluate if site-specific measures are needed to protect the health and safety of property occupants and construction workers. For example, for projects located on land historically used for agricultural, weed abatement, or related activities, the potential for elevated levels of organochlorinated pesticides shall be addressed. For projects located within proximity to SR 237, the potential for ADL contamination shall be addressed. Field techniques that may be employed under include but are not limited to:

Page 31-32 **ADD** the following text to Specific Plan requirement 10.3.1-4 listed under Contaminated Groundwater, Soil, and Soil Vapor in Table 2.3-6:

- **10.3.1-4:** Remediation and/or Management Measures. At properties with known environmental impacts that must be addressed to make the property compatible with its future use, appropriate remediation and/or management measures must be implemented under the oversight and to the satisfaction of a qualified environmental regulatory agency such as DTSC, RWQCB, or SCCDEH. Contaminants are considered adequately remediated if levels are at or below the current DTSC, Water Board, or U.S. EPA cleanup levels or background levels. Remediation techniques may include but are not limited to excavation, extraction, bioremediation, oxidation, reduction, phytoremediation, and thermal treatment.

Management measures may include engineering and administrative controls such as but not limited to impermeable surface caps, vapor intrusion mitigation systems, permeable reactive barriers, land use covenants, and deed restrictions. Field techniques that may be employed under include but are not limited to:

- Excavation, extraction, or removal of impacted material for off-site disposal or temporary on-site storage or treatment;
- Ex-situ (i.e., above-ground) treatment of impacted material via physical and/or chemical processing; and
- In-situ (i.e., below-ground) treatment of impacted material via intrusive physical and/or chemical processing.

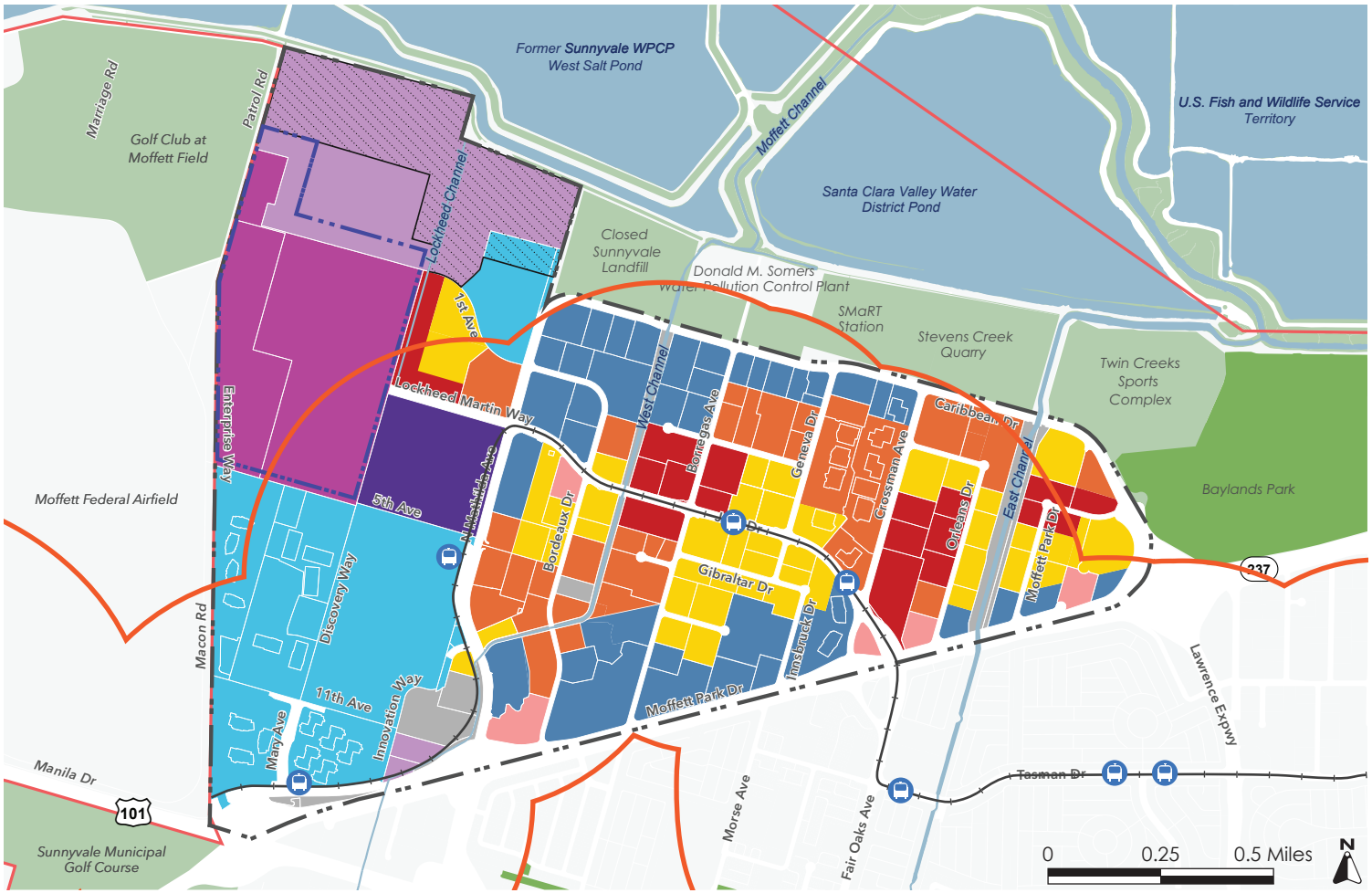
These field techniques include those currently known and used (e.g., dig-and-haul, landfarming, groundwater and soil vapor extraction and treatment, subsurface injection, etc.) and those that will become state of the art in the future. Prior to the issuance of building permits, the applicant shall demonstrate that hazardous materials do not exist on the site or that the proposed construction and use of the site are approved by the environmental oversight agency with jurisdiction that meets the requirements of Health and Safety Code Section 101480.

Page 32 **ADD** the following text in Table 2.3-6 after Requirement 10.3.1-7:

Imported Soils

- **Requirement 10.3.1-8:** Imported Soil Testing. Prior to issuance of building permits, any development project within Moffett Park that includes the importation of soil shall conduct proper sampling to ensure that the imported soil is free of contamination. Imported materials shall be characterized according to the DTSC's 2001 Information Advisory Clean Imported Fill Material.

Page 48 **REPLACE** Figure 3.1-1 Transit Priority Area with the following:



Source: Raimi & Associates, April 2023.

TRANSIT PRIORITY AREA

FIGURE 3.1-1

Page 50 **ADD** the following text before the last sentence on the page:

In addition, the Specific Plan includes the following policy to reduce unnecessary lighting during nighttime.

Proposed Specific Plan Policy:

- **Policy OSE-3.4**: Integrate dark sky policies into site lighting and street light plans.

Consistent with Specific Plan Policy OSE-3.4, future development would comply with the exterior lighting standards described in Section 6.6.9 of the Specific Plan, requiring compliance with the International Dark-Sky Association's Backlight-Uplight-Glare rating system, automatic shutoffs for unnecessary lighting from 10 PM to sunrise, and other requirements. Therefore, implementation of the Specific Plan would not substantially adversely affect day or nighttime views in the area because of new sources of light and glare. **(Less than Significant Impact)**

Page 61 **REVISE** the following text of Impact AIR-1:

Impact AIR-1:	The project would ~~not~~ conflict with or obstruct implementation of the applicable air quality plan**. (~~Less than~~ Significant and Unavoidable Impact)**

Page 71 **ADD** the following bullets at the end of the page:

- Single-occupancy vehicle target of less than 50 percent when feasible

Page 73 **REVISE** the following text in the fourth paragraph and in Table 3.3-6:

The Specific Plan buildout would result in a reduction in operational NO_x emissions. Therefore, operational NO_x emissions would not result in a significant impact to public health. However, Specific Plan buildout would result in a~~n~~ net increase of approximately 190 ~~205~~ tons per year (or 0.52 tons per day) in ROG emissions which is well above the 10 tons per day threshold. To evaluate the Specific Plan's effects on O_3 levels in the region, the operational ROG emissions at buildout were compared to regional emissions that lead to elevated concentrations of O_3 (refer to Table 3.3-6 below).

Table 3.3-6: Comparison of Project Emissions to Air Basin Emissions			
Scenario	**ROG (tons/day)**	**PM_{10} (tons/day)**	**$PM_{2.5}$ (tons/day)**
Bay Area Air Basin in 2020	205	88.6	37.7
Bay Area Air Basin in 2035[1]	203	96.1	39.9
Project Net Operational Emissions in 2035	0.52	0.32	0.08
Percentage of Emissions in Air Basin in 2040	0.25 percent	0.24 percent	0.15 percent

Notes:

[1] CARB emission inventories are reported out to year 2035, which is the closest year of analysis to the proposed operational year of 2040.

Source: Illingworth & Rodkin, Inc. *Moffett Park Specific Plan Air Quality and Greenhouse Gas Report.* November 23, 2022. Page 48.

Page 80 **ADD** the following text to the second sentence of the first paragraph under Impact AIR-C:

The geographic area for consistency with the 2017 CAP and criteria air pollutants is the San Francisco Bay Air Basin. Past, present, and future development projects (including those in the cities of Santa Clara and Mountain View, as well as other projects in the City of Sunnyvale) contribute to the region's adverse air quality impacts on a cumulative basis.

Page 86 **ADD** the following text under Regional and Local heading:

Guidelines and Standards for Land Use Near Streams

To identify streamline permitting for streamside activities, representatives from Valley Water, 15 cities (including the City of Sunnyvale), the County of Santa Clara, business, agriculture streamside property owner and environmental interests formed the Water Resources Protective Collaborative (Collaborative) in 2002. The Collaborative adopted the Guidelines and Standards for Land Use Near Streams, a manual of tools, standards, and procedures to protect streams in Santa Clara County in 2007. The Guidelines and Standards for Land Use Near Streams was developed to address land use activities near streams and to protect surface and groundwater quality and quantity in Santa Clara County. This document includes measures to protect riparian corridors including requirements for native planting, establishing riparian buffers, maximizing distance of lighting from the riparian corridor and avoidance of nighttime lighting, and preserving fish and aquatic wildlife habitat.

As a part of the Collaborative's effort to address land use activities near streams, City of Sunnyvale's Municipal Code Chapter 19.81 requires streamside development review (based on the Collaborative's Guidelines and Standards for Land Use Near Streams) be completed as a part of a building permit plan check process, design review, plan permit, or discretionary review process.

Water Resources Protection Ordinance and Manual

Valley Water's Water Resources Protection Ordinance requires projects to obtain an encroachment permit prior to making modifications on or within a Valley Water facility or easement. Valley Water integrated the Guidelines and Standards for Land Use Near Streams into their permitting process by adopting the Water Resources Protection Manual as a framework for evaluating permit applications and setting permit conditions under the Water Resources Protection Ordinance. The Water Resources Protection Manual includes recommendations to protect riparian corridors such as preserving in and near-stream existing riparian vegetation whose canopies provide shade and nutrients to aquatic wildlife, protecting stream characteristics for suitable fish habitat, avoiding nighttime lighting within riparian corridors, and locating paved areas and active recreational areas outside of riparian corridors.

Page 88 **ADD** the following text to the first paragraph under the Section 3.4.1.2 heading:

Moffett Park is comprised of mostly developed property containing ruderal fields and vegetation, and more natural lands along the Bay to the north. Database searches and field visits were completed to identify the existing habitat and species in Moffett Park and the vicinity. While Moffett Park is approximately 1,270 acres, only approximately 93 acres (or seven percent) of the northwest corner of Moffett Park contains sensitive habitat. The existing habitats and species are discussed below.

Pages 92-93 **ADD** the following text to the first sentence under the Sunnyvale East Channel and Associated Channel heading:

The Sunnyvale East Channel (shown on Figure 3.10-1) is a channelized waterway that feeds into the Bay by way of the eastern branch of Guadalupe Slough into Sunnyvale and appears to be tidally influenced to approximately US 101 to the south.

Page 93 **ADD** the following text to the first sentence under the Sunnyvale West Channel heading:

The Sunnyvale West Channel (shown on Figure 3.10-1) is a channelized waterway that feeds into the Bay by way of the western branch of Guadalupe Slough into Sunnyvale and is tidally influenced to approximately Mathilda Avenue to the south.

Page 101 **ADD** the following text to the title of the figure:

SPECIAL STATUS ANIMALS IN MOFFETT PARK, PER CNDDB

Page 103 **ADD** the following text in the first paragraph under Special Species Project Requirements:

- **10.3.5-1:** Special Status Plants. At the time development is proposed, focused special status plant surveys shall be completed by a qualified biologist (defined as a person with a minimum of a four-year degree in wildlife sciences, biology, environmental sciences, or equivalent experience in the biological sciences) for alkali milk-vetch and Congdon's tarplant in the grasslands and vernally mesic areas (e.g., areas with a moderate supply of moisture) of Moffett Park's northwestern corner.

Page 104 **ADD** the following text in the first paragraph in this discussion:

Future development should be designed and constructed to avoid impacts to special status species. If impacts cannot be avoided, measures shall be implemented to reduce the impacts to a less than significant level. Future development would obtain necessary permits from USFWS and/or CDFW, as appropriate. Potential impacts of future development under the Specific Plan to special status animal species that have the potential to occur or are present within Moffett Park are discussed below.

Page 104 **ADD** the following text in the last paragraph in this discussion:

With the implementation of the proposed Specific Plan Project Requirement 10.3.5-1, future development under the proposed Specific Plan would result in a less than significant impact on special status alkali milk-vetch and Congdon's tarplant by ensuring project design avoids these habitats, or implementing restoration plans. Future development would obtain necessary permits from CDFW, as appropriate. If focused rare plant surveys determine that these species are absent from areas proposed for future development, then there would be no impact to these species. **(Less than Significant Impact)**

Page 105 **ADD** the following text to Specific Plan requirement 10.3.5-2:

- **10.3.5-2:** Burrowing Owl Survey. Preconstruction surveys shall be completed by a qualified biologist in areas where burrowing owl habitat occurs such as ruderal lots (not including impervious surfaces). Each preconstruction survey shall consist of two surveys: an initial survey no more than 14 days in advance of the on-set of ground-disturbing activity and a follow-up survey occurring within 24 hours prior to the start of construction. These surveys shall be conducted in accordance with the methods described in the Staff Report on Burrowing Owl Mitigation or the most recent California Department of Fish and Wildlife (CDFW) guidelines at the time development is proposed. The surveys shall cover all areas of suitable burrowing owl habitat within the construction zones.

    - If preconstruction surveys are undertaken during the non-breeding season (September 1 through January 31), any burrows occupied by resident owls in areas planned for

construction shall be protected by a construction-free buffer with a radius of 150 to 250 feet around each active burrow, with the required buffer distance to be determined in each case by a qualified biologist with at least two years of experience surveying for burrowing owls. Passive relocation of resident owls is not recommended by the CDFW where it can be avoided. If passive relocation is unavoidable, resident owls may be passively relocated according to a relocation plan prepared by a qualified biologist.

- If preconstruction surveys are undertaken during the breeding season (February 1 through August 31) and active nest burrows are located within or near construction zones, a construction-free buffer of 250 feet shall be established around all active owl nests. The buffer areas shall be enclosed with temporary fencing, and construction equipment and workers shall not be allowed to enter the enclosed setback areas. Buffers shall remain in place for the duration of the breeding season. Should construction work be halted or paused for more than one week, new preconstruction surveys shall be prepared meeting the same requirements. After the breeding season (i.e., once all young have left the nest), passive relocation of any remaining owls may take place but only under the conditions described below.

Page 113 **ADD** the following text after the Raptor Perches bullet:

Future development adjacent to riparian habitat or waterways would also be subject to the Guidelines and Standards for Land Use Near Streams, City Municipal Code Chapter 19.81 Streamside Development Review, and Water Resources Protection Ordinance, as applicable.

Page 113 **ADD** the following text to the second paragraph of Specific Plan requirement 10.3.5-11:

Future development must comply with all state and federal laws and regulations related to disturbance to jurisdictional waters. If it is determined that wetlands within Moffett Park under the USACE's and/or RWQCB's jurisdiction, future project developers would be required to obtain a Section 404 Clean Water Act permit from the USACE, Section 401 water quality certification from the RWQCB, and/or Section 1602 Streambed Alteration Agreement from the CDFW or demonstrate that such permits are not necessary prior to initiating any construction-related activities within jurisdictional waters. Future project developers shall satisfy all agency requirements to mitigate aquatic impacts. These may include avoidance of aquatic resources, measures to minimize impacts, or compensation (e.g., habitat enhancement) for impacts at a minimum of 1:1. Mitigation for the permanent loss of waters of the US and/or state shall be required by either purchasing appropriate mitigation credits from an approved mitigation bank (currently mitigation banks do not exist for this location, but should one become available this would become an option) or via permittee responsible mitigation for which the applicant would need to provide a project-specific Wetland/Riparian Mitigation and Monitoring Plan (MMP) prepared by a qualified wetland restoration ecologist. The MMP would form the basis of the applicants permit package to the USACE, CDFW, and/or

RWQCB and shall also be submitted to the City of Sunnyvale for review and approval. At a minimum this plan shall include:

- A description of the impacted water;
- A map depicting the location of the mitigation site(s) and a description of existing site conditions;
- A detailed description of the mitigation design that includes: (i) the location of the created wetlands; (ii) proposed construction schedule; (iii) a planting/vegetation plan; (iv) specific monitoring metrics, and objective performance and success criteria, such as delineation of created area as jurisdictional waters using USACE published methods; and (v) contingency measures if the created wetlands do not achieve the specified success criteria; and
- Short-term and long-term management and monitoring methods.

Page 116 **ADD** the following text before the paragraph above Impact BIO-5:

In addition, the proposed Specific Plan includes Policy OSE-3.4 requiring future development in Moffett Park to integrate dark sky policies into site lighting and street light plans. Future development would comply with the exterior lighting standards described in Section 6.6.9 of the Specific Plan, requiring compliance with the International Dark-Sky Association's Backlight-Uplight-Glare rating system, diversion of lighting from habitat areas, automatic shutoffs for unnecessary lighting from 10 PM to sunrise, and light temperature requirements.

Page 116 **REVISE** the following text to the paragraph above Impact BIO-5:

With the implementation and compliance of the above proposed Specific Plan standards and guidelines for bird-safe design and lighting and Specific Plan Policy OSE-3.4~~and City's Bird Safe Design Guidelines~~, future development in Moffett Park would not result in significant impacts to the movement of resident or migratory birds. **(Less than Significant Impact)**

Page 116 **ADD** the following text before the first paragraph under Impact BIO-5:

Future development adjacent to waterways would comply with the Guidelines and Standards for Land Use Near Streams and the City Municipal Code Chapter 19.81 Streamside Development Review. In addition, if future development would result in modifications within Valley Water property or easements, an encroachment permit would be required from Valley Water and subject to the Water Resources Protection Ordinance.

Page 129 **REVISE** the text under Impact CUL-3 as follows:

As discussed in Section 3.5.1.2 and under Impact CUL-2 above, there is potential for buried archaeological resources to be disturbed during construction or demolition. Future development implementing the Specific Plan would comply with the Specific Plan Project Requirement~~s~~ 10.3.2-5 identified under Impact CUL-2 ~~(Requirements 10.3.2-1 through 10.3.2-5)~~ to protect archaeological

resources and human remains if discovered. Therefore, future development would result in less than significant impacts. **(Less than Significant Impact)**

Page 129 **ADD** the following text to the Impact CUL-C statement:

Impact CUL-C:	The project would <u>not</u> result in a cumulatively considerable contribution to a cumulatively significant cultural resources impact. **(Less than Significant Cumulative Impact)**

Page 137 **ADD** the following text to the Impact EN-1 statement:

Impact EN-1:	The project would not result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation. **(Less than Significant <u>Impact</u>)**

Page 138 **ADD** the following text to row B in Table 3.6-1:

B. Specific Plan Buildout <u>(2040)</u>	254,483,320	1,939,560	20,254,020

Page 139 **REVISE** the last sentence of the second paragraph as follows:

Given Moffett Park's accessibility to existing transit, the Specific Plan's proposed mix of uses (i.e., jobs, housing, and services), the Specific Plan's multi-modal transportation network, and Specific Plan policies TDMP-2.1 through ~~2.4~~2.5 (which require implementation of a TDM program), multi-modal transportation options and alternatives to SOV trips would reduce gasoline consumption.

Page 139 **REVISE** the paragraph under Impact EN-2 as follows:

Future development under the Specific Plan would obtain electricity from SVCE, which is 100 percent GHG-emission free energy from renewable and hydroelectric sources, consistent with the state's RPS program and SB 350.[8] In addition, future projects under the Specific Plan would meet or exceed state mandated Title 24 energy efficiency, CALGreen, and Sunnyvale Green Building standards given future projects would comply with Specific Plan policies DS-4.1, DS-4.8, ~~DS-5.5~~ DS-5.4, and IU.5-1 through IU-5.4 pertaining to energy efficiency. Future development would also comply with the City's Reach Code requirements. In addition, as discussed in Section 3.8

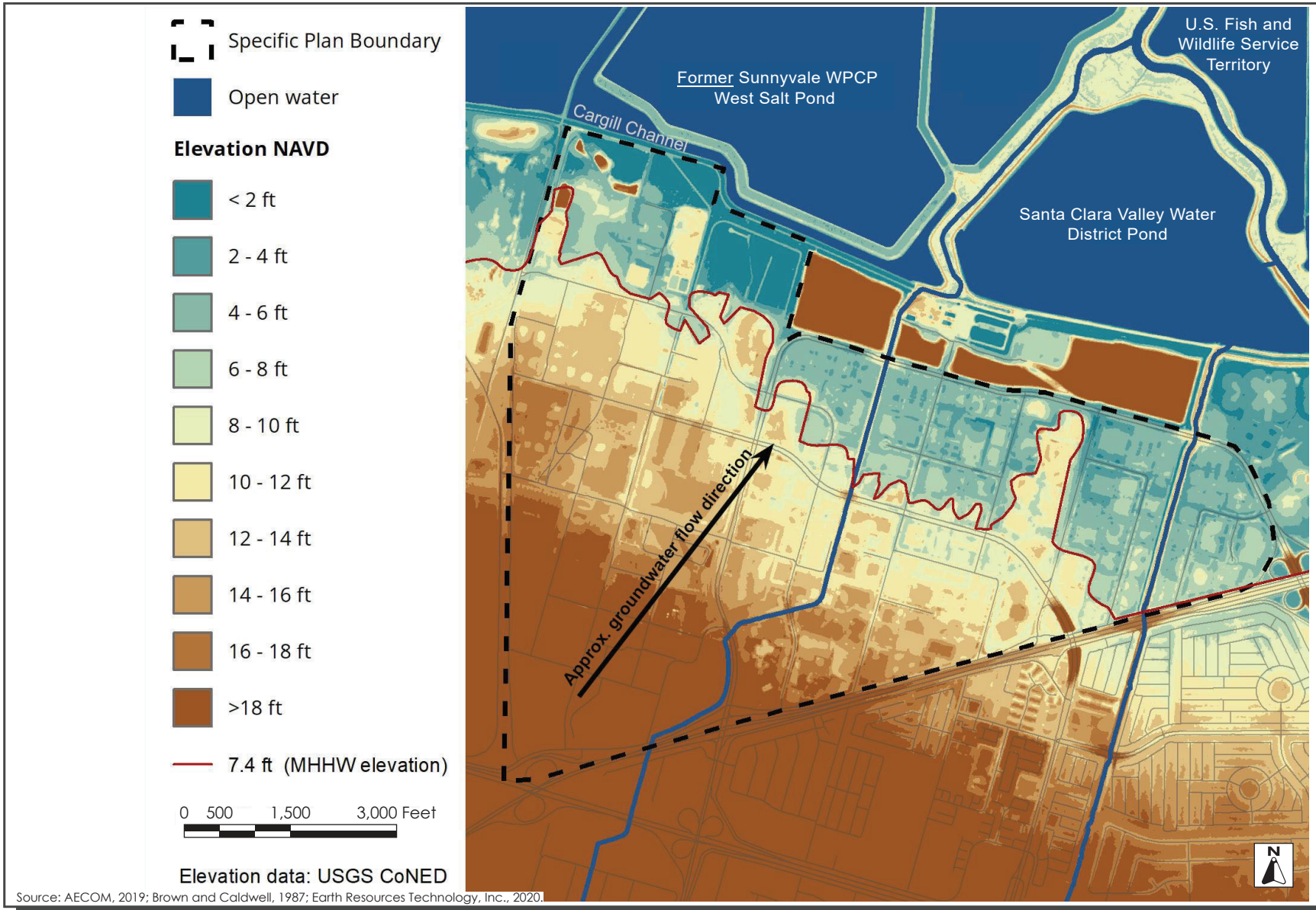
[8] SVCE is the default electricity provider in the City. Building occupants/owners need to voluntarily opt-out of SVCE in order to obtain electricity directly from PGE.

Greenhouse Gas, future development would be consistent with the City's Climate Action Playbook. Therefore, buildout of the Specific Plan would not obstruct a state or local plan for renewable energy or energy efficiency. **(Less than Significant Impact)**

Page 145 **REVISE** the last sentence of the first paragraph under the Groundwater and Subsidence heading as follows:

Local groundwater currently provides 40 percent of the ~~Bay Area~~Santa Clara County's water supply.

Page 146 **REPLACE** Figure 3.7-1 Topography of Moffett Park with the following:



Source: AECOM, 2019; Brown and Caldwell, 1987; Earth Resources Technology, Inc., 2020.

TOPOGRAPHY OF MOFFETT PARK

FIGURE 3.7-1

Page 148 **ADD** the following text to the last sentence in the paragraph under the Lateral Spreading heading:

The former salt ponds are located approximately 1,000 feet north of Moffett Park.

Pages 165-166 **ADD** the following text to the paragraph before the Impact GHG-2 statement:

However, some of the future non-residential buildings may include natural gas appliances and plumbing in accordance with exceptions in the Reach Code; therefore, future projects that include natural gas appliances or natural gas plumbing would result in a significant project-level impact. As acknowledged by the Reach Code, it is not feasible to prohibit all future non-residential developments under the Specific Plan from using natural gas. Mitigation for future development that results in a significant GHG impact could include the purchase of carbon offset credits or compliance with a qualified GHG reduction strategy. **(Significant and Unavoidable Impact)**

Page 167 **ADD** the following text to the fifth row for Play 3.2 of Table 3.8-3:

3.2	Increase transportation options and support shared mobility	**Consistent.** As required by TDMP-2.2, future projects under the Specific Plan shall implement TDM plans to promote alternatives to single-occupancy vehicle trips (per Specific Plan Policy TDMP-2.5~~X~~, in Section 3.3 Air Quality). Required TDM measures include unbundled parking, carpool/vanpool parking, bicycle parking along with on-site showers and lockers. Other TDM measures could include pre-tax transportation benefits (including employer contributions to transit and bike benefit programs), shared biking programs, and shuttle service. Future projects would be designed to accommodate for rideshare services.

Page 183 **ADD** the following text at the end of the first paragraph under Site History and Current Uses heading:

It is possible that abandoned agricultural wells could occur in Moffett Park.

Page 184 **ADD** the following text to point 4:

4. **Sunnyvale Naval Industrial Reserve Ordnance Plant** (see APN 110-02-015 on Figure 3.9 5.) (GeoTracker database listing number T0608576849), case open – remediation as of June 12, 2018. Groundwater contamination has been identified in the area and is undergoing remediation by Lockheed Missiles and Space Company under the oversight of the San Francisco Bay RQWCB. This facility is located in the same area as the Lockheed Sunnyvale – Plant One Facility. In January 2020, the Water Board issued concurrence with the Final Proposed Plan for groundwater remediation. The purpose of the plan is to conduct remedial

action consisting of in-situ bioremediation and chemical reduction, in addition to groundwater monitoring and land use controls.

According to the Navy, it is coordinating review of the Record of Decision (ROD) by the RQWCB. The ROD, once approved by the RQWCB, documents the selected remedy for groundwater remediation, which would satisfy the requirements of the Comprehensive Environmental Response Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and (to the extent practicable) the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). In addition, a cleanup plan is being developed to remediate soil and soil vapor at the NIROP site. Once the final plan is approved, it is expected a remedy of land use controls would run with the land, with the potential for additional cleanup measures such as soil removal and soil vapor mitigations in the event the site is redeveloped.[9]

Page 183 **ADD** the following text before the Regulatory Database Search heading:

In addition, California banned lead as a fuel additive in 1992. Tailpipe emissions from automobiles using leaded gasoline (prior to the ban) contained lead and resulted in aerially deposited lead (ADL) being deposited in and along roadways throughout the state. As a result, sites within Moffett Park closest to SR 237 may contain ADL.

Page 190 **ADD** the following text to Specific Plan requirement 10.3.1-2:

- **10.3.1-2:** Site Management Plan. At properties with known or suspected minor environmental impacts that can be addressed safely and effectively during subsurface disturbance activities, a Site Management Plan (SMP) shall be prepared prior to development activities to establish management practices for handling contaminated soil, soil vapor, groundwater, or other materials during construction activities. Subsurface sampling shall be compared to then-current DTSC, Water Board, or U.S. EPA screening levels for the proposed land use and background levels to determine if risk is present. The SMP shall also address management of site risks and previously unknown conditions during earthwork activities in areas where impacted soil, soil vapor, and/or groundwater are present or suspected. Recommendations for elements to be included in site-specific Health and Safety Plans (HSPs), to be prepared by individual contractors for their employees' safety based on their work scope, may also be included in the SMP. Worker training requirements and health and safety shall be described in the SMP. The SMP shall be reviewed and approved by a qualified environmental regulatory agency such as California Department of Toxic Substances Control (DTSC), San Francisco Bay Regional Water Quality Control Board (RWQCB), or Santa Clara County Department of Environmental Health (SCCDEH*).*

[9] United States Department of the Navy. *Draft EIR Moffett Park Specific Plan, File No. 2021080338.* February 9, 2023.

Page 190 **ADD** the following text to the first paragraph of the bullet for Specific Plan requirement 10.3.1-3:

- **10.3.1-3:** Phase II Environmental Site Assessment. At properties with known or suspected environmental impacts that require additional investigation prior to subsurface disturbance activities, a Phase II ESA shall be prepared and implemented prior to development activities to determine the nature and extent of impacts. The Phase II ESA shall be reviewed and approved by a qualified environmental regulatory agency such as DTSC, RWQCB, or SCCDEH. Consideration should be given to obtaining approval for an investigation plan from the oversight agency prior to completing the Phase II investigation. The scope of work shall include soil, groundwater, and/or soil vapor sampling in areas of potential concern to evaluate if site-specific measures are needed to protect the health and safety of property occupants and construction workers. For example, for projects located on land historically used for agricultural, weed abatement, or related activities, the potential for elevated levels of organochlorinated pesticides shall be addressed. For projects located within proximity to SR 237, the potential for ADL contamination shall be addressed. Field techniques that may be employed under include but are not limited to:

Page 191 **ADD** the following text to the last paragraph on the page:

Future development in compliance with existing regulations and policies (including the above Specific Plan Project Requirements) would reduce impacts from on-site soil, soil vapor, and/or groundwater contamination by requiring sampling for contaminants, proper handling of hazardous materials contamination, and remediation of contamination under regulatory agency oversight. If project sites proposed for development have met the Specific Plan requirements 10.3.1-1 through 10.3.1-5 above through previous environmental work, additional work may not be required unless previously unknown conditions are encountered. It is assumed that sites under regulatory oversight would comply with oversight agency requirements. **(Less than Significant Impact)**

Page 191 **ADD** the following text to Specific Plan requirement 10.3.1-4:

- **10.3.1-4:** Remediation and/or Management Measures. At properties with known environmental impacts that must be addressed to make the property compatible with its future use, appropriate remediation and/or management measures must be implemented under the oversight and to the satisfaction of a qualified environmental regulatory agency such as DTSC, RWQCB, or SCCDEH. Contaminants are considered adequately remediated if levels are at or below the current DTSC, Water Board, or U.S. EPA cleanup levels or background levels. Remediation techniques may include but are not limited to excavation, extraction, bioremediation, oxidation, reduction, phytoremediation, and thermal treatment. Management measures may include engineering and administrative controls such as but not limited to impermeable surface caps, vapor intrusion mitigation systems, permeable reactive barriers, land use covenants, and deed restrictions. Field techniques that may be employed under include but are not limited to:

- Excavation, extraction, or removal of impacted material for off-site disposal or temporary on-site storage or treatment;
- Ex-situ (i.e., above-ground) treatment of impacted material via physical and/or chemical processing; and
- In-situ (i.e., below-ground) treatment of impacted material via intrusive physical and/or chemical processing.

These field techniques include those currently known and used (e.g., dig-and-haul, landfarming, groundwater and soil vapor extraction and treatment, subsurface injection, etc.) and those that will become state of the art in the future. Prior to the issuance of building permits, the applicant shall demonstrate that hazardous materials do not exist on the site or that the proposed construction and use of the site are approved by the environmental oversight agency with jurisdiction that meets the requirements of Health and Safety Code Section 101480.

Page 192 **ADD** the following text after the last paragraph under the Asbestos-Containing Materials heading, before the discussion of Impact HAZ-3:

Imported Soils

Future development projects could require the importation of soil (e.g., to backfill excavated areas and/or balance a site). Without proper sampling of imported soils, hazardous materials could be introduced and cause unacceptable exposure of humans and the environment to contaminated soils. Future development projects would comply with the following Specific Plan requirements to ensure imported soil used in Moffett Park is free of contamination. **(Less than Significant Impact)**

Hazards and Hazardous Materials Project Requirement:

- **10.3.1-8:** Imported Soil Testing. Prior to issuance of building permits, any development project within Moffett Park that includes the importation of soil shall conduct proper sampling to ensure that the imported soil is free of contamination. Imported materials shall be characterized according to the DTSC's 2001 Information Advisory Clean Imported Fill Material.

Page 198 **REVISE** the text under the Water Resources Protection Ordinance and District Well Ordinance as follows:

Water Resources Protection Ordinance and District Well Ordinance

~~Valley Water operates as the flood control agency for Santa Clara County. Their stewardship also includes creek restoration, pollution prevention efforts, and groundwater recharge. Permits for well construction and destruction work, most exploratory boring for groundwater exploration, and projects within Valley Water property or easements are required under Valley Water's Water Resources Protection Ordinance and District Well Ordinance.~~ Valley Water operates as the flood protection agency for Santa Clara County. Valley Water also provides stream stewardship and is the wholesale water supplier throughout the county, which includes the groundwater recharge program. In accordance with Valley Water's Water Resources Protection Ordinance, any work within Valley Water's fee title right of way or easement or work that impacts Valley Water facilities requires the issuance of a Valley Water permit. Under Valley Water's Well Ordinance 90-1, permits are required for any boring, drilling, deepening, refurbishing, or destroying a water well, cathodic protection well, observation well, monitoring well, exploratory boring (45 feet or deeper), or other deep excavation that intersects the groundwater aquifers of Santa Clara County. Abandoned wells encountered during construction are required to be properly destroyed per Well Ordinance 90-1.

Water Resources Protective Collaborative Guidelines for Land Use Near Streams

The Collaborative adopted Guidelines and Standards for Land Use Near Streams: A Manual of Tools, Standards, and Procedures to Protect Streams in Santa Clara County in 2007. The Guidelines and Standards were developed to address land use activities near streams and to protect surface and groundwater quality and quantity in Santa Clara County.

As a part of the Collaborative's effort to address land use activities near streams, City of Sunnyvale's Municipal Code Chapter 19.81 requires streamside development review (based on the Collaborative's Guidelines and Standards for Land Use Near Streams) to be completed as a part of a building permit plan check process, design review, plan permit, or discretionary review process.

Page 201 **ADD** the following text at the end of the first paragraph under Groundwater:

It is possible that abandoned wells could occur in Moffett Park given its agricultural history.

Page 202 **ADD** the following footnote to the third sentence of the first full paragraph on the page:

The depth of groundwater can vary seasonally, and can be influenced by underground drainage patterns, regional fluctuations, and other factors (including sea-level rise). The San Francisco Bay RWQCB's Geotracker database includes groundwater quality data and the depth to the groundwater table data collected from monitoring wells within Moffett Park. Based on the data collected at 26 monitoring wells, from 2005 to 2021, the depth to groundwater levels (at the highest groundwater table elevations) in Moffett Park mostly ranges from three to nine feet below the ground surface (at

20 monitoring wells) with shallow aquifers being about five to 20 feet thick.[10] In the Santa Clara subbasin, shallow aquifer zones are generally within 150 feet of ground surface, while deeper aquifer zones generally occur at depths below 150 feet.[11]

Page 202 **REVISE** the text of the last sentence of the first full paragraph and **ADD** text to the end of the paragraph on the page as follows:

A map of the approximate groundwater elevation ~~depth~~ in Moffett Park is shown on Figure 3.10-2. Figure 3.10-2a shows the estimated depth to water in Moffett Park, based on an interpolation between measured values in the Geotracker database.

Page 202 **ADD** the following footnote at the end of the last paragraph before the Storm Drainage System:

Studies completed to assess the influence of tides on groundwater elevations at the shallowest aquifers generally conclude that tidal influence was not measurable at the locations monitored. Due to geologic conditions within Moffett Park (clay layers with low hydraulic conductivity), the rate of groundwater flow is several orders of magnitude slower than tides. Therefore, tidal influence is not evident in Moffett Park's groundwater table. The presence of the former salt evaporation ponds to the north of Moffett Park may further prevent tidal influence on the groundwater table inland of the ponds (e.g., Moffett Park).[12]

Page 202 **ADD** the following text to the first paragraph under the Storm Drainage System heading:

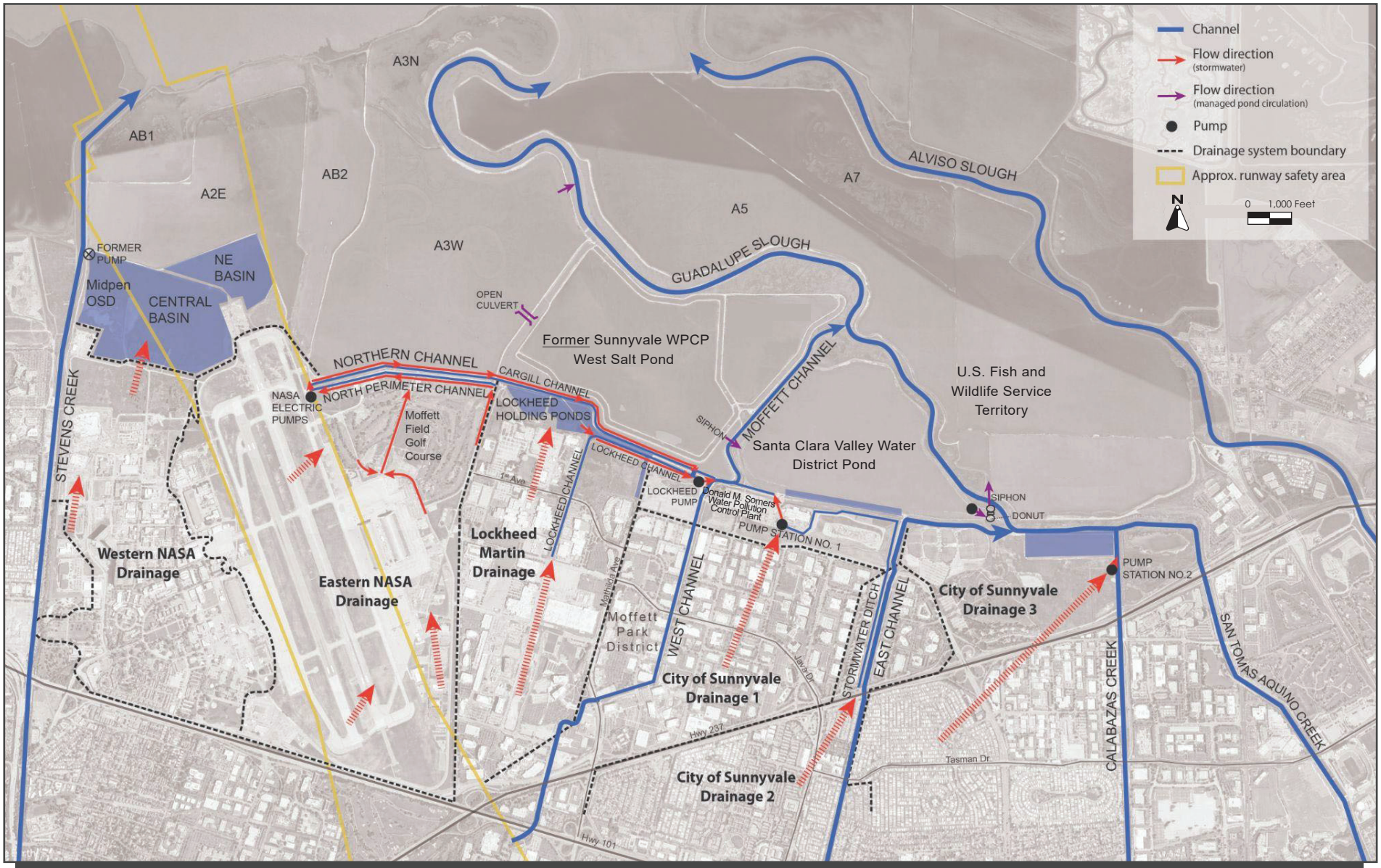
Most of Moffett Park consists of impervious surfaces (e.g., paved parking lots and buildings). Stormwater runoff from impervious surfaces within Moffett Park is collected by the City's stormwater system and by a private storm drainage system located generally west of Mathilda Avenue that does not flow to the City's system. Moffett Park is located in an area where catchments drain to hardened channels (e.g., Lockheed Martin, Sunnyvale West Channel and Sunnyvale East Channels and/or tidal areas (e.g., San Francisco Bay) as described below.[13] Per Valley Water, the West and East Channels were designed for an approximate 10-year storm event and were constructed with a combination of concrete box culverts, concrete lining, sack concrete slope protection, rock slope protection, or earth lined trapezoidal shaped channels where the most downstream sections

[10] San Francisco Estuary Institute, ESA, and pathways Climate Institute. *Sea-level rise impacts on shallow groundwater in Moffett Park: A technical addendum to the Moffett Park Specific Plan.* November 2021. Page 6.
[11] Santa Clara Valley Water District. *2021 Groundwater Management Plan*. November 2021. Page 49.
[12] San Francisco Estuary Institute, ESA, and pathways Climate Institute. *Sea-level rise impacts on shallow groundwater in Moffett Park: A technical addendum to the Moffett Park Specific Plan.* November 2021. Page 17.
[13] Santa Clara Urban Runoff Pollution Prevention Program. *Hydromodification Management Plan Applicability Map*. Accessed June 5, 2022. https://scvurppp.org/hmp-maps/.
- Appendix E, Hydromodification Management Requirements

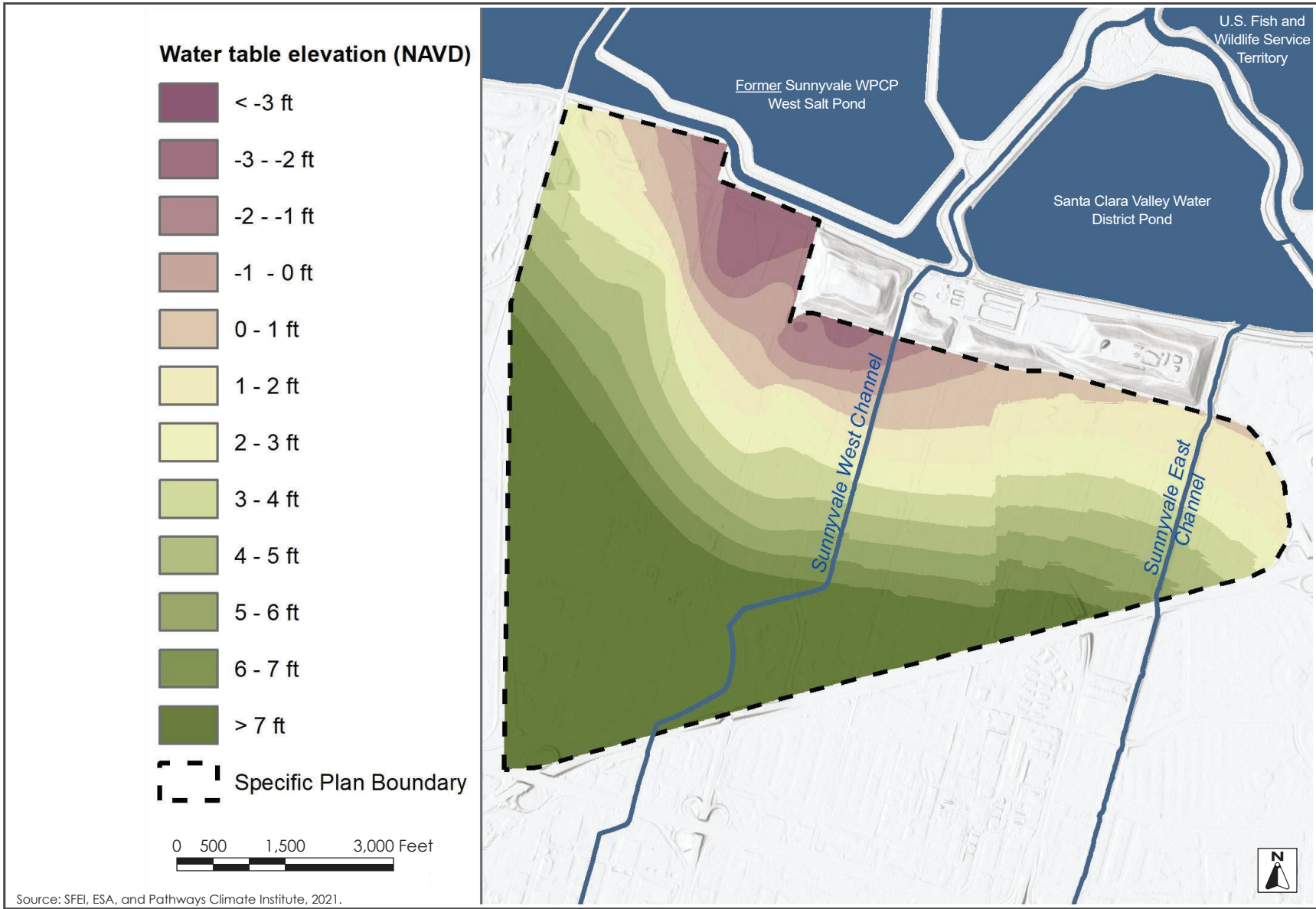
included earthen levees.[14] Based on the Santa Clara Valley Urban Runoff's Hydromodification Management Applicability Map for Sunnyvale, Moffett Park is not subject to the MRP's hydromodification management control requirements.

Pages 203-204 **REPLACE** Figure 3.10-1 Drainage System in Moffett Park and Figure 3.10-2 Groundwater Elevations in Moffett Park with the following:

[14] Valley Water. *Moffett Park Specific Plan Drive Environmental Impact Report (DEIR).* February 10, 2022.



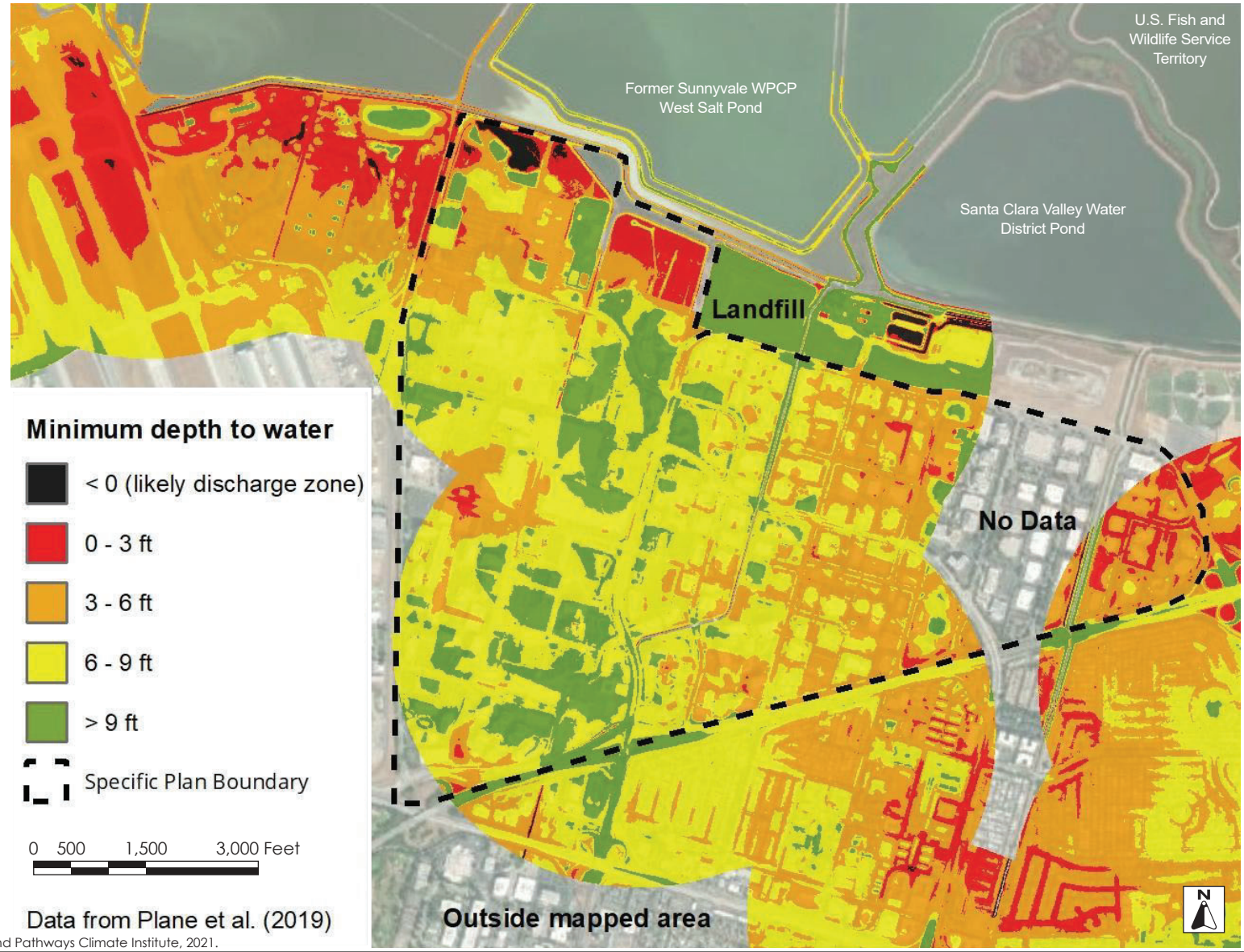
DRAINAGE SYSTEM IN MOFFETT PARK | FIGURE 3.10-1



Source: SFEI, ESA, and Pathways Climate Institute, 2021.

~~GROUNDWATER DEPTH IN MOFFETT PARK~~GROUNDWATER ELEVATIONS IN MOFFETT PARK | FIGURE 3.10-2

Page 204 **ADD** the Figure 3.10-2a after Figure 3.10-2 on page 204:



Source: SFEI, ESA, and Pathways Climate Institute, 2021.

ESTIMATED DEPTH TO WATER PER GEOTRACKER DATABASE

FIGURE 3.10-2a

Page 206 **ADD** the following text to the end of the first paragraph:

Areas designated within Zone X, which is not a SFHA, may be subject to increased flooding in the future, due to sea level rise or changes that affect levees which currently protect these areas.

Page 206 **REVISE** text of the second paragraph as follows:

According to Valley Water, the cause of high-water levels on Sunnyvale East and West Channels could stem from multiple factors, including backwater flows from San Tomas Aquino and Calabazas Creeks, coastal flood events, high flows on the creeks themselves and higher roughness in the channel. Flooding could potentially occur from a combination of one or more of these factors.[15] ~~The Sunnyvale East and West Channels are at risk of flooding due to several factors: (1) insufficient conveyance capacity for discharge from the channels' watersheds; (2) backwater flows from Calabazas and San Tomas Aquino Creeks during 100-year discharge in these creeks, and (3) elevated bay water levels.~~[16] Modeling conducted for FEMA's flood insurance study map for the City of Sunnyvale indicate that flooding from the channels would occur for a 100-year storm event. Generally, the flood risks are larger in the downstream reaches of the drainage channel, where the 100-year water surface elevation is due to the combination of water levels in the Bay, backwater flow from Calabazas and San Tomas Aquino Creeks, and large runoff volumes from the watershed.

Page 206 **ADD** the following text to the first bullet point:

- South San Francisco Bay Shoreline Phase III Feasibility Study – undertaken by the USACE, Valley Water, and the California Coastal Conservancy that is evaluating the feasibility of implementing levee improvements and habitat restoration that would benefit Moffett Park. The design and construction of improvements is unknown at this time. The Shoreline Phase III Feasibility Study will determine the feasibility of implementing various options to protect the low-lying areas along the Santa Clara County shoreline at risk to coastal flooding and sea-level rise, as well as identify opportunities for environmental restoration and expanded public access to San Francisco Bay. The outcome of the Shoreline Phase III Feasibility Study must determine that there is a positive benefit to cost ratio of building coastal flood protection in the study area in order for the project to move forward with design and construction. After the completion of the feasibility study, the project must compete nationally for congressional funding. The project partners, including the City of Sunnyvale, will work together throughout the feasibility study and beyond in order to build appropriate shoreline protection. At this time, the feasibility study has not commenced.

[15] Valley Water. *Moffett Park Specific Plan Draft Environmental Impact Report.* February 10, 2023.
[16] ESA and SFEI. *Sunnyvale Sea-Level Rise Adaptation Strategy: Background.* November 2020. Pages 19-20.

Page 209 **ADD** the following text after the second paragraph as follows:

In addition, the improper destruction of wells could affect the groundwater quality and potable water supply. Groundwater wells (including abandoned wells that were sealed prior the adoption of Valley Water's Well Ordinance 90-1) shall be properly destroyed in accordance with Valley Water's Well Ordinance 90-1 to reduce impacts to the groundwater supplies.

Page 210 **REVISE** the text of the third sentence of the first paragraph under Impact HYD-3 as follows:

The implementation of the Specific Plan would add ~~215 to 240~~ 212 to 230 acres of park and open space areas.

Page 214 **ADD** the following text to the first paragraph under Section 3.10.3:

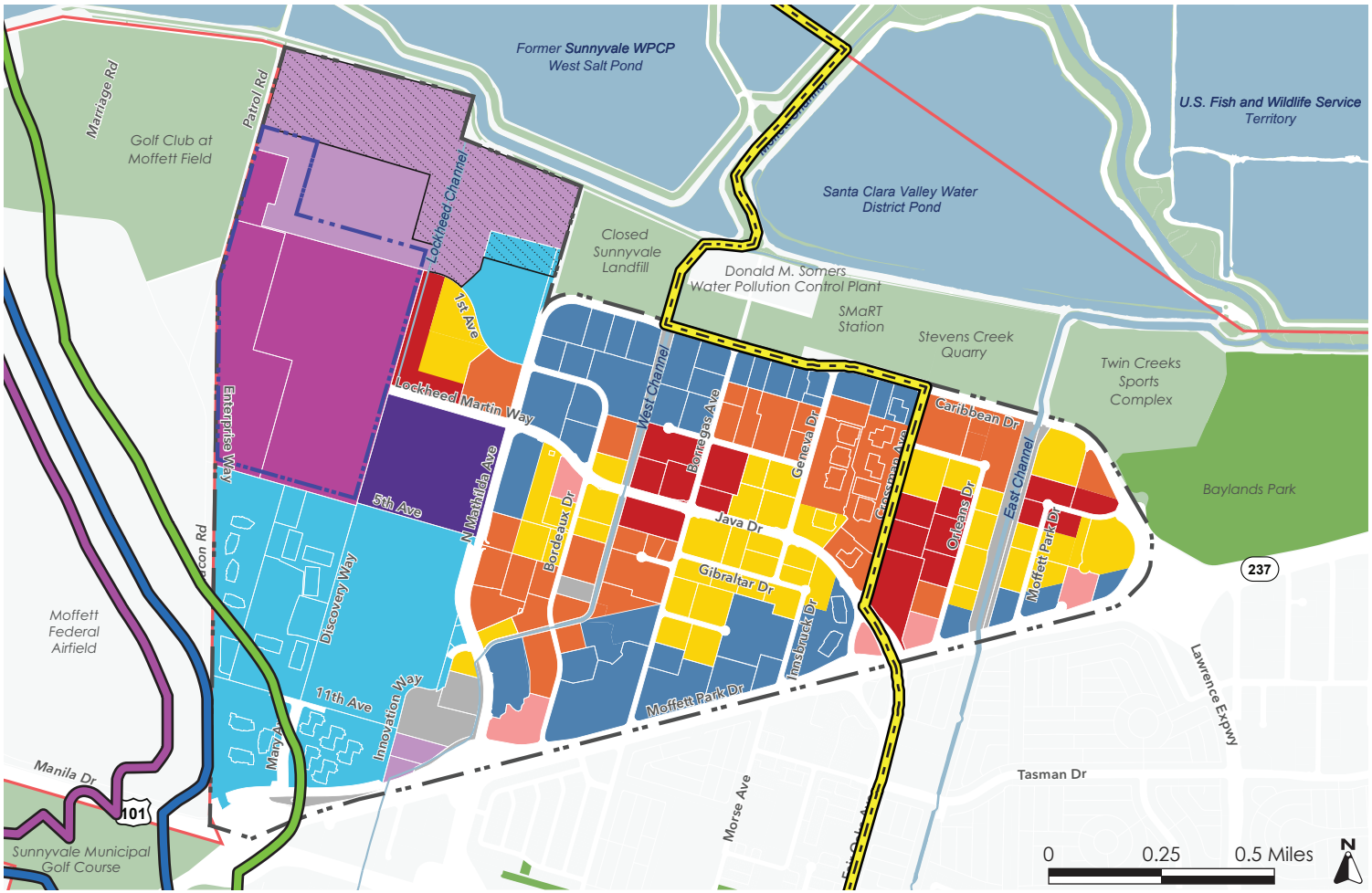
Per *California Building Industry Association v. Bay Area Air Quality Management District,* 62 Cal. 4th 369 *(BIA v. BAAQMD)*, effects of the environment on a project or Specific Plan are not considered CEQA impacts. The following discussion on the effects of flooding and sea-level rise is included for informational purposes only.

Future development shall comply with existing regulations, including NFIP and Sunnyvale Municipal Code Chapter 16.62, to avoid and/or minimize effects of flooding by implementing measures such as elevating the lowest floor to or above the base flood elevation, using construction materials and utility equipment resistant to flood damage, and anchoring new construction to prevent flotation, collapse or lateral movement of the structure.

Page 214 **REVISE** the first bullet as follows:

- Adding fill to the site and/or r~~R~~aising the finished floor elevation for ~~non-residential~~ buildings by one foot, which would provide additional accommodation for higher floodwaters due to sea-level rise,

Page 254 **REPLACE** Figure 3.13 5 Moffett Federal Airfield Noise Levels at Proposed Land Uses with the following:



Source: Raimi & Associates, April 2023.

MOFFETT FEDERAL AIRFIELD NOISE LEVELS AT MOFFETT PARK | FIGURE 3.13-5

Page 257 **ADD** the following text to the first paragraph under the Existing Conditions heading:

The City of Sunnyvale Housing Element and related land use policies were last updated in December 2014. In 2019, the City had an approximate population of 155,567 residents and 94,849 employees in 2019. The City had an average of 2.69 persons per household.[17] As a result, the City's existing (2019) jobs to housing ratio is 1.64 jobs per household. ~~As of January 1, 2022, the City of Sunnyvale had an approximate population of 156,234 with an average of 2.62 persons per household, and total household number of 62,491.[18]~~

Page 259 **REVISE** Table 3.14-2 and **ADD** text below Table 3.14-2 as follows:

Table 3.14-2: Projected Growth Citywide			
	Households	**Residents/ Population**	**Jobs/Employees**
A. General Plan Buildout	82,122	197,785~~203,985~~	121,689~~43,856~~
B. Net Increase from Proposed Specific Plan	20,000	42,000	26,954
Total (A+B)	102,122	239,785~~245,985~~	148,643~~70,810~~
2040 Projected Citywide Growth	84,170	222,210	108,640

Buildout of the City's adopted General Plan would result in a jobs to housing ratio of 1.48. Combined with the net growth from the proposed project, the projected citywide jobs to housing ratio would be 1.45.

Page 269 **REVISE** the text in the first paragraph under the Parks and Open Space heading as follows:

Parks and open space in the City are managed by the Department of Public Works Parks Division. The City currently has approximately 772~~765~~ acres of parkland[19], including approximately 185~~177~~ acres of park, 264 acres of special use facilities, 87 acres of school open space, three acres of public grounds (including orchards and open space surrounding the Community Center and Civic Center

[17] Sources: 1) Strategic Economics. *Moffett Park Specific Plan Fiscal Impact Analysis Results.* October 4, 2022. and 2) California Department of Finance. "E-5 Population and Housing Estimates for Cities, Counties, and the State, 2011-2020 with 2010 Census Benchmark." May 2022. Accessed March 3, 2023. Available at: https://dof.ca.gov/forecasting/demographics/estimates/estimates-e5-2010-2020/.

[18] ~~California Department of Finance. "E-5 City/County Population and Housing Estimates for Cities, Counties, and the State, January 2021-2022." May 2022. Accessed June 3, 2022. Available at: http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-5/.~~

[19] The City's available parkland is estimated to increase to 778 in 2023.

campuses), and 48 acres of greenbelts and trails. The City's parkland total includes other recreational facilities such as the John W. Christian Greenbelt, a senior center, tennis courts, and a skate park

Page 270 **REVISE** the text in the second paragraph under the Libraries heading as follows:

In 2007, the City of Sunnyvale developed a service ratio goal of one square foot per capita of building space for libraries.[20] Based on the current population (155,567~~156,234~~ persons) and current library size (60,800 square feet), the City of Sunnyvale is providing 0.39 square feet per capita and is not meeting its goals.

Page 274 **ADD** the following text in the second paragraph under Impact PS-4:

SMC Chapter 19.74 establishes a standard of five acres of park for every 1,000 residents and requires new housing projects to either provide the appropriate amount of park space or pay in-lieu fees. Projects that comply with Chapter 19.74 of the Municipal Code are determined by the City to be provide adequate park and recreational facilities to serve its increase in population and not result in substantial deterioration of existing facilities because the recreational demand of project residents would be met by new (as well as existing) recreational facilities. In other words, the provision of new recreational facilities pursuant to Chapter 19.74 of the Municipal Code would offset the project's demand on existing recreational facilities by providing additional and alternative sources of recreation to existing facilities, thereby not resulting in substantial acceleration or physical deterioration of existing facilities.

The Specific Plan would generate approximately 42,000 residents; thus, pursuant to SMC Chapter 19.74, 210 acres of new park space would be required. Any in-lieu fees received from future development projects would be used to fund the construction of new or expanded park or recreation facilities within proximity to Moffett Park for the purpose of serving residents of the project. The proposed 212 to 230~~215 to 240~~ acres of park and open space (which could be developed in the MP-AC and MP-MU land use designations), therefore, would be adequate to serve the increased demand from future residents of the Specific Plan.

Page 275 **ADD** the following text after the bulleted list:

In addition, the City currently has approximately 772 acres of park and open space and 156,234 residents, which results in a ratio of 4.94 acres per resident. The implementation of the Specific Plan would result in approximately 42,000 new residents and at least 212 acres of new park and open space. Under existing conditions with the Specific Plan, the City would have 984 acres of park and open space and 198,234 residents, resulting in a ratio of 4.96 acres of park and open space per

[20] City of Sunnyvale. *Council Report: Sunnyvale Library of the Future Study and Strategy: Facility Scenarios.* April 24, 2022. Page 2.

resident. The project, therefore, would increase the amount of park and open space provided per resident than under existing conditions.

Page 280 **REVISE** the text under the Existing Conditions heading as follows:

Parks and open space in the City are managed by the Department of Public Works Parks Division. The City currently has approximately 772~~773~~ acres of parkland[21], including approximately 185~~177~~ acres of park, 264 acres of special use facilities, 87 acres of school open space, three acres of public grounds (including orchards and open space surrounding the Community Center and Civic Center campuses), and 48 acres of greenbelts and trails. The City's parkland total includes other recreational facilities such as the John W. Christian Greenbelt, a senior center, tennis courts, and a skate park.

Page 280 **REVISE** the text of the second sentence in the paragraph under Sunnyvale Municipal Code as follows:

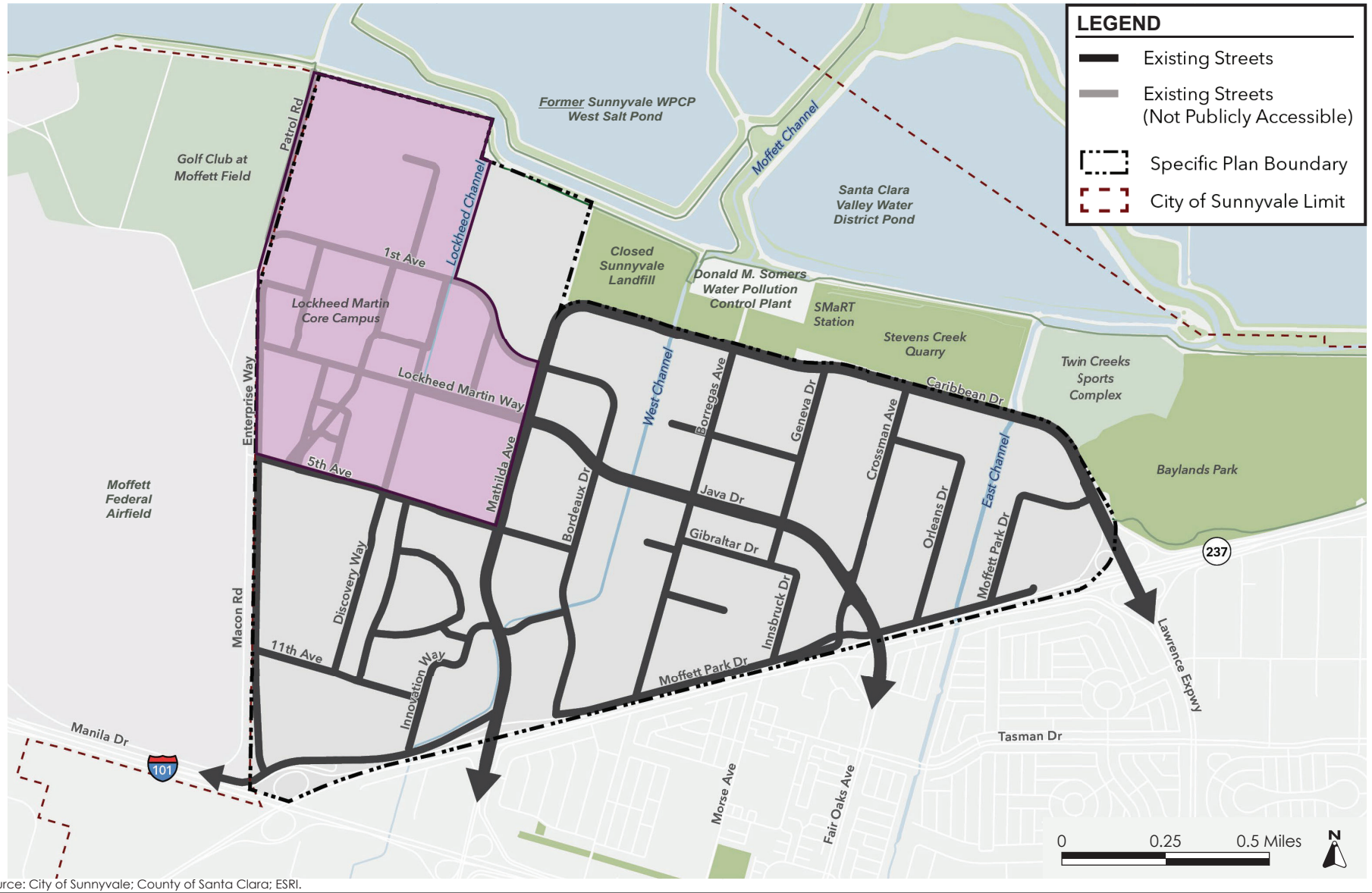
In accordance with the open space and recreation sub-element of the General Plan, development projects must dedicate five~~5.34~~ acres of land to public park and recreational facilities, per each one thousand persons.

Page 281 **ADD** the following text at the end of the last sentence of the first paragraph as follows:

The implementation of the Specific Plan would result in a net increase of approximately 42,000 residents. Future residents (as well as employees) in Moffett Park would increase the use and demand on existing park and recreational facilities. As discussed in Section 2.3 Project Description, the Specific Plan proposes over 200 acres of park and open space that would offset the project's demand on nearby park and recreational facilities. Future development projects would comply with SMC Chapter 19.74 which requires future residential developments to provide ~~5.34~~ five acres of parkland/open space per 1,000 residents. Compliance with the SMC and implementation of Specific Plan policies OSE-2.1 through OSE-2.8 requiring recreational amenities (described under Impact PS-4 in Section 3.15 Public Services) would ensure the development of park and recreational facilities adequately serve residents and substantial physical deterioration of existing park and recreational facilities would not occur or be substantially accelerated. **(Less than Significant Impact)**

Page 288 **REPLACE** Figure 3.17 1 Existing Roadway Network with the following:

[21] The City's available parkland is estimated to increase to 778 in 2023.

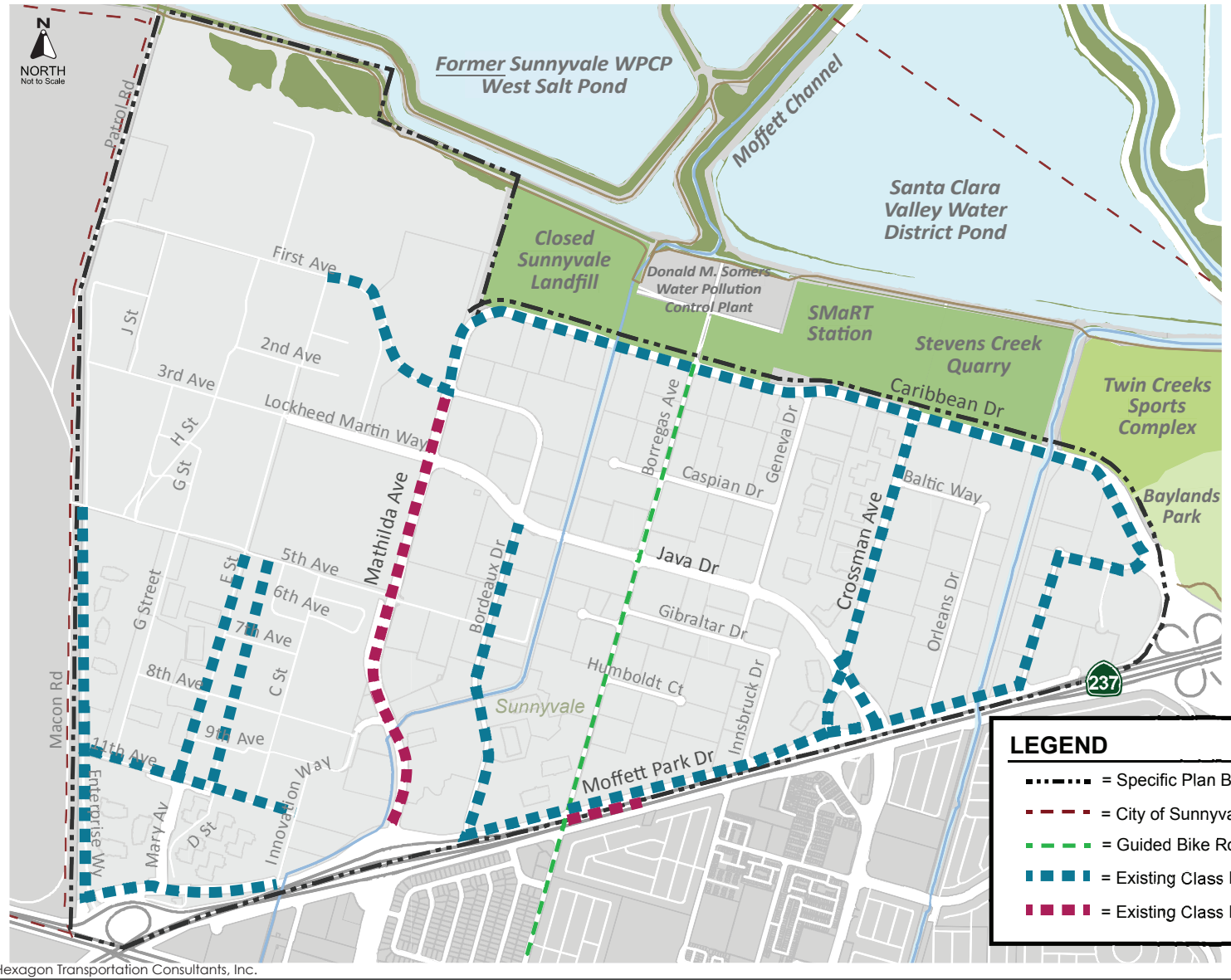


Source: City of Sunnyvale; County of Santa Clara; ESRI.

EXISTING ROADWAY NETWORK

FIGURE 3.17-3

Page 291 **REPLACE** Figure 3.17 2 Existing Bicycle Facilities with the following:



Source: Hexagon Transportation Consultants, Inc.

EXISTING BICYCLE FACILITIES

FIGURE 3.17-2

Page 292 **REVISE** the sentence before the Transit Facilities heading as follows:

The location of the above described missing ~~P~~pedestrian facilities are shown on **Error! Reference source not found.**.[22]

Page 292 **REVISE** the second paragraph under the Transit Facilities heading as follows:

VTA provides commuter light rail service between the cities of Sunnyvale, San José, and Mountain View. Moffett Park is served by the VTA orange line, which runs from Mountain View to Alum Rock in San José, with four stops in Moffett Park along Moffett Park Drive, Mathilda Avenue, and Java Drive. Light rail service is provided with approximately 15-minute~~20-minute~~ headways during weekdays from 5 AM to 12 AM ~~5:30 AM to 12:46 AM the next day~~. Weekend service is provided with approximately 30-minute headways from 6 AM to 12 AM~~5:58 AM to 12:46 AM~~. The orange line, VTA bus routes 56 and 523, and ACE red shuttle all stop at the Lockheed Martin Transit Center, located at Mathilda Avenue and 5th Avenue.

Page 292 **ADD** the following at the end of the page:

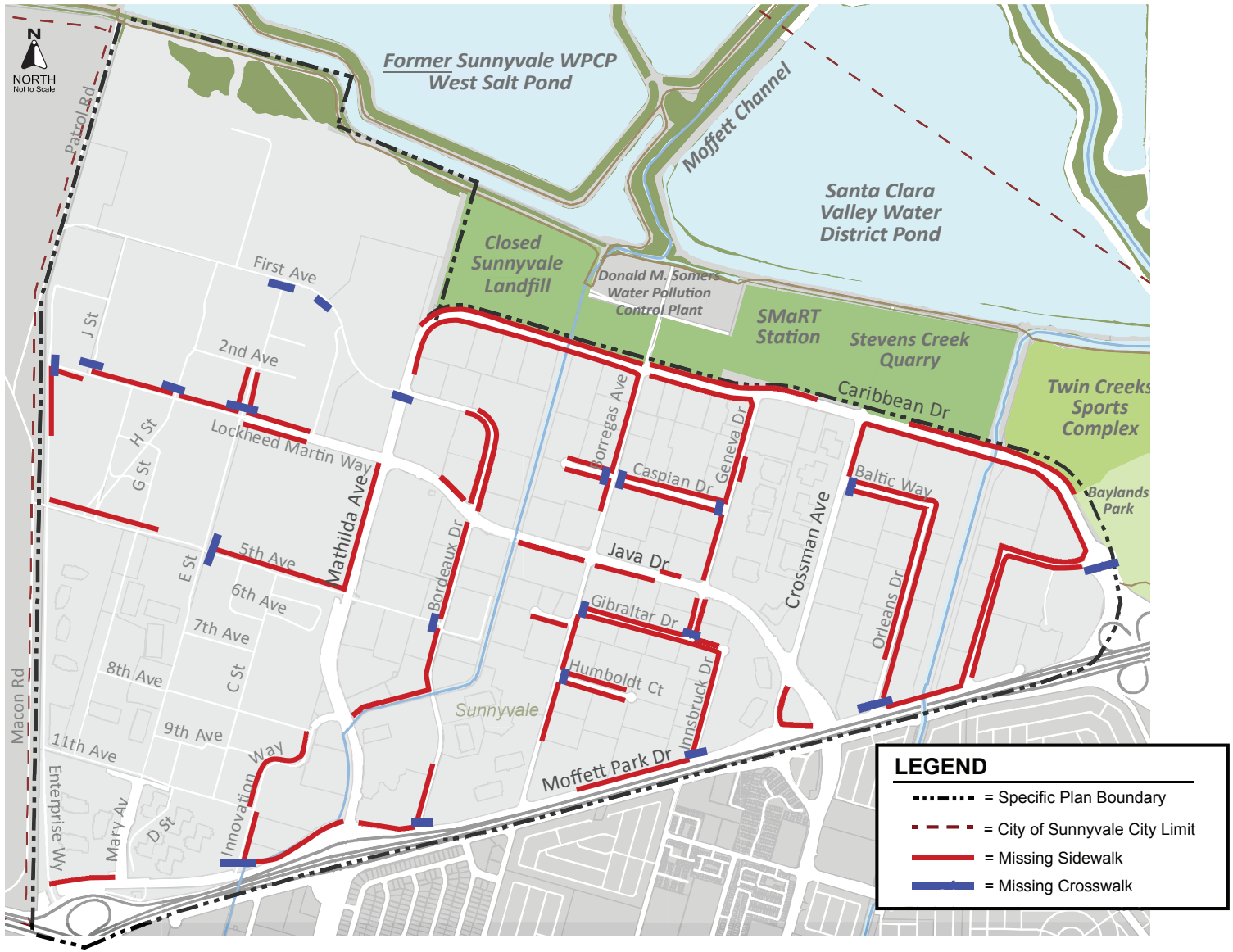
The table below lists the transit options from Moffett Park to local schools.

Transit Options to Local Schools from Moffett Park		
School	**Location**	**Transit Options**
Sunnyvale School District		
Lakewood Elementary School	750 Lakechime Drive	• Local Bus Route 56, approximate 15-minute walk from the nearest stop • VTA LRT Orange Line and transfer to Local Route 55 at Tasman Drive/Reamwood Avenue, approximate seven-minute walk from the nearest stop
Columbia Middle School	739 Morse Avenue	• Local Bus Route 56, approximate 16-minute walk time from the nearest stop
Fremont Union High School District		
Fremont High School	575 West Fremont Avenue	• VTA LRT Orange Line and transfer to Bus Route 523 at Lockheed Martin Transit Center, approximate five-minute walk from the nearest stop
Santa Clara Unified School District		
George Mayne Elementary School	5030 North First Street	• VTA LRT Orange Line and transfer to Bus Route 59 at Old Ironsides station, approximate eight-minute walk time from the nearest stop

[22] Note that Gibraltar Avenue has newly constructed sidewalks along the south side (not shown on the figure).

Transit Options to Local Schools from Moffett Park		
School	**Location**	**Transit Options**
Dolores Huerta Middle School and Kathleen MacDonald High School	3556 and 3588 Zanker Road	• Take VTA LRT Orange Line to Baypointe Station, approximate 19-minute walk from nearest stop

Pages 294-295 **REPLACE** Figure 3.17-3 Location of Mission Pedestrian Facilities and Figure 3.17-4 Existing Transit Facilities with the following:



Source: Hexagon Transportation Consultants, Inc.

LOCATION OF MISSING PEDESTRIAN FACILITIES

FIGURE 3.17-2

Source: Hexagon Transportation Consultants, Inc.

EXISTING TRANSIT FACILITIES

FIGURE 3.17-4

Page 296 **REVISE** the text of the third paragraph under Impact TRN-1 as follows:

The non-driving internal trips would be short trips, assumed to use modes such as walking, biking, or scooters to move around within Moffett Park. These non-driving trips would generate minimal transit demand. Out of 99,828 non-driving external trips, 23~~11~~ percent (or 22,960~~10,981~~, of non-driving trips) would be transit trips. The non-driving external trips would include the use private shuttles (which would be 59~~27~~ percent of non-driving trips)[23] and public transit (23~~11~~ percent of non-driving trips).

Page 297 **REVISE** Table 3.17-2 as follows:

Table 3.17-2: Project Trips and Mode Split at Buildout

Trip Type	Percentage of Total Trips[1]	Estimated Average Daily Number of Trips[2]
Internal (trips within Moffett Park)		
• Driving[3]	0	0
• Non-driving	20	117,444
o *~~Bike/walk is 100 percent of n~~Non-driving includes bike/walk, transit, and internal circulator (117,444 trips)*		
External (entering or leaving Moffett Park)		
Driving	63	369,950
Non-driving	17	99,828
o *Bike/walk is 18~~62~~ percent of non-driving (17,969~~61,893~~ trips)*		
o *Transit is 23~~11~~ percent of non-driving (22,960~~10,981~~ trips)*		
o *Shuttle is 59~~27~~ percent of non-driving[4] (58,899~~26,954~~ trips)*		
Total Trips	**100**	**587,222**

[1] Source: Hexagon Transportation Consultants. *Moffett Park Specific Plan CEQA Transportation Analysis.* June 29, 2022. Page 9.

[2] Ibid.

[3] With district parking, people coming into Moffett Park would need to park once and use other modes of transport (e.g., walking or biking) to complete their activities within Moffett Park; therefore, it is assumed travel within Moffett Park would be achieved via non-driving modes of transportation.

[23] Source: Hexagon Transportation Consultants. *Moffett Park Specific Plan CEQA Transportation Analysis.* June 29, 2022. Page 9.

Table 3.17-2: Project Trips and Mode Split at Buildout		
Trip Type	**Percentage of Total Trips[1]**	**Estimated Average Daily Number of Trips[2]**
[4] The 59~~27~~ percent of non-driving shuttle trips was calculated using existing data about shuttle services provided by existing companies within Moffett Park. There is currently no TDM requirement in place for provision of shuttle services. However, future proposed development projects would implement TDM measures including shuttle-accessibility to the extent practical.		

Page 297 **REVISE** the first sentence of the second paragraph under the Transit Facilities heading as follows:

The addition of the ~~almost 11,000~~ transit trips (see Table 3.17-2~~1~~) from implementation of the project would not occur instantaneously. This number of additional transit riders would occur over time and would be expected at buildout. The City and future development projects would comply with the following Specific Plan mobility policies to support public transit:

Page 298 **ADD** text to the second sentence in the first paragraph as follows:

The implementation of the above Specific Plan policies would improve public transit serving Moffett Park by improving transit convenience, connectivity, and capacity. Additionally, the City would coordinate with the VTA and Moffett Park's Transportation Management Association to develop the necessary transit capacity to accommodate a citywide increase in transit demand, which could include voluntary contributions by development projects to the VTA for transit expansions and enhancements.

Page 308 **REVISE** the source identified at the bottom of Table 3.17-5 as follows:

Source: Hexagon Transportation Consultants. *Moffett Park Specific Plan CEQA Transportation Analysis.* ~~*Moffett Park Specific Plan VMT Analysis.*~~ June 22~~April 29~~, 2022. Page 7.

Page 316 **ADD** the following text after the first bulleted list:

SB 610 and the California Water Code (Section 10912[a]) require a WSA to (1) state whether the water supply needs of the development can be met by the supplies available to the water provider as described in its UWMP and (2) determine if the water provider's available water supplies are capable

of meeting the development's needs during single-dry and multiple-dry water years as described in the UWMP's 20-year projection.

Page 322 **REVISE** the third sentence of the second paragraph under the Groundwater heading as follows:

The City's groundwater safe yield (or pumping capacity) of its operating physical wells is estimated to be 8,000 AFY.[24] In fiscal year 2021 to 2022, the City ~~received~~ pumped 135 AF of groundwater.

Page 330 **ADD** text to the last paragraph as follows:

Implementation of these improvements would increase service pressures throughout Moffett Park to provide reliability under MDD plus fire flow, accommodating future demands in Moffett Park. ~~0~~At the time construction details are known, the City shall complete environmental review and future development projects shall contribute a fee toward improvements (i.e., water connection fee). In addition, at the time of future development, project-specific utility confirmation studies may be required by the City to confirm if additional, minor localized improvements would be required. Based on previous analyses for utility improvements located within existing rights-of-way in developed South Bay locations, the primary environmental effects associated with construction can be mitigated to less than significant levels. Thus, buildout of the Specific Plan would not result in the relocation or expansion of water facilities that would cause significant environmental effects. **(Less than Significant Impact)**

Page 332 **ADD** the following text after Table 3.19-3:

The City's CIP program shall be updated to include the above identified CIPs. The sewer system CIPs are funded through sewer connection fees. Developers are required to pay sewer connection fees prior to development or redevelopment of a property.

Page 334 **ADD** text to the first paragraph on the page as follows:

toward improvements. The sewer system CIPs are funded through the collection of water connection fees. Developers are required to pay the water connection fee prior to development or redevelopment of a property. In addition, at the time of future development, project-specific utility confirmation studies may be required by the City to confirm if additional, minor localized improvements would be required. Based on previous analyses for utility improvements located within existing rights-of-way in developed South Bay locations, the primary environmental effects associated with construction can be mitigated to less than significant levels. Thus, buildout of the Specific Plan would not result in

[24] Schaaf & Wheeler. Draft Water Supply Assessment for the Moffett Park Specific Plan Update (MPSP) Project. September 2022. Appendix J of the Moffett Park Specific Plan Draft EIR.

the relocation or expansion of wastewater and sewer system facilities that would cause significant environmental effects. **(Less than Significant Impact)**

Page 334 **REVISE** the second sentence of the first paragraph under Stormwater Drainage as follows:

The implementation of the Specific Plan would add ~~215 to 240~~ 212 to 230 acres of park and open space areas.

Page 334 **ADD** text to the end of the first paragraph under the Electric Power, Natural Gas, or Telecommunications Facilities heading as follows:

Existing natural gas, electricity, and telecommunications utility infrastructure would continue to serve future development under the Specific Plan. Future development under the Specific Plan would be subject to subsequent environmental review to confirm if all site-specific and project-specific impacts were evaluated in this EIR. In the event additional electrical or telecommunication infrastructure is identified as needed during environmental review for future development, the construction-related impacts would be less than significant in conformance with regulations, including General Plan and Specific Plan policies, identified in Sections 3.3 Air Quality, 3.4 Biological Resources, 3.5 Cultural Resources, 3.7 Geology and Soils, 3.9 Hazards and Hazardous Materials, 3.10 Hydrology and Water Quality, and 3.13 Noise and Vibration. Pursuant to the City's Reach Code, no new residential development would include natural gas use. Exceptions to the Reach Code for natural gas use are limited to uses such as factories, hazardous materials manufacturing, and laboratory facilities, as well as emergency operation centers, and commercial dryers in large hotels. Therefore, for most of the new uses in Moffett Park, new or expanded natural gas infrastructure would not be required.

Page 348 **REVISE** the first paragraph and **ADD** a bullet as follows:

The analysis in the EIR concluded that the implementation of the Specific Plan would result in significant and unavoidable impacts from 1) project-level operational criteria air pollutant emissions, ~~and~~ 2) operational greenhouse gas emissions, and 3) potential construction-related impacts from expanding the WPCP to treat cumulative sewage generation. These impacts are identified as follows:

- **Impact AIR-1:** The project would conflict with or obstruct implementation of the applicable air quality plan. **(Significant and Unavoidable Impact)**

Page 352 **ADD** the following text before the Section 7.3.2 Alternatives Selected heading:

7.3.1.1 *No Residential Alternative*

An alternative to the project with no residential land uses was not evaluated because it did not meet the City's basic objectives of the project, which include providing housing (objective 1, 2, 3) and open space (objectives 6 and 7) which would not be possible without the park impact fees assessed on residential development. For this reason, a No Residential Alternative was not analyzed further.

Page 354 **ADD** the following text after the first paragraph under Section 7.3.2.2 No Project/No New Development Alternative heading:

The City's draft Housing Element identifies a shortage in meeting its Regional Housing Needs Allocation (RHNA) of 4,640 dwelling units. A strategy identified in the draft Housing Element to meet its shortfall is the inclusion of housing in Moffett Park. Under the No Project/No New Development Alternative, the City would need to identify other sites in the City to accommodate 4,640 dwelling units to meet its RHNA shortfall. The corresponding environmental impacts of developing 4,640 dwellings units elsewhere in urban infill locations within the City would result in substantially less environmental impacts than implementation of the proposed project.

Page 356 **ADD** the following text after the second paragraph on the page:

In addition, the City's draft Housing Element identifies a shortage in meeting its Regional Housing Needs Allocation (RHNA) of 4,640 dwelling units. A strategy identified in the draft Housing Element to meet its shortfall is the inclusion of housing in Moffett Park. Under the No Project/Adopted Specific Plan Alternative, the City would need to identify other sites in the City to accommodate 4,640 dwelling units to meet its RHNA shortfall. The corresponding environmental impacts of developing 4,640 dwellings units elsewhere in urban infill locations within the City would result in substantially less environmental impacts than implementation of the proposed project.

Page 357 **ADD** the following text in the second paragraph on the page:

Conclusion

The No Project/Adopted Specific Plan Buildout Alternative would result in lesser aesthetics, air quality, energy, GHG, hazards and hazardous materials, noise, population and housing, public services, recreation, and utilities and services systems impacts. This alternative would avoid the Specific Plan's significant and unavoidable utilities and services impact as the City's wastewater treatment system has capacity for this alternative.

The No Project/~~New Development~~ Adopted Specific Plan Buildout Alternative would result in the same or similar impacts to biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use, and transportation.

The No Project/Adopted Specific Plan Alternative would partially meet Objectives 4, 7 and 8, and would not meet the other five objectives (Objectives 1, 2, 3, 5, or 6).

Page 361 **ADD** text to the last column of the Objective 6 row in Table 7.3-2 as follows:

Table 7.3-2: Comparison of Impacts of the Proposed Specific Plan to Project Alternatives

Impacts	Proposed Project	No Project/No New Development Alternative	No Project/Adopted Specific Plan Buildout Alternative	25 Percent Reduced Development Alternative
• Objective 2		No	No	Yes
• Objective 3		No	No	Yes
• Objective 4		Partially	Partially	Yes
• Objective 5		No	No	Yes
• Objective 6		No	No	Yes, but not to the same extent as the proposed Specific Plan
• Objective 7		No	Partially	Yes
• Objective 8		Partially	Partially	Yes

Notes:
Bold text indicates being environmentally superior to the proposed Specific Plan.
NI = No impact; LTS = Less than significant impact; SU = Significant and unavoidable.

Page 362 **REVISE** the California Department of Finance reference as follows:

California Department of Finance. "E-5 City/County Population and Housing Estimates for Cities, Counties, and the State, 2011-2020 with 2010 Census Benchmark~~January 2021-2022~~." May 2022. Accessed March 3, 2023~~June 3, 2022~~. Available at: http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-5/.

Page 367 **ADD** the following text above the Hexagon Transportation Consultants reference:

Hexagon Transportation Consultants. *Moffett Park Specific Plan CEQA Transportation Analysis.* June 29, 2022. Page 7.

Page 367 **REVISE** the Hexagon Transportation Consultants reference as follows:

---~~Hexagon Transportation Consultants~~. *Moffett Park Specific Plan CEQA Transportation Analysis.* June 29, 2022. Page 9.

Page 369 **ADD** the following text above The King's Academy reference:

Strategic Economics. *Moffett Park Specific Plan Fiscal Impact Analysis Results.* October 4, 2022.

Appendix I **REPLACE** pages 2-10 of Appendix I with the following:

Hexagon Transportation Consultants, Inc.

Memorandum

Date: February 14. 2023

To: Chris Sensenig, Raimi + Associates

From: Huy Tran, T.E.
Ollie Zhou, T.E.

Subject: Moffett Park Specific Plan CEQA Transportation Analysis

Hexagon Transportation Consultants, Inc. has completed a Vehicle-Miles Traveled (VMT) analysis for the proposed Moffett Park Specific Plan (MPSP) project located in Sunnyvale, CA in an area generally bounded by SR 237 to the south, Caribbean Drive to the east and north, and Enterprise Way to the west. As proposed, the buildout of the MPSP project would consist of 20,000 residential units, approximately 27.389 million s.f. of office, 4.602 million s.f. of industrial, 607,209 s.f. of hotel, 558,095 s.f. of retail, and 326,122 s.f. of institutional land uses. The non-residential land uses would total approximately 33.482 million s.f., equating to approximately 95,683 jobs. The project site is shown in Figure 1.

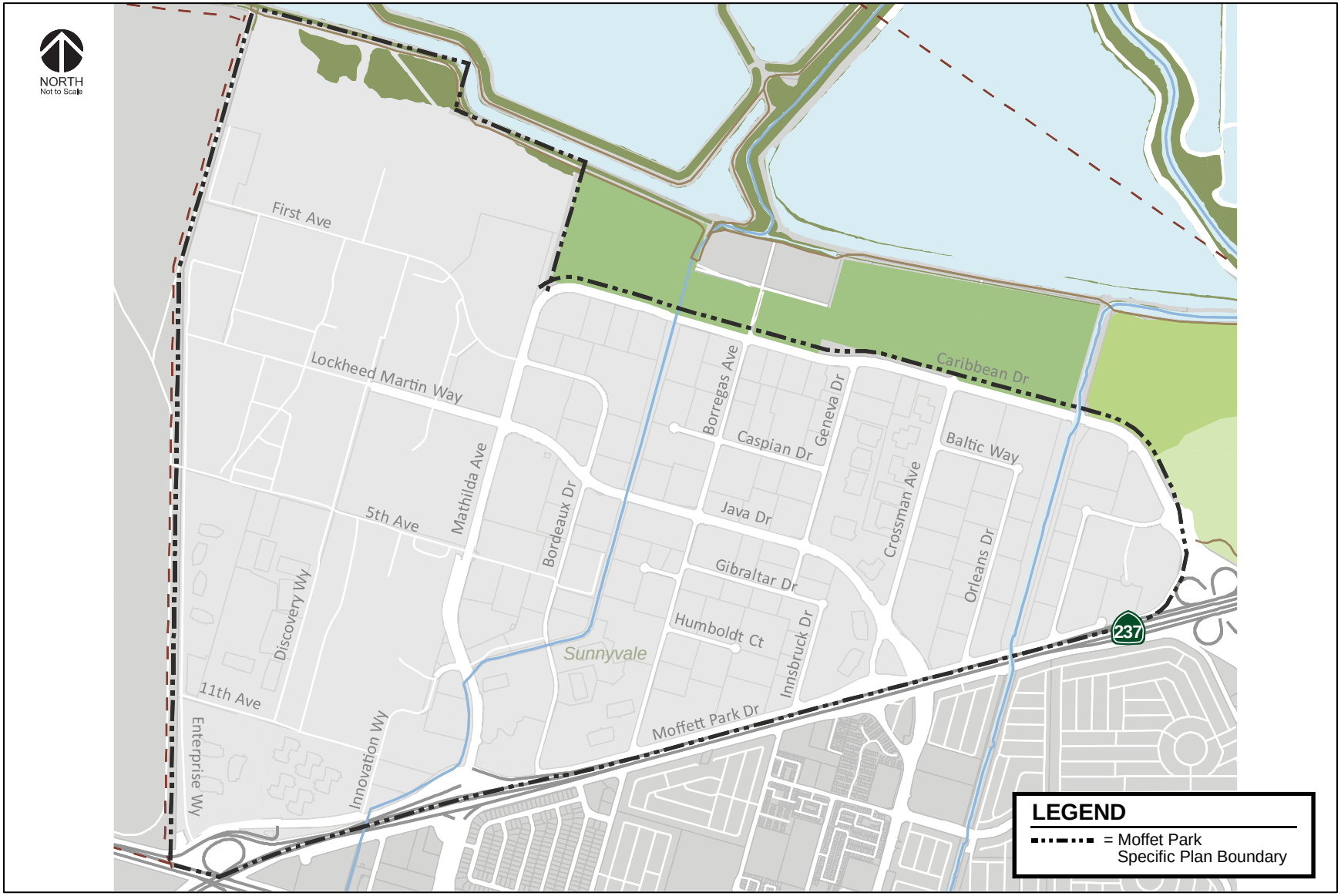
Vehicle Miles Traveled

Pursuant to SB 743, the Governor's Office of Planning and Research (OPR) published the finalized *Updates to the CEQA Guidelines* in December 2018. The guidelines stated that level of service will no longer be considered an environmental impact under CEQA and consider vehicle-miles-traveled (VMT) the most appropriate measure of transportation impact.

Project VMT is defined as the total distance traveled by vehicles to and from the proposed project over a typical day. In order to estimate VMT for the various land use components, the citywide travel demand forecast model was updated in April 2022 and used. The citywide model is the best available model to represent travel within the City of Sunnyvale and serves as the primary forecasting tool for the city. The model is a mathematical representation of travel within the nine Bay Area counties, as well as the Santa Cruz, San Benito, Monterey, and San Joaquin counties. The base model structure was developed by the Metropolitan Transportation Commission (MTC) and further refined by the City/County Association of Governments and Santa Clara Valley Transportation Authority for use within San Mateo County and Santa Clara County. The City further refined this model for application with Sunnyvale to add more detail to the zone structure and transportation network.

There are four main components of the model: 1) trip generation, 2) trip distribution, 3) mode choice, and 4) trip assignment. The model uses socioeconomic inputs (i.e., population, income, employment) aggregated into geographic areas, called transportation analysis zones (TAZ) to estimate travel within the model area. There are 207 TAZs within the model to represent the City of Sunnyvale, 53 of which represent the Moffett Park area. The model was used to estimate the proposed project's effect on VMT in accordance with the City's VMT guidelines.

Figure 1
Moffett Park Specific Plan Area Boundary



VMT Impact Threshold

According to the City of Sunnyvale *Transportation Analysis Guideline for Vehicle Miles Traveled and Local Transportation Analysis,* published in October 2021, a mixed land use development must analyze each land use separately. The document also specified different VMT impact thresholds, screening criteria, and analysis methodologies for different land uses. The MPSP proposes a combination of residential, office, retail, hotel, and institution land uses. Per the Council Policy 1.2.8 and City's guidelines, the following VMT thresholds of significance, are applied for the respective land uses:

Residential Land Uses

Projects that include residential uses are said to create a significant VMT impact when the estimated project-generated VMT exceeds the existing countywide average residential VMT per capita, minus 15 percent. Since this project is utilizing the citywide travel demand forecast model (see Appendix) to estimate project-generated VMT, the model is also used to estimate existing countywide average residential VMT per capita, to ensure the VMT analysis is consistent in its methodology. As shown in Table 1 below, the existing countywide average residential VMT per capita is estimated at 12.98. Therefore, the residential VMT threshold of significance, calculated at 15 percent below the countywide average, would be 11.03.

Employment Land Uses

Projects that include employment land uses are said to create a significant VMT impact when the estimated project-generated VMT exceeds the existing countywide average employment VMT per employee, minus 15 percent. Since this project is utilizing the citywide travel demand forecast model (see Appendix) to estimate project-generated VMT, the model is also used to estimate existing countywide average employment VMT per employee, to ensure the VMT analysis is consistent in its methodology. As shown in Table 1 below, the existing countywide average employment VMT per employee is estimated at 18.49. Therefore, the employment VMT threshold of significance, calculated at 15 percent below the countywide average, would be 15.72.

Table 1
VMT Impact Thresholds

Scenario/Threshold	Residential VMT per Capita	Employment VMT per Employee
Year 2020 Existing Countywide VMT[1]	12.98	18.49
VMT Impact Threshold [2]	11.03	15.72

Notes:
[1] Determined using the City of Sunnyvale Travel Demand Model updated in April 2022.
[2] Council Policy 1.2.8 indicates that the project VMT impact threshold to be 15% less than the Year 2020 Existing Countywide VMT average.

Hotel Land Uses

The MPSP proposes approximately 607,209 s.f. of hotel land use under buildout conditions. The proposed hotels are expected to be business hotels that would mostly serve the immediate office uses within Moffett Park. Guests at these hotels would be conveniently located within close proximity to offices that are within walking/biking distances. It is assumed that the proposed hotels would reduce overall VMT as hotel patrons no longer need to reside in hotels further away from the offices in Moffett

Park. Additionally, hotel employees were also included in the VMT analysis for employment land use. Therefore, the hotel land use proposed by MPSP would result in a less than significant VMT impact.

Retail Land Uses

Per Council Policy 1.2.8 and the City's VMT guidelines, retail projects with less than 100,000 s.f. are considered local-serving or as determined by the City to be local-serving are exempt from completing a VMT analysis. The MPSP proposes approximately 558,095 s.f. of retail land use under buildout conditions. The retail land uses are expected to be spread out across Moffett Park, including general retails, restaurants, and grocery stores. These land uses would be serving mostly the Moffett Park and are considered and determined by the City to be local-serving. Local-serving retail would reduce the travel distances for its patrons, as patrons would no longer need to travel longer distances to do the same kind of activities (i.e buy groceries). This would lead to a net reduction in total VMT generated by retail land uses. Therefore, the retail land use proposed by MPSP would result in a less than significant VMT impact.

Institutional Land Uses

The MPSP proposes approximately 326,122 s.f. of institution land use under buildout conditions. This would include the existing Foothill College Center on Innovation Way and a new elementary school. It is assumed that the new elementary school would serve the future residents within the Moffett Park area under buildout conditions. Therefore, the elementary school would be considered local-serving and would reduce overall VMT for institution land uses. The institutional land use would result in a less than significant VMT impact.

VMT Evaluation

Since the project is expected to be a long-range project, it is anticipated that the long-range regional land use growth is needed to support the level of development proposed at the project site. The most readily available long-range forecast year is the year 2040 cumulative conditions, which assumes the buildout of the City of Sunnyvale General Plan, the Downtown Specific Plan, Lawrence Station Area Plan update, the El Camino Real Specific Plan, the Fortinet Precise Plan, and regional growth projected by the Association of Bay Area Governments (ABAG) modified by VTA/C/CAG for model land use inputs. A detailed description of the citywide travel demand forecast model's existing conditions validation and cumulative scenario assumptions are included in the Appendix. Shown below in Table 2 is a summary of the land use inputs for the model area under cumulative with MPSP scenario.

District Parking Concept

The MPSP under full buildout conditions would implement a district parking strategy, where parking is mostly centralized in a series of shared parking garages located along Mathilda Avenue and Caribbean Drive (Figure 2). Minimal parking for residential and retail uses will be located along the Java Drive corridor. Only a small number of areas will have all parking located on-site. It is assumed that with District Parking, anyone coming into the Moffett Park will only need to park once and use other modes of transportation to complete all of their activities within Moffett Park. The Moffett Park area will provide a variety of multimodal transportation options such as bicycle and walking networks, rental bikes and scooters, etc... Therefore, it is assumed that travel within Moffett Park is not vehicular trips and would thus not count towards VMT.

Figure 2
District Parking Concept

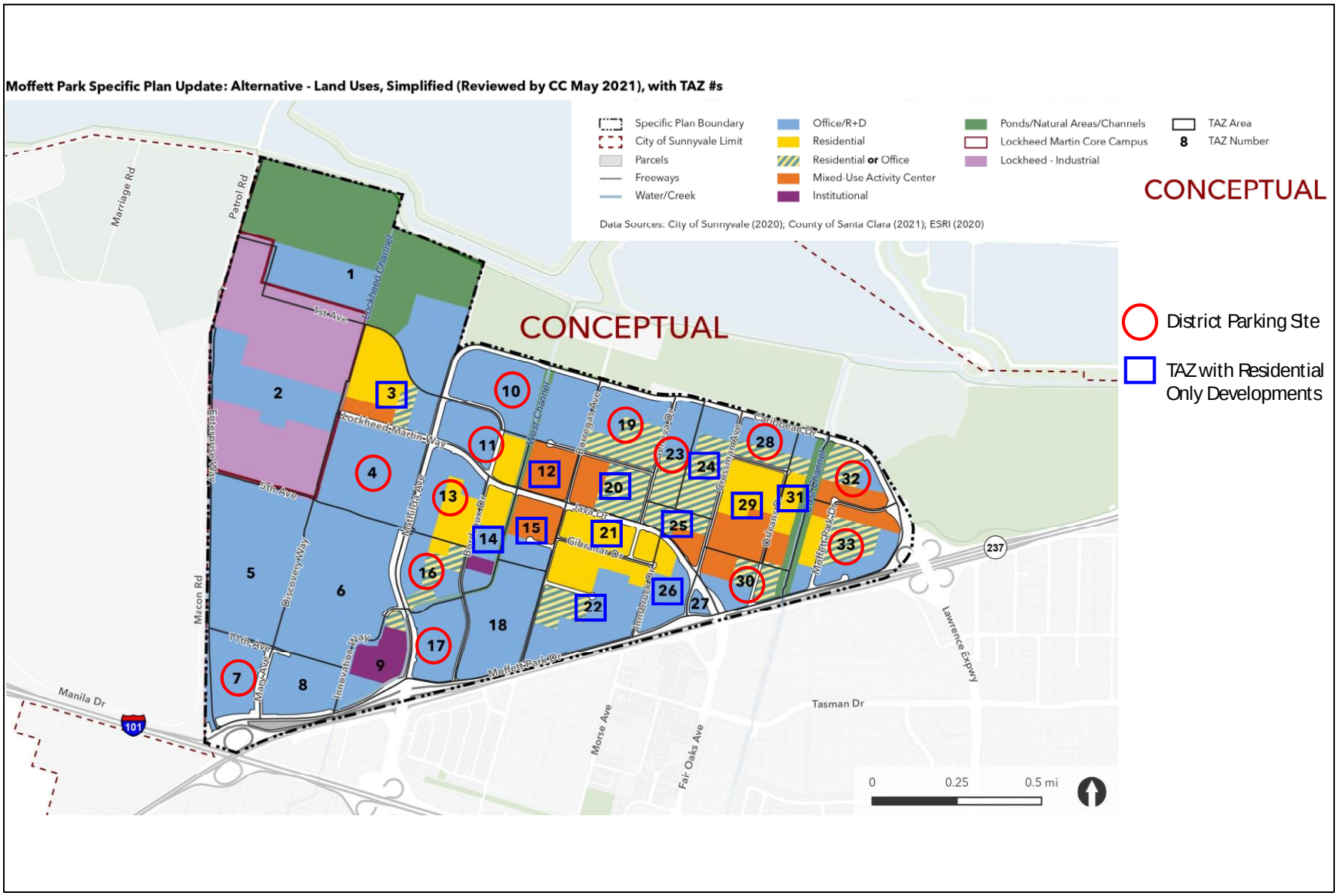


Table 2
2040 Cumulative with MPSP Model Land Use Input Summary

County	Total Households	Total Population	Employed Residents	Total Employments
San Francisco	483,686	1,167,689	620,054	872,489
San Mateo	317,509	914,309	445,533	470,273
Santa Clara	918,891	2,692,323	1,250,650	1,409,649
Alameda	734,071	2,083,458	1,019,973	953,132
Contra Costa	475,412	1,386,523	665,873	497,928
Solano	169,294	509,796	242,486	150,983
Napa	54,694	158,040	75,565	83,361
Sonoma	219,066	596,627	286,492	243,580
Marin	111,584	277,254	131,575	134,963
City of Sunnyvale	**99,868**	**234,425**	**145,476**	**169,635**
MPSP	**20,000**	**42,000**	**26,600**	**95,683**

Residential Land Uses

According to Council Policy 1.2.8 and the City's VMT guidelines, residential land uses are evaluated based on a VMT per capita metric. Using the model, this metric is calculated only for the home-based trips in the model, per OPR's Technical Advisory on Evaluating Transportation Impacts in CEQA. Based on the latest citywide travel demand model, the existing countywide average residential VMT is 12.98. Therefore, City's residential VMT impact threshold, at 15% below the existing countywide average, would be 11.03 VMT per capita.

Based on the Sunnyvale model, the project is projected to generate 9.47 VMT per capita under year 2040 cumulative with project conditions and thus would not have a VMT impact (see Table 3). Therefore, the MPSP's residential land uses VMT impact would be less than significant.

Employment Land Uses

According to Council Policy 1.2.8 and the City's VMT guidelines, general employment (including hotel employees) land uses are evaluated based on an employment VMT per employee metric. Using the model, this metric is calculated only for home-based work trips, per OPR's Technical Advisory on Evaluating Transportation Impacts in CEQA. Based on the latest citywide travel demand model, the existing countywide average employment VMT is 18.49 per employee. Therefore, the City's jobs VMT impact threshold, at 15% below the existing countywide average, would be 15.72 VMT per employee.

Based on the Sunnyvale model, the project is projected to generate 14.14 VMT per employee under year 2040 cumulative with project conditions and thus would not have a VMT impact (see Table 3). Therefore, the MPSP's employment land uses VMT impact would be less than significant.

Table 3
Employment and Residential VMT Evaluation

Scenario	Residential VMT [1]	Population	Residential VMT per Capita [2]	Employment VMT [3]	Jobs	Employment VMT per Employee [4]
Year 2020 Existing Countywide VMT	25,380,474	1,955,426	12.98	20,068,560	1,085,370	18.49
VMT Impact Threshold [5]	--	--	11.03	--	--	15.72
MPSP	397,593	42,000	9.47	1,353,390	95,683	14.14
VMT Impact?	--	--	No	--	--	No

Notes:
[1] Residential VMT = Home-Based Trip Productions * Distance
[2] Residential VMT per Capita = Residential VMT / Population
[3] Employment VMT = Home-Based Work Trip Attactions * Distance
[4] Employment VMT per Employee = Employment VMT / Jobs
[5] Council Policy 1.2.8 indicates that the project VMT impact threshold to be 15% less than the Year 2020 Existing Countywide VMT average.

MPSP Impact to Transit Facilities

The City's Transportation Analysis Guidelines require an evaluation of transit facilities. However, there are no established impact criteria by either VTA or the City of Sunnyvale. For the purpose of this study, the MPSP is said to create a potentially significant transit impact if:

1. The project is expected to generate increased transit demand that may not be accommodated by the existing transit services; or

2. The project is expected to reduce transit availability or access to transit facilities.

Transit Demand and Availability

Under cumulative + MPSP conditions, the model estimated that approximately 37% of all trips generated by the Moffett Park land uses would be non-driving trips (see Table 4). Approximately half of these trips would be internal to Moffett Park (trips that begin and end in Moffett Park), and the other half of these non-driving trips would have one trip-end outside of Moffett Park.

The non-driving trips internal to Moffett Park, would all be relatively short trips. Under the District Parking concept, these trips are assumed to use non-driving modes such as walking, biking, or scooters to move around within the Moffett Park area. It is assumed that these non-driving trips would generate minimal transit demand.

The non-driving trips external to Moffett Park would have on trip end outside of Moffett Park. It is anticipated that a larger number of these non-driving trips would use private shuttles (59%) as part of the Moffett Park's aggressive TDM measures. The model estimated that approximately 24% of all external non-driving trips (or 4% of all trips) generated by Moffett Park would use public transit (see Table 4).

The draft MPSP Mobility section includes goals (Goal M-3, Goal M-4) and policies (all policies under Goal M-3, Goal M-4) to improve the public transit serving Moffett Park by improving transit convenience, connectivity, and capacity. It is anticipated that the City, in coordination with the Santa Clara Valley Transportation Authority (VTA) and the Moffett Park's Transportation Management Association (TMA) will develop the necessary transit capacity that could accommodate the anticipated increase in transit demand. The MPSP's Goal M-3 and Goal M-4 would seek to increase transit availability and access to transit facilities in the Moffett Park Area. Therefore, the MPSP's impact on transit facilities would be *less than significant.*

Table 4
Cumulative + MPSP Non-Driving Mode Split for Moffett Park Area

	Mode Split under MPSP Buildout Daily
Internal (trips within Moffett Park) % of Total Trips	
Driving	0%
Non-Driving	20%
Bike/Walk % of Non-Driving	*100%*
External (entering/leaving Moffett Park) % of Total Trips	
Driving	63%
Non-Driving	17%
Bike/Walk % of Non-Driving	*18%*
Transit % of Non-Driving	*23%*
Shuttle % of Non-Driving	*59%*
Total	
Daily Person-Level Trips	587,222
Driving	63%
Non-Driving	37%
Bike/Walk % of Non-Driving	*62%*
Transit % of Non-Driving	*11%*
Shuttle % of Non-Driving	*27%*

Notes:
All mode split percentages and trip estimates are generated using the Sunnyvale citywide travel demand model.

MPSP Impact to Bicycle and Pedestrian Facilities

The City's Transportation Analysis Guidelines require an evaluation of bicycle and pedestrian facilities. However, there are no established impact criteria by either VTA or the City of Sunnyvale. For the purpose of this study, the MPSP is said to create a potentially significant bicycle or pedestrian impact if:

1. The project reduces, severs, or eliminates existing or planned pedestrian or bicycle facilities; or
2. The project creates demand for pedestrian or bicycle facilities that do not currently exist.

Under cumulative + MPSP conditions, all trips internal to Moffett Park are expected to be non-driving trips. These trips are envisioned to use non-driving modes such as walking, biking, or scooters to move around within the Moffett Park area. Therefore, it is anticipated that the MPSP would generate a considerate number of bicycle and pedestrian trips on the bicycle and pedestrian facilities within the Moffett Park area. As discussed above, it is estimated that these trips would account for approximately 20% of all trips generated by Moffett Park.

As shown in Table 4 above, it is estimated that approximately 18% of all external non-driving trips (or 3% of all trips) generated by Moffett Park would be walking or biking trips with one trip end outside of Moffett Park.

The draft MPSP Mobility Section includes goals (Goal M-2 and Goal M-4) and policies (all policies under Goal M-2 and Goal M-4) to improve the safety, connectivity and comfort level of the bicycle and

pedestrian network within the Moffett Park area. It is expected that the planned bicycle and pedestrian network within and accessing the Moffett Park area would be sufficient to accommodate the anticipated demand. Therefore, the MPSP's impact on transit facilities would be *less than significant.*

Appendix J **REVISE** Appendix J to remove the word "DRAFT" from the cover page of the Water Supply Assessment and the DRAFT watermark throughout the Water Supply Assessment.

Appendix A: Draft EIR Comment Letters

California Department of Transportation

DISTRICT 4
OFFICE OF REGIONAL AND COMMUNITY PLANNING
P.O. BOX 23660, MS–10D | OAKLAND, CA 94623-0660
www.dot.ca.gov

February 8, 2023

SCH #: 2021080338
GTS #: 04-SCL-2021-01158
GTS ID: 23974
Co/Rt/Pm: SCL/ 237/ 3.29

Michelle King, Principal Planner
City of Sunnyvale
456 West Olive Avenue
Sunnyvale, CA 94087

Re: Moffett Park Specific Plan Project + Draft Environmental Impact Report (DEIR)

Dear Michelle King:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the Moffett Park Specific Plan Project. We are committed to ensuring that impacts to the State's multimodal transportation system and to our natural environment are identified and mitigated to support a safe, sustainable, integrated and efficient transportation system. The following comments are based on our review of the December 2022 DEIR.

Project Understanding
The proposed project would allow for the addition of residential uses and an increase in the allowable office/industrial/R&D, commercial, and institutional uses within Moffett Park. The Specific Plan would allow for a net increase of 20,000 residential units (where there are no residential units existing today), 650,000 square feet of commercial uses,1 10.0 million square feet of office/industrial/R&D uses, and 200,000 square feet of institutional uses beyond what is currently existing and recently approved. As a result, the buildout of the Specific Plan (which would include existing, recently approved, and proposed uses) would result in a total of 20,000 residential units and approximately 33.5 million square feet of commercial, office/industrial/R&D, and institutional uses.

Travel Demand Analysis
With the enactment of Senate Bill (SB) 743, Caltrans is focused on maximizing efficient development patterns, innovative travel demand reduction strategies, and multimodal improvements. For more information on how Caltrans assesses Transportation Impact Studies, please review Caltrans' Transportation Impact Study Guide (*link*).

The project VMT analysis and significance determination are undertaken in a manner consistent with the Office of Planning and Research's (OPR) Technical Advisory. Per the DEIR, this project is found to have *less than significant VMT impact.* Caltrans supports the TDM measures and mitigation strategies proposed to minimize impacts to operations from the proposed project. Caltrans also supports the mitigation measures to increase active transportation mode-share in the project area by creating an accessible network to all transportation users.

Lead Agency
As the Lead Agency, the City of Sunnyvale is responsible for all project mitigation, including any needed improvements to the State Transportation Network (STN). The project's fair share contribution, financing, scheduling, implementation responsibilities and lead agency monitoring should be fully discussed for all proposed mitigation measures.

Equitable Access
If any Caltrans facilities are impacted by the project, those facilities must meet American Disabilities Act (ADA) Standards after project completion. As well, the project must maintain bicycle and pedestrian access during construction. These access considerations support Caltrans' equity mission to provide a safe, sustainable, and equitable transportation network for all users.

Encroachment Permit
Please be advised that any permanent work or temporary traffic control that encroaches onto Caltrans' right of way (ROW) requires a Caltrans-issued encroachment permit. As part of the encroachment permit submittal process, you may be asked by the Office of Encroachment Permits to submit a completed encroachment permit application package, digital set of plans clearly delineating Caltrans' ROW, digital copy of signed, dated and stamped (include stamp expiration date) traffic control plans, this comment letter, your response to the comment letter, and where applicable, the following items: new or amended Maintenance Agreement (MA), approved Design Standard Decision Document (DSDD), approved encroachment exception request, and/or airspace lease agreement. Your application package may be emailed to D4Permits@dot.ca.gov.

Please note that Caltrans is in the process of implementing an online, automated, and milestone-based Caltrans Encroachment Permit System (CEPS) to replace the current permit application submittal process with a fully electronic system, including online payments. The new system is expected to be available during 2023. To obtain information about the most current encroachment permit process and to download the permit application, please visit https://dot.ca.gov/programs/traffic-operations/ep/applications.

Thank you again for including Caltrans in the environmental review process. Should you have any questions regarding this letter, or for future notifications and requests for review of new projects, please email LDR-D4@dot.ca.gov.

Sincerely,

MARK LEONG
District Branch Chief
Local Development Review

c: State Clearinghouse

Department of Toxic Substances Control

Yana Garcia
Secretary for
Environmental Protection

Meredith Williams, Ph.D.
Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Gavin Newsom
Governor

SENT VIA ELECTRONIC MAIL

February 7, 2023

Ms. Michelle King
Principal Planner
City of Sunnyvale
456 West Olive Avenue
Sunnyvale, CA 94086
MKing@sunnyvale.ca.gov

DRAFT ENVIRONMENTAL IMPACT REPORT FOR MOFFETT PARK SPECIFIC PLAN – DATED DECEMBER 2022 (STATE CLEARINGHOUSE NUMBER: 2021080338)

Dear Ms. King:

The Department of Toxic Substances Control (DTSC) received a Draft Environmental Impact Report (EIR) for the Moffett Park Specific Plan (Project). The Lead Agency is receiving this notice from DTSC because the Project includes one or more of the following: groundbreaking activities, work in close proximity to a roadway, importation of backfill soil, and/or work on or in close proximity to an agricultural or former agricultural site.

DTSC recommends that the following issues be evaluated in the Hazards and Hazardous Materials section of the EIR:

1. A State of California environmental regulatory agency such as DTSC, a Regional Water Quality Control Board (RWQCB), or a local agency that meets the requirements of Health and Safety Code section 101480 should provide regulatory concurrence that any Project sites, including those for which Phase I Environmental Site Assessments have been performed, are safe for construction and the proposed use.

2. Refiners in the United States started adding lead compounds to gasoline in the 1920s in order to boost octane levels and improve engine performance. This practice did not officially end until 1992 when lead was banned as a fuel additive in California. Tailpipe emissions from automobiles using leaded gasoline

contained lead and resulted in aerially deposited lead (ADL) being deposited in and along roadways throughout the state. ADL-contaminated soils still exist along roadsides and medians and can also be found underneath some existing road surfaces due to past construction activities. Due to the potential for ADL-contaminated soil DTSC, recommends collecting soil samples for lead analysis prior to performing any intrusive activities for the project described in the EIR.

3. If any projects initiated as part of the proposed project require the importation of soil to backfill any excavated areas, proper sampling should be conducted to ensure that the imported soil is free of contamination. DTSC recommends the imported materials be characterized according to DTSC's 2001 *Information Advisory Clean Imported Fill Material*.

4. If any sites included as part of the proposed project have been used for agricultural, weed abatement or related activities, proper investigation for organochlorinated pesticides should be discussed in the EIR. DTSC recommends the current and former agricultural lands be evaluated in accordance with DTSC's 2008 *Interim Guidance for Sampling Agricultural Properties (Third Revision)*.

DTSC appreciates the opportunity to comment on the EIR. Should you choose DTSC to provide oversight for any environmental investigations, please visit DTSC's Site Mitigation and Restoration Program page to apply for lead agency oversight. Additional information regarding voluntary agreements with DTSC can be found at DTSC's Brownfield website.

If you have any questions, please contact me at (916) 255-3710 or via email at Gavin.McCreary@dtsc.ca.gov.

Sincerely,

Gavin McCreary
Project Manager
Site Evaluation and Remediation Unit
Site Mitigation and Restoration Program
Department of Toxic Substances Control

cc: (see next page)

cc: (via email)

Governor's Office of Planning and Research
State Clearinghouse
State.Clearinghouse@opr.ca.gov

Mr. Dave Kereazis
Office of Planning & Environmental Analysis
Department of Toxic Substances Control
Dave.Kereazis@dtsc.ca.gov

ENCL (1) Navy Comments Regarding the Draft EIR Moffett Park Specific Plan, File No. 2021080338

Navy comments regarding Draft EIR Moffett Park Specific Plan, File No. 2021080338

Section	Section Name	Draft Plan	Navy comment
3.9.1.2	Regulatory Database Search	4. **Sunnyvale Naval Industrial Reserve Ordnance Plant** (see APN 110-02-015 on Figure 3.9-5.) (GeoTracker database listing number T0608576849), case open – remediation as of June 12, 2018. Groundwater contamination has been identified in the area and is undergoing remediation by Lockheed Missiles and Space Company under the oversight of the San Francisco Bay RQWCB. This facility is located in the same area as the Lockheed Sunnyvale – Plant One Facility. In January 2020, the Water Board issued concurrence with the Final Proposed Plan for groundwater remediation. The purpose of the plan is to conduct remedial action consisting of in-situ bioremediation and chemical reduction, in addition to groundwater monitoring and land use controls.	The EIR should note that the cleanup of the Sunnyvale Naval Industrial Reserve Ordnance Plant (NIROP) is also being overseen by the United States Department of the Navy as the lead agency under the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), with regulatory agency oversight provided by the San Francisco Bay Regional Water Quality Control Board. The description mentions the proposed plan to remediate groundwater; however, we have progressed to the review of the Record of Decision. The groundwater remediation includes the use of land use controls with the land until the groundwater cleanup goals are achieved. It should also mention that a cleanup plan is being developed to remediate soil and soil vapor at the NIROP site. Once the final plan is approved, the Navy envisions a remedy of land use controls that would run with the land, with the potential for additional cleanup measures such as soil removal and soil vapor mitigations in the event the site is redeveloped.
3.9.2.1	Project Impacts	Impact HAZ-2	The Specific Plan Project Requirements noted as 10.3.1-1 through 10.3.1-5 do not acknowledge that many of the contaminated sites within the planning area have already been thoroughly investigated. Remedies already have been, or will be, approved by the appropriate regulatory authorities prior to any redevelopment under the plan. Thus, in many cases the types of investigations called for in the Requirements would not be necessary and would be superfluous. In the specific case of the NIROP

			facility, approved CERCLA remedial action remedies for groundwater, soil, and soil vapor will be in place prior to any redevelopment of the property. Remedies will be documented in formal records of decision, and any ongoing land use controls and requirements will be recorded in the chain of title for the property. The text of the EIR should acknowledge that where remedies are already in place and approved by appropriate regulatory authorities, the additional studies and investigations should not be required.

SUNNYVALE SCHOOL DISTRICT
LEARN TODAY. LEAD TOMORROW.

February 10, 2023

Michelle King, Principal Planner
Department of Community Development
City of Sunnyvale
456 West Olive Avenue
Sunnyvale CA 94086
mking@sunnyvale.ca.gov

RE: Draft EIR/Moffett Park Specific Plan; File No. 2021080338

Dear Ms. King:

On behalf of the Sunnyvale School District ("District"), we are responding to the City of Sunnyvale's recent release of the Draft Moffett Park Specific Plan ("Specific Plan") and related Draft Environment Impact Report ("DEIR"). As the primary provider of public preschool and elementary school education within the Specific Plan area, the impacts of the Specific Plan on public education in the region is of considerable concern to our District and Board of Education. The District shares many of the community values expressed in the Specific Plan; however, unless we find effective ways to partner with the City and hold developers accountable for ensuring that we have sufficient resources to provide school capacity as residential development occurs, families may begin to look for residential communities outside of the region due to school overcrowding. In addition, as further described in this letter, we believe that some impacts have not been fully or accurately characterized in the DEIR.

The District appreciates the time that City staff has taken to meet and discuss issues of concern, and this letter formalizes and summarizes the items we hope to identify, address and resolve through the Specific Plan EIR process. Enclosed with this comment letter you will also find Resolution #R23-19 adopted by the District Board of Education expressing its concerns with the Specific Plan and DEIR and requesting that the City take more affirmative steps in the Specific Plan to ensure that school facility capacity keeps pace with development.

We offer the following comments on the Specific Plan and the DEIR:

1. **School Capacity and Development**

- About 85% of projected buildout of the Specific Plan area will occur within the boundaries of our District. Based on student generation data and the number and types of anticipated residential and commercial development within the Specific Plan, our District agrees that a realistic estimate of total new students is 1,200 but could be significantly higher depending on type and density of dwelling units approved.

- Currently, the District does not own land or operate any schools within the Specific Plan area. The two schools located closest to that area are Lakewood Elementary School, serving grades TK-5, and Columbia Middle School, serving grades 6-8. As noted in the DEIR, both schools are slightly below capacity at present. Please note that the District recently learned of the likely closure of a local charter school (Summit Denali Charter School) that derives significant enrollment from families in the attendance area of Columbia Middle School. Students returning to Columbia Middle School starting in the 2023-24 school year are likely to absorb and exceed all current capacity at that site, which should be noted in the DEIR.

- The DEIR is clear that neither of the two schools have anywhere near sufficient capacity to house anticipated student generation, and we agree. In the short term and on a temporary basis, existing sites will require significant expansion to house students beginning within the next five (5) years. However, over the longer term, a school site of up to 10 acres will have to be acquired and a new school developed to serve the Moffett Park area. Costs to acquire land and build a new TK-8 school are estimated to be in the range of $160-200 million in today's dollars. School fees are likely to generate about 50% of the total construction cost for a new campus; however, school fees collected by the time the District must start planning a new campus will be far below the amount needed. In addition, this fee collection does not account for funds that will be needed in the short term for existing campus expansion.[1] Early planning is essential, as school financing, site development and construction can easily take ten years to accomplish.

- With regard to the District's ultimate need for a TK-8 school site, we appreciate that some thought has been given to school locations in the Specific Plan area. It appears that a potential school site of approximately four acres is identified on page 71 of the Specific Plan in the artist rendering of the Crossman neighborhood, but this site is not reflected or studied in the DEIR. We note that the neither the Crossman parcel nor the parcels identified in the DEIR designated for institutional/school uses (on Bordeaux Drive and Innovation Way) may be approvable by the California Department of Education ("CDE") due to proximity to the Moffett Field airport facility, VTA rail lines and freeways. Because school

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[1]/ Estimates of residential fee collection are based on an assumption of 20,000 residential dwelling units at 1200 square feet each. More precise square footage information is needed to estimate available resources.

sites must meet very high safety thresholds, it is critical that the City work with the District directly to locate, reserve and designate in the Specific Plan at least one potential future school site that has a reasonable likelihood of being approved by CDE.

We recognize that high density neighborhoods may require some new approaches to school facility planning, and we are open to considering alternatives that call for less acreage than the state standard of 9-16 acres for an elementary school and 17-22 acres for a middle school.[2] However, the needs created by a TK-8 grade span will necessitate significantly more than four acres of land.

While laying out a myriad of facts about the insufficiency of existing schools to meet capacity needs from anticipated development, the DEIR nevertheless concludes that the implementation of the Specific Plan would not result in significant impacts to schools, based on the conclusion that in accordance with Government Code Section 65995, payment of school impact fees is considered adequate mitigation of impacts associated with the increased demands on school facilities resulting from development; further, the DEIR states that it is the District's responsibility to implement the specific methods for mitigating school impacts.

These conclusions should be re-evaluated. In March 2020, upon the failure of Proposition 13, the last attempted statewide school bond measure, Government Code Section 65996 (quoted in the DEIR) became inoperative and was replaced by Government Code Section 65997 to cover the period of time between approved state bond programs. Government Code Section 65997 expands the power of local agencies to condition environmental approvals of development projects on certain forms of school facility mitigation, such as use of community facility districts under the Mello-Roos Community Facility Act of 1982 (see Gov. Code, § 65997, operative upon failure of Proposition 13 in March, 2020, and replacing Gov. Code, § 65996, which became inoperative upon failure of Proposition 13.) Government Code Section 65997 is operative for as long as state bond funds for school facilities remain unavailable.

Notwithstanding this legal authority, we encourage and request that the City consider all possible avenues available to set conditions on development for school facility mitigation purposes, and that at a minimum the City consider some additional methods to incentivize developers to voluntarily agree to provide funding or assistance in excess of statutory fee amounts. Developer contributions to costs in excess of school impact fees or agreement to place projects within community facilities districts are the most common and reliable ways we can assure the availability of funding for a new school when the school is needed to serve the future residents of the Moffett Park area. The District's current general obligation bond authority is dedicated solely to improvement of existing facilities serving current residents. The State of California School Facility Program is out of funding, and even if funds are replenished through a state bond measure in the future, the program requires a local match to be provided by the District.

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[2] / Source: California Department of Education, *Guide to School Site Analysis and Development* (2000).

2. School Service and Safety

Aside from the impact of the Specific Plan on school facility capacity, we note the following additional concerns with the DEIR:

- **Transportation Services** – The District provides home-to-school transportation to students living in areas of the District that we identify as safety-zones, which are those areas in which travel to school on foot has been determined to pose a safety hazard to students. Under our safety-zone criteria, the entirety of the Moffett Park Specific Plan area would qualify for such transportation services. To accommodate 1,200+ students with busing support would require an additional 22 buses and drivers on the road daily. For context, the District currently operates only **4** buses. It is not evident that the transportation and traffic impact created by more than 5 times the current environmental baseline for school bus traffic in Sunnyvale was taken into consideration and these impacts must be acknowledged and addressed.

- **Safe Routes to School (TR7 Table 3.3-2)** – The DEIR does not appear to show or address the Safe Routes to School Program that General Plan policies reference.

- **Traffic/Circulation Impact Analysis** – In the short term, students in the project area will be attending school at Lakewood and Columbia. However, there is no evidence that the traffic or air quality analyses take into consideration the increase in traffic to those sites from the Specific Plan area and the accompanying release of pollutants in the region. These impacts must be characterized, addressed and mitigated.

All of the foregoing factors should be considered in the DEIR and squarely acknowledge these problems for decision makers and the public, and, in light of the significant impact of planned growth or increasing residential density on our District, the DEIR should propose mitigation measures to lessen or avoid those impacts.

3. Specific Plan Strategies/CEQA Mitigation Measures

In order to address the above-described impacts, the District requests that additional strategies be included within the Specific Plan in support of public education, as well as included in the DEIR as mitigation measures to address and reduce the environmental impacts of the City's growth plans.

First, please establish an overall Specific Plan goal that is supportive of our District but is more focused and specific than the City's General Plan goals. The General Plan currently states only its vision "to support and work cooperatively with the educational institutions which serve Sunnyvale so as to provide the opportunity for a quality education for all youth, and lifelong learning for all residents."

A goal statement in the Specific Plan that the District would support could be very straightforward, such as:

"The City seeks to ensure that youth in the Moffett Park Specific Plan area have access to a quality school system with safe, adequate facilities and funding available as homes are built and additional school capacity is needed. Requiring, encouraging and/or incentivizing landowners and developers through development incentives or otherwise, to provide land, funding or participation in community facilities districts that provide funding in excess of minimum development impact fees, are the primary methods to sustain quality educational services and will be supported by the City as development moves forward."

Second, plan strategies for the Specific Plan and mitigation measures for the impact of the Specific Plan on school facilities, capacity and funding that should be included are the following:

- Provide information to school districts when considering Specific Plan amendments, zone changes, or other legislative land use policy decisions and ensure that information about school capacity contained in development and environmental analysis incorporates current information on school capacity and the cumulative impacts of individual projects on school capacity.

- Review proposed legislative land use decisions in the context of the adequacy of present and future school facilities and require all developers to confirm, prior to receiving any project entitlements from the City, that they have met with affected school districts to discuss the impact of the project on school capacity and consider forms of mitigation, including placing the project into a community facilities district.

- In addition to the Bonus Floor Area Ratio incentives, grant additional density, more flexible setbacks and building heights, and/or reduced parking requirements or other development incentives for projects that voluntarily provide additional financial support for school facility funding; when and as possible, impose conditions on projects requiring school facility mitigation in excess of statutory school fees.

- In conjunction with affected school districts, reserve or provide for the identification and dedication of school sites within the Specific Plan area.

- Support lobbying efforts to expand State funding of the public school system.

- Support school construction bond measures or other financing options, such as the use of community facilities districts, for the construction of new schools in the Specific Plan area.

Thank you for the opportunity to comment on the DEIR for the Moffett Park Specific Plan update. Again, we thank the City staff for meeting with us and for being willing to consider the solutions we have identified. We appreciate the continued partnership working towards providing our community with the best education achievable for our residents.

We look forward to consulting further with the City regarding the problems we face and the active inclusion of our needs as the City moves forward to implement the Moffett Park Specific Plan over the next 20+ years.

Very Truly Yours,

Michael Gallagher, Ed.D.
Superintendent

CC: Larry Klein, City of Sunnyvale Mayor
City of Sunnyvale City Council Members

- Omar Din
- Alysa Cisneros
- Russ Melton
- Richard Mehlinger
- Murali Srinivasan
- Linda Sell

Enclosure

- Resolution #R23-19In the Matter of Resolution of the Board of Education of the Sunnyvale School District Regarding Moffett Park Specific Plan and Future Development Within the City of Sunnyvale

RESOLUTION #R23-19

RESOLUTION OF THE BOARD OF EDUCATION OF THE SUNNYVALE SCHOOL DISTRICT REGARDING MOFFETT PARK SPECIFIC PLAN AND FUTURE DEVELOPMENT WITHIN THE CITY OF SUNNYVALE

WHEREAS, the Sunnyvale School District ("District") has a long history of providing high quality preschool, elementary and middle school education to students in the local community, consistent with its mission to provide every student with a strong foundation of academic, behavioral, and social-emotional skills to prepare them for success in a diverse, challenging, and changing world; and

WHEREAS, our District has a history of working successfully with the City of Sunnyvale ("City") through partnership arrangements to deliver on that mission by providing enhanced services and benefits to the community, including shared use of fields, sports facilities, libraries and community centers, consistent with the values expressed in the City's General Plan; and

WHEREAS, the City has recently released a proposed updated Specific Plan for the Moffett Park region of the community, articulating its vision and set of guiding principles, development standards, and design guidelines for future development within Moffett Park; and

WHEREAS, as documented in the Draft Environmental Impact Report ("DEIR") prepared for the Specific Plan update and released for public review and comment, the Specific Plan would allow for a net increase of 20,000 residential units, 650,000 square feet of commercial uses, 10 million square feet of office/industrial/R&D uses, and 200,000 square feet of institutional uses beyond what is currently existing or approved and most of which (85%) would be located within the boundaries of our District; and

WHEREAS, the District has determined based on current student generation rates that full buildout of the area will bring over 1,200 new students to the District, overwhelming and far exceeding the capacity of existing sites located closest to the Moffett Park area (Columbia Middle School and Lakewood Elementary School), creating transportation, traffic and other impacts and ultimately requiring at least one new school site to be acquired and developed; and

WHEREAS, the Specific Plan relies on development impact fees to fund the need for expanded and new school facilities to house students from Moffett Park, but such fees will fund only a fraction of the need for new or expanded schools to serve the region; and

WHEREAS, while this District is fortunate to have been supported by the community in the passage of general obligation bond measures, such funds are needed for and already allocated to the improvement, repair and upgrade of existing schools and sites to meet current needs; bond funds are not available for, nor should current taxpayers bear the burden of, paying for the development of new sites to serve future residents and for the benefit of home developers; and

WHEREAS, the District believes that developers, with the encouragement of local land use agencies, commonly contribute and should contribute additional funds for school construction in California and should be incentivized to the maximum extent possible to do so for development with the Specific Plan area.

NOW, THEREFORE, be it resolved, determined, and ordered by the Board of Education of the Sunnyvale School District as follows:

Section 1. Recitals. That the foregoing recitals are true and correct.

Section 2. Development of Mitigation Strategies. That the Board of Education authorizes and directs the Superintendent to provide a copy of this Resolution to the City for submission into the record of proceedings related to the adoption of the updated Specific Plan and certification of the related Environment Impact Report, registering the concerns expressed herein and requesting that, in light of the inadequacy of school impact fees and other available resources to cover the true cost of developing new or expanded school facilities caused by development, the City should take aggressive steps, and include stronger measures in the Specific Plan to encourage, motivate and incentivize developers to fully mitigate the impacts of development on the District as land use approvals are made.

It is the position of this Board that our community expects and deserves excellent, safe schools; that high quality schools enhance civic life in our communities consistent with the views and goals of the City's General Plan and Moffett Park Specific Plan; and that good schools help create a market for new homes and bring residents to, and sustain families in, our community. As such, home developers should be prepared to, expected to, and incentivized by the City to, fully mitigate the impact of their development on schools.

PASSED AND ADOPTED this day, February 2, 2023, by the following vote:

AYES: 4

NAYS: 0

ABSTAIN: 0

ABSENT: 1

APPROVED:

President of the Board of Education of the Sunnyvale School District

Attest:

Clerk of the Board of Education of the Sunnyvale School District

Santa Clara Valley Transportation Authority

February 10, 2023

City of Sunnyvale
Department of Community Development
City of Sunnyvale
465 West Olive Avenue, Sunnyvale, CA 94086

Re: Draft EIR Moffett Park Specific Plan

Dear Michelle,

Thank you for the opportunity to comment on the Moffett Park Specific Plan Draft Environmental Impact Report (DEIR). VTA also plans to submit a separate letter with comments on the Moffett Park Specific Plan. VTA has the following comments on the DEIR.

Air Quality and Greenhouse Gas Impacts – TDM Mitigation Measures

The DEIR notes that the buildout of the Moffett Park Specific Plan (MPSP) would result in Significant and Unavoidable Impacts in the areas of Air Quality and Greenhouse Gas Emissions (Impact AIR-2, p. 74, and Impact GHG-1, p. 162). The DEIR states that mobile emissions, from project-generated motor vehicle trips, "account for 89 percent of emissions from Specific Plan buildout" and notes that the Specific Plan includes TDM policies to reduce vehicle trips, which would reduce mobile emissions (p. 70).

VTA supports the inclusion of extensive TDM policies in the draft Specific Plan, including establishing a Transportation Management Association (TMA), requiring a TDM plan and TMA membership of new developments, and working with the TMA to achieve a 50 percent single-occupancy vehicle (SOV) rate at full buildout of the Specific Plan. However, VTA believes that these TDM requirements – which translate into mitigation measures in the DEIR – can be strengthened. In particular, VTA recommends that the City establish an SOV rate target for an intermediate year (for instance 2030 or 2035), and consider establishing a more aggressive SOV rate target for buildout. For comparison, the North Bayshore Precise Plan in Mountain View identifies a 45 percent SOV target for office trips, and the Google North Bayshore Master Plan includes an objective to achieve a 35 percent SOV rate at full buildout.

Transportation Analysis - Assumptions about Project Trips and Mode Splits

In Table 3.17-2 and accompanying text, the DEIR analysis assumes that 100 percent of internal trips (within Moffett Park) would be accomplished by non-driving modes at project buildout. A footnote states that "With district parking, people coming into Moffett Park would need to park once and use other modes of transport (e.g., walking or biking) to complete their activities within Moffett Park" (p. 297). VTA staff does not completely agree with this assumption. The DEIR

does not provide any mitigation measure nor does the MPSP include a policy to incentivize or enforce this “park-once” approach. Given that the MPSP area is more than two miles long (Caribbean Drive/SR 237 to Enterprise Way), it is certainly possible that travelers will chose to drive or take transit for internal trips. The district parking and “park-once” approach in the MPSP will certainly encourage fewer trips to be made by car, but VTA encourages the City to consider adding a policy to establish parking pricing, to further encourage “park-once” and non-single-occupancy vehicle travel.

It appears to VTA staff that Table 3.17-2 in the DEIR incorrectly translates the percentages of non-driving external trips from Table 4 in the Hexagon memorandum in Appendix I. Table 3.17-2 suggests that just under 2% (10,981) of all project trips would be made by public transit, whereas the Hexagon memo states that “approximately 24% of all external non-driving trips (or 4% of all trips) generated by Moffett Park would use public transit” (Hexagon memo p. 8). While this difference is unlikely to affect the DEIR’s conclusions about Transportation impacts, clarifying this will help the City and VTA plan for future transit service to Moffett Park.

Transit Priority Areas Map

The location of the Borregas light rail station is incorrectly shown on the Transit Priority Areas map in the DEIR (Figure 3.1-1, p. 48). However, this does not appear to affect the DEIR’s general characterization of which MPSP development areas fall within Transit Priority Areas and which do not.

Transit Facilities

Transit facilities information is out of date, p. 292. Precise times are used in the DEIR description which are only accurate at a specific period and then become quickly outdated. VTA recommends updating the Final DEIR to reference more general time intervals to account for future schedule changes. The Orange Line currently runs every 15 minutes on weekdays.

- LR Orange Line, 5a-12a weekdays, every 15 minutes.
- LR Orange Line, 6a-12a weekends, every 30 minutes.
- Express Line 122 does not exist and was discontinued in 2020. It is incorrectly shown on in the DEIR (Figure 3.17-4, p. 305).

VTA recommends that Voluntary Contributions also be identified for transit improvements to support the proposed MPSP Policies M-3.2, M-3.3, M-3.4. The Mathilda and Java Drive corridors will require significant changes and enhancement to support transit. When the Voluntary Contribution program was established, its intent was to provide local jurisdictions with a pathway for developers to contribute funding towards regional transportation facilities. While the early focus of contributions under this program was often to direct funding towards freeway and express lanes projects, VTA encourages local jurisdictions to take a similar contribution approach towards transit expansions and enhancements which can also address travel demand along regional transportation corridors. To achieve the travel mode share splits and goals

outlined in the MPSP and DEIR, funding and contributions from private sources will be required to achieve the recommended outcomes. For instance, voluntary contributions should also be identified for transit facilities including the planned reconstruction of the Borregas Light Rail station.

Analysis of Congestion Management Program Facilities

VTA staff appreciates that the DEIR and Appendix I include analysis of the project's effects on Congestion Management Program (CMP) facilities including CMP intersections and freeway segments, recognizing that this analysis was performed for City and CMP purposes and the findings to not constitute CEQA impacts. VTA supports the City's statement in the DEIR that "Express lane projects… would improve freeway traffic flow" and that "these express lane projects would be included in the citywide nexus study. Future development under the Specific Plan would participate in VTA's Voluntary Freeway Contribution Program and contribute their fair share towards the identified express lane projects via the nexus study" (p. 306). Before identifying specific projects to fund, Sunnyvale staff should first consult with both the current VTA Planning and Programming Officer and Engineering Program Delivery Officer at the time to best coordinate efforts.

The DEIR states that the "The results of the TIA showed that the buildout of the Specific Plan would result in LOS operational deficiencies at a total of 16 study intersections under background plus project and/or cumulative plus project conditions" (p. 299). The DEIR also notes that "No feasible improvements were identified at seven of the 16 deficient intersections… due to right of way constraints" and summarizes feasible improvements for the other 11 intersections (p. 302). VTA notes that several of the intersections where LOS operational deficiencies were found are CMP intersections, and that two of these CMP intersections are along the County's Expressway system (Intersections #40 and #45) and one crosses the VTA light rail Orange Line. The City should work with the County and VTA to monitor the Project's effect on these intersections as buildout occurs, to determine whether the potential improvements in the DEIR (such as depressing light rail tracks at Lawrence Expressway and Tasman Drive) is warranted, and to contribute funds through the citywide nexus study/fee.

Please do not hesitate to contact me (408) 550-4559 or brent.pearse@vta.org to discuss any questions you may have on this letter.

Sincerely,

Brent Pearse

Brent Pearse
Transportation Planner

File: 28370
Sunnyvale East Outfall

X-Fac:
Sunnyvale West Outfall

February 10, 2022

Michelle King, Principal Planner
City of Sunnyvale
Community Development Department
456 West Olive Avenue
Sunnyvale, CA 95110

Subject: Moffett Park Specific Plan Draft Environmental Impact Report (DEIR)

Dear Michelle King:

The Santa Clara Valley Water District (Valley Water) has reviewed the Draft Environmental Impact Report (DEIR) for the proposed Moffett Park Specific Plan, received on December 19, 2022.

Within the Plan area Valley Water has fee title property and easement along both the Sunnyvale East and West Channels. Both channels were constructed in the 1960's by Valley Water to serve as storm drains in response to flooding caused by a combination of major storm events, land subsidence, and inadequate drainage to the south San Francisco Bay. The channels should not be referred to as "creeks" or "rivers" as they are not located in the vicinity of a historic creek and have no historical upstream watershed. They were designed for an approximate 10-year storm event and were constructed with a combination of concrete box culverts, concrete lining, sack concrete slope protection, rock slope protection, or earth lined trapezoidal shaped channels where the most downstream sections included earthen levees.

Proposed development or other work or access within Valley Water right of way will require issuance of encroachment permits in accordance with Valley Water's Water Resources Protection Ordinance and all work proposed must be in compliance with Valley Water's Water Resources Protection Manual. Issuance of a Valley Water encroachment permits is a discretionary act and requires Valley Water to be considered a responsible agency under CEQA.

Based on our review Valley Water has the following comments:

1. Page 28 and page 112 state that mitigation will be provided for impacts to riparian habitat. Please note that no mitigation is allowed on Valley Water property for non-Valley Water projects.

2. The DEIR does not include any discussion in the Biological Resources or Hydrology and Water Quality sections regarding impacts on the Sunnyvale East or West Channels due to the proposed the pedestrian bridge crossings. The DEIR should include discussion of how any proposed bridge crossings may impact Sunnyvale East and West Channels. To minimize impacts to these facilities, including operational impacts, the number of new crossings should be minimized and where possible pedestrian crossings should be incorporated into existing road crossings.

3. The discussion on page 86 under Regional and Local Regulatory Framework, should include the Water Resources Protection Collaborative's Guidelines and Standards for Land Use near Streams (Guidelines and Standards), which was adopted by the City, and Valley Water's Water Resources Protection Ordinance and Manual.

4. Page 92 states that Sunnyvale East *appears* to be tidally influenced. The document should state that the channel *is* tidally influenced to approximately Highway 101.

5. Page 93 states Sunnyvale West channel is tidally influenced. The document should state that the channel is tidally influenced to approximately Mathilda Avenue.

6. The discussion of riparian impacts in the Biological Resources section, including pages 111 (Impact BIO-2) and page 116 (Impact BIO-5) should discuss compliance with the Guidelines and Standards and the Valley Water's Water Resources Protection Manual, including lighting and setbacks to waterways and riparian areas.

7. The Groundwater and Subsidence section on page 145 notes that local groundwater provides 40 percent of the Bay Area's water supply. While this is accurate for Santa Clara County, California's Groundwater Bulletin 118 (Department of Water Resources, 2020) notes groundwater provides 20% of the water supply for the San Francisco Bay Hydrologic Region. Also, this paragraph uses meters instead of feet as the unit of measure. Meters are not used anywhere else in the DEIR; therefore, for consistency, the document should use feet instead of meters in this paragraph

8. The discussion regarding Valley Water on page 198, should be replaced with the following text:

   "Valley Water operates as the flood protection agency for Santa Clara County. Valley Water also provides stream stewardship and is the wholesale water supplier throughout the county, which includes the groundwater recharge program. In accordance with Valley Water's Water Resources Protection Ordinance, any work within Valley Water's fee title right of way or easement or work that impacts Valley Water facilities requires the issuance of a Valley Water permit. Under Valley Water's Well Ordinance 90-1, permits are required for any boring, drilling, deepening, refurbishing, or destroying a water well, cathodic protection well, observation well, monitoring well, exploratory boring (45 feet or deeper), or other deep excavation that intersects the groundwater aquifers of Santa Clara County."

9. The discussion on page 199 regarding the City's regulatory framework related to water resources should include reference to the Guidelines and Standards.

10. The discussion on page 201, Groundwater, should note that due to the long agricultural history of the Santa Clara Subbasin and subsequent land development, there are likely many abandoned wells in the Subbasin. While some of these abandoned wells may have been sealed prior to well permitting requirements, many have open casings and may be discovered during construction. If abandoned wells are encountered during construction, they must be properly destroyed with related work permitted by Valley Water as per Valley Water's Ordinance 90-1 discussed above.

11. The discussion under Groundwater on page 202, needs to include a reference(s) supporting the statements made in the paragraph starting with the sentence "Studies completed to assess the influence of tides on groundwater elevations at the shallowest aquifers generally concludes that tidal influence was not measurable at the locations monitored."

12. Page 204, Figure 3.10-2, is titled "Groundwater Depth in Moffett Park" (note – 'depth to groundwater' is the commonly used term) but the figure legend uses the phrase "water table elevation (NAVD)". Depth to groundwater and water table elevation mean two different things. The figure legend and title need to be corrected as noted for accuracy and consistency.

13. The discussion on page 206 regarding flooding should note that the Specific Plan area includes areas in a Special Flood Hazard Area(SFHA) AE to the north and east and areas to the south and west are generally located in Zone X, protected by levees. Areas currently designated as Zone X, which is not a SFHA, may in the future be subject to increased flooding due to sea level rise or other changes that impact the levees that currently protect those areas.

14. The discussion of flooding of Sunnyvale East and West Channels on page 206 needs to be revised for accuracy. Please replace the sentence regarding flooding on these channels with the following:

    "The cause of high-water levels on Sunnyvale East and West Channels could stem from multiple factors, including backwater flows from San Tomas Aquino and Calabazas Creeks, coastal flood events, high flows on the creeks themselves and higher roughness in the channel. Flooding could potentially occur from a combination of one or more of these factors."

15. The discussion on page 206 under "Flooding and Other Inundation Hazards" states, "The Shoreline Project, a joint effort between Valley Water, Coastal Conservancy, and the United States Army Corps of Engineers (USACE), is planning, designing, and constructing a shoreline levee to replace the protection provided by the salt pond berms." The DEIR should also note that the Shoreline Phase III Feasibility Study will determine the feasibility of implementing various options to protect the low-lying areas along the Santa Clara County shoreline at risk to coastal flooding and sea-level rise as well as identify opportunities for environmental restoration and expanded public access to San Francisco Bay. The outcome

of the Shoreline Phase III Feasibility Study must determine that there is a positive benefit to cost ratio of building coastal flood protection in the study area in order for the project to move forward with design and construction. After the completion of the feasibility study, the project must compete nationally for congressional funding. The project partners, including the City of Sunnyvale, must work together throughout the feasibility study and beyond in order to build appropriate shoreline protection. It should also be noted that at this time the feasibility study has not commenced.

16. The discussion of impacts related to flooding on pages 210 (Impact HDY-3), 211 (Impact HYD-4) and 212 (Impact HYD-C) do not discuss how new development will be protected from existing flooding or comply with the National Flood Insurance Program requirements and City floodplain policies and requirements. Nor do the discussions address the additional fill proposed to raise the finished floors of non-residential buildings (page 214) as may be required for residential buildings to meet federal and City floodplain ordinances would impact both the extent and depth of existing flooding. While Valley Water is working to make flood protection improvements on both Sunnyvale East and West Channels as part of our capital improvement program, until these projects are completed and the Flood Insurance Rate Maps (FIRM) are revised, development within existing Special Flood Hazard Areas (SFHA) will need to comply with federal and City flood ordnance requirements. Additionally, Valley Water's projects may not remove all properties currently located within the SFHAs for various reasons including flooding from other sources such as tidal flooding.

17. In the second paragraph on page 322 under "Groundwater", please either delete the term "safe yield" regarding groundwater extraction of 8,000 AFY because that term is not used in Valley Water's 2021 Groundwater Management Plan or provide a proper citation if that term is used in a City of Sunnyvale planning document. Additionally, the word "received" should be replaced by "pumped" in the sentence "In fiscal year 2021 to 2022, the City of Sunnyvale received 135 AF of groundwater."

18. The discussion on page 335 regarding water supply and the Water Supply Assessment in Appendix J conclude that the project could increase water demands up to 7,400 acre-feet per year beyond the estimated use in the City's 2020 Urban Water Management Plan. Even before these additional demands the Urban Water Management Plan already assumes a substantial increase in water conservation to allow supplies to meet future demands. Valley Water encourages the City to help meet this water conservation goal by requiring all available water conservation measures in the master plan. Valley Water has been working with jurisdictions throughout the county on a Model Water Efficient New Development Ordinance that the City may consider ensuring that there are sufficient water supplies into the future. Measures from the Model Water Efficient New Development Ordinance include:

    - Hot water recirculation systems;
    - Alternate water sources collection (like cisterns) and recycled water connections as feasible;
    - Encourage non-potable reuse of water like recycled water, graywater and rainwater/stormwater in new development and remodels through installation of dual plumbing for irrigation, toilet flushing, cooling towers, and other non-potable water uses;

- Require dedicated landscape meters where applicable;
- Require installation of separate submeters to each unit in multi-family developments and individual spaces within commercial buildings to encourage efficient water use (Studies have shown that adding submeters can reduce water use 15 to 30 percent); and
- Use of weather- or soil-based irrigation controllers.

19. Appendix G, Technical Memorandum: Stormwater Management, the first sentence on page 14 states, "…including the reasons for increased groundwater discharge in recent years". It is not clear from the report what, if any data or technical analysis is used to support that statement. The DEIR should specify what specific years does "recent years" represent in this sentence.

20. Appendix G, Sunnyvale Sea-Level Rise Adaptation Strategy: Background, Groundwater Vulnerability Assessment, page 37, as the Groundwater Sustainability Agency for the Santa Clara Subbasin, Valley Water would be interested in coordinating efforts to supplement the initial assessment of increasing groundwater hazard due to sea-level rise by the Plane et al. (2019) study.

Please provide a copy of the Final EIR when available. As proposed developments/projects are proposed please forward project specific CEQA and project proposals for Valley Water review. For any questions you may contact me at
sdharasker@valleywater.org

Sincerely,

DocuSigned by:
Colleen Haggerty
7BA292496623483...

for Shree Dharasker
Associate Civil Engineer
Community Projects Review Unit

cc: Y. Arroyo, S. Dharasker, V. De La Peidra, S. Ferranti, C. Haggerty, M. Martin, E. Zedler, R. Grillo, L. Bankosh, R. Blank, J. Bourgeois, B. Yerrapotu, File

brick.

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10 February 2023
Michelle King
Principal Planner
456 West Olive Ave.
Sunnyvale, CA 94086
mking@sunnyvale.ca.gov

Re: Comments on Draft Moffett Park Specific Plan

Dear Ms. King:

I hope this letter finds you well. Brick. would like to express its support for the Moffett Park Specific Plan's goals of creating a more connected, inclusive and sustainable built environment. Our thanks goes out to the City staff and the team of consultants who have put together a very thoughtful plan for the future of Moffett Park. As architects currently working in the City, we appreciate the opportunity to contribute to the success of the Moffett Park Specific Plan and to the future of the City of Sunnyvale.

As an architectural firm with a strong interest in sustainable design and urban planning, we are writing to express some of our points of concern regarding the Draft Moffett Park Specific Plan. We believe it is important to provide constructive feedback on proposals that will shape the future of the city, and we believe the Draft Moffett Park Specific Plan could benefit from some revisions.

Firstly, we would like to address the issue of street and infrastructure improvements. While we support the goal of creating a sustainable community, we do not believe that upgrading all infrastructure, regardless of whether it is necessary or not, is an economically sustainable policy. This approach will certainly lead to a significant increase in costs for developers and may jeopardize the feasibility of many projects. Instead, we believe that the city should focus on upgrading infrastructure only when it is necessary and where it will have the greatest impact on sustainability and livability.

Another area of concern is the requirement for green roofs. As architects, we believe that green roofs are an important tool for reducing the urban heat island effect, improving air quality, and providing additional outdoor space. However, we also believe that the requirement for green roofs may limit the feasibility of mass timber projects given the weight requirements and the additional structural support necessary. The sustainable benefits of a green roof, namely stormwater retention and heat island reduction, can be achieved in other ways that do not require increasing the structural capacity of the building.

Finally, we would like to highlight the requirement for Creation/Innovation spaces in the O-1 and O-2 zones. While we believe that these spaces have the potential to be an important asset to the new district, we have concerns about the specific requirements outlined in the Draft Moffett Park Specific Plan. The tenant market for these types of small spaces is limited, which will result in many empty spaces. Many large corporate tenants cannot share their campuses with other tenants due to security concerns. Additionally,

the requirement for redundant infrastructure, such as electrical services and generators, will increase the carbon footprint of the project and place additional demands on the city's infrastructure.

We believe that the Draft Moffett Park Specific Plan has the potential to be a positive step forward for the city of Sunnyvale, but also believe that some revisions are necessary to ensure that it is sustainable, livable, and economically viable. We would be happy to engage further in this important conversation and provide any additional feedback that may be of assistance.

Thank you for your time and consideration.

Sincerely,

Mathew Combrink
Design Partner

From: Gladwyn D'Souza [redacted]
Sent: Friday, February 10, 2023 12:17:41 PM
To: Michelle King <MKing@sunnyvale.ca.gov>
Subject: SCH #2021080338 Moffett Park Specific Plan

Because of out of attainment NOX, Ozone and VMT in Appendix D- Air Quality- the project should add feasible measures for AQ public health impact reduction.

1. Charge incoming vehicles via Fastrak or video; and rebate automatically with cashout, those that are electric, including e and other micromobility, and who would participate in the program via rfid, or face recognition.

2. The TDM, set a goal of 50% SOV, is excellent but is still out of attainment of PM2.5. Increase mitigation via increased vegetative barriers, indoor air filters, and a stronger target like 25% SOV. CARB in 2005 recommended that housing be located 500' away from pollution sources. Recent recommendations in the European Union say the barrier should be 1000' to avoid significant epigenetic effects. Highway Vegetative Barriers are on way to reduce impacts.

3. The recommendations in 2 will also reduce GHG. Reduce GHG further feasibly by designing the project as a microgrids for 24/7 renewables similar to the google project in San Jose at Diridon station and use geothermal for fixed power.

Regards,
Gladwyn

Google LLC
1600 Amphitheatre
Parkway
Mountain View, CA 94043

650 253-0000 main
Google.com

February 10, 2023

City of Sunnyvale
Community Development Department, Planning Division
Attn: Michelle King, Principal Planner
456 West Olive Avenue
Sunnyvale, CA 94086
Sent via email mking@sunnyvale.ca.gov

Dear Michelle,

Google LLC appreciates the opportunity to provide public comment on the Draft Environmental Impact Report (DEIR) for the Moffett Park Specific Plan (MPSP), State Clearinghouse No. 2021080338.

As set forth in Section 2.3 of the DEIR, the City's vision for Moffett Park is as follows: "Moffett Park is an integral part of Sunnyvale, and a well-connected ecological innovation district with a diverse mix of uses that serves as a model of resilience, climate protection, equity, and economic opportunity." The City's guiding principles for the MPSP include creating a healthy, resilient, and biodiverse environment and integrating innovative and emerging technologies in the district to support the community wide goals. (DEIR, Section 2.3.)

Consistent with this vision and guiding principles, the MPSP and DEIR contain implementing policies such as IU-3.3, which is specific to utilities and service systems, and provides: "Encourage sustainable development practices for development projects to reduce the demands on the water supply and sanitary sewer systems, including use of recycled water indoors, installation of localized blackwater systems, regenerative and high efficiency landscape practices that reduce water and energy use, development of private district utility systems, and increased building efficiency beyond City standards."

Google LLC supports the City's vision for Moffett Park as an ecological innovation district, and specifically supports any future proposals for private district utility systems (District Systems) consistent with the MPSP and DEIR's policies and analysis. This letter describes District

Systems, including the components necessary to enable District Systems and the service options; the benefits of District Systems compared to business-as-usual; and the most accurate way for District Systems to be studied and assessed in a future project context.

Projects within Moffett Park could construct and operate private District Systems that could serve certain buildings within the Master Plan with wastewater, recycled water, thermal energy (heating and cooling), centralized waste management and local renewable energy generation. The District Systems would include two primary components: (1) one or more Central Plants (CP), and (2) a network of underground pipe connections that connect multiple buildings to the CP.

The particular District Systems that could be implemented in Moffett Park could include:

- Local renewable energy generation and battery storage.
- District Thermal with all-electric heating and cooling systems.
- Water Reuse Facility that treats wastewater to create recycled water for non potable reuse. This could include the use of pyrolysis or anaerobic digestion (including best management practices for odor control) for onsite solids management.
- Centralized Waste Management opportunities to manage waste at the source to become a resource.

Associated with a District Thermal System, there are a number of integrated technology opportunities to increase energy efficiency and reliability, such as:

- Thermal Storage tanks or materials with high thermal capacity.
- Waste Heat Recovery Systems including heat recovery from sewer lines (related to Water Reuse and District Thermal).
- Ground-Source Heat Exchange Field (i.e., geofield): where possible, geofields would be implemented to leverage renewable, seasonal thermal energy storage. Geofields could consist of energy piles either integrated with a structural pile foundation or as drilled bores underneath a mat slab foundation. Energy bores could also be implemented in open space (i.e., not as part of a building's foundation system). The energy bores could have a maximum depth of 500 feet.

District Systems provide significant benefits compared to business-as-usual utility connections. For example, District Systems can provide the following:

- **Increased environmental performance** through energy efficiency, reduced carbon footprint, reduced potable water use, increased reliability,
- **Reduced burden on city infrastructure**,
- **Improved urban outcomes** through significantly reduced building equipment footprints, resultant noise and pollutants, and

- **Circular economy and innovation** by providing local opportunities to innovate through reusing resources and addressing the City's targets of carbon neutrality and climate action goals.

Any environmental review of future projects with proposed District Systems (or with the option for District Systems) should not consider District Systems as additive to business-as-usual (i.e., additive to a baseline project with conventional utility connections). Rather, any future environmental review of projects with District Systems should analyze the impacts of District Systems, which is anticipated to be below the impacts of business-as-usual.

Thank you for the opportunity to provide these comments, and we look forward to the future growth of Moffett Park.

Sincerely,

Jeff Holzman
Director of Real Estate Development – Sunnyvale

MPSP Questions

PG. 46: What does the city anticipate for maintenance of parks on private property? What is the role for property owners? Will easement agreements be put in place to protect property owners from liability from public access to the property?

PG 74: What does, “expansion and restoration of LM Stormwater Detention Area” mean?

PG 74: Plan calls for extension of Discovery Way across Navy site. Would this be dedicated public road to City?

PG 79: Navy Site MP-E1 zoning – Allows mix of uses, but only mentions corporate office. Please confirm that light industrial including warehouse and distribution is allowed.

PG. 84: How does District Parking work? District parking is excluded from FAR. Is structured non-district parking included in FAR?

PG 86: Since not requesting Bonus FAR, is north parcel exempt from development agreement requirement?

PG 89: Need to prepare and submit a Habitat Enhancement and Management Plan and a maintenance and management plan. Clarify 1) FAR can be transferred anywhere in Moffett Park? 2) is preparation of plans only requirement or is implementation, maintenance and management required? 3) Can we transfer FAR to other owned sites in West Matilda neighborhood to be “banked” for future use, without a development plan? 4) If so, if we sell site with banked FAR in future to a developer, can they use “banked” FAR without incurring Community Benefit obligations for the banked FAR?

PG 93: What is definition of creative space not adjacent to Residential? How is creative space going to work in our secure core campus?

PG 96: Can new public streets West of Matilda be dedicated?

PG 97: Existing private utilities shall be improved to City standards. Is this continuation of current policy in which streets fronting redevelopment need to be improved OR an expansion of this policy? Who determines dedication City or Developer?

PG 187: Why showing so many new vehicular streets on Navy site? Exempted on Page 103 from small blocks.

PG 226: Project can exceed parking maximum by 50% if all excess shared with public. So this means the excess could not be leased by tenants but available for first come, first serve?

PG 227: How does “At Adoption” “Mid Term” and “At Full Build Out” work? Is this by project or over the years for all of Moffett Park? Office numbers too low, especially “Mid term” and “Full Build Out”. Residential should not go below 1.0 – Near impossible to sell / lease unit without parking.

PG 228: Can office tenant or resident have renewal options for parking lease?

PG 287: Objective to cap parking at 57K spaces for all of Moffett Park. Why this number? Never cited in EIR.

EIR Questions

PG 138: New natural gas services to be prohibited in Moffett Park? Is this an issue for our continuing industrial operations! Can exemption for industrial uses be incorporated?

PG 296: District Parking Strategy: Mostly centralized in series of shared parking garages. Additional detail on how this would work?

From: Perry Hariri <phariri@miramarcapital.com>
Sent: Friday, February 10, 2023 4:56:42 PM
To: Michelle King <MKing@sunnyvale.ca.gov>; Trudi Ryan <tryan@sunnyvale.ca.gov>; Ray Hashimoto <rhashimoto@HMHca.com>; Ian Murphy <imurphy@bdearch.com>; Nathan Simpson <nsimpson@bdearch.com>; Laird Bennion <LBennion@miramarcapital.com>; Jennifer Renk <JRenk@sheppardmullin.com>
Subject: Comments on Moffet Park Specific Plan Draft EIR

Michelle,

Below please find the comments from our team on the Draft EIR

Perry Haririr
Managing Partner

MIRAMAR CAPITAL
4300 Stevens Creek Blvd | Suite 180 |San Jose, CA 95129

email phariri@miramarcapital.com
mobile 925.580.1438
website www.miramarcapital.com

From: Ray Hashimoto <rhashimoto@HMHca.com>
Sent: Friday, February 10, 2023 10:20 AM
To: Perry Hariri <phariri@miramarcapital.com>; Laird Bennion <lbennion@miramarcapital.com>
Cc: Ian Murphy <imurphy@bdearch.com>; Jennifer Renk <JRenk@sheppardmullin.com>
Subject: Comments on Moffet Park Specific Plan Draft EIR

Below are our comments to the EIR focused on the infrastructure/utility items and the appendices that support their findings:
In the BKF Waste Water Master Plan Report (October 2022) Section 6.0- Existing System Evaluation (BKF Report), it indicates that there was an evaluation of the "Cumulative Impact Evaluation and Cumulative Impact Improvements. If this evaluation includes off site flows + the flows created by the Moffett Park Specific Plan (MPSP) full build out, the proposed new sanitary sewer system is overbuilt to accommodate sanitary sewage for the entire City of Sunnyvale (City). The builders and developers in the MPSP should not be held entirely responsible for the cost of this City-wide system upgrade. Accordingly, a careful nexus study must be completed to

determine the level of incremental responsibility the new MPSP development should contribute to the new City-wide system. Under the total cost estimates in the BKF Report, there is only a $ 600,000 difference ($17.9 million vs. $18.5 million) between the total cost for the MPSP improvements versus the cost to remedy existing deficiencies. This indicates that the MPSP projects are responsible for a the lion's share of the City-wide upgrade. These significant improvement costs not only add to the cost of housing, but appear to be disproportionate to the actual MPSP impacts to the sanitary sewer system.

Moreover, the BKF Report calls for upping the size of the primarily 12" water main system to 16" and 18' mains. This upsizing seems very conservative and may be setting up an the overbuilding of the water system to a level that is not needed or necessary. Again, we are concerned about the significant cost of providing new infrastructure that seems to be over engineered for the actual needs in the MPSP, which will result in higher costs for the much-needed housing in the City that the MPSP seeks to unlock.

Ray Hashimoto, AICP
Principal, Land Development Manager

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MIRAMAR CAPITAL

February 10, 2023

Ms. Trudi Ryan, Community Development Director
Ms. Michelle King
City of Sunnyvale
456 West Olive Ave
Sunnyvale, CA 98088-37

Re: Moffett Park Area Specific Plan Draft
Java Drive Project Site

Dear Ms. King:

As you know, Miramar Capital has submitted to the City a development concept design for a 300+ unit residential project on a +/- 2.0-acre site located at 352 E. Java Drive, the SE corner of Java Drive and Geneva Drive, to inform the drafting of the policies and standards for the South Java area of the Moffett Park Specific Plan (MPSP). The recently released Draft MPSP appears to have changed dramatically since the last public presentation. We are concerned that certain new policies and development standards of the draft MPSP will make it infeasible and impractical to accomplish the goals of the MPSP to develop high-density residential in the South Java Area which is critical to achieve the jobs and housing balance and support the CEQA analysis for the MPSP. Below is a synopsis of our concerns:

1. We have studied and optimized our design for the highest residential density possible that is viable and feasible on our site. The design would include parking above grade at 0.82 spaces/unit. Soil conditions in that area of Moffett Park are poor, mostly due to a high groundwater table, and subterranean parking and deep foundations for Type I (concrete) high-rise construction at that location are not viable. The maximum density we can achieve for a marketable and feasible product on that 2 ac. site is a Type III (5-story wood over 2 story concrete) building with 330 units. Type I (concrete) high-rise construction, even with ideal soil conditions, is not viable due to construction costs and interest rates. We are not aware of many, if any, Type I high-rise residential projects under development in the market.

2. **Most critically, the proposed 50-foot diagonal bike/ped (The Diagonal) path would bisect our site and many other parcels in the area** and drastically reduce our developable site and render development of any building on the parcel infeasible by dramatically increasing costs and causing design inefficiencies. A 50-ft wide path through the middle of the site would create 2 small and irregular shape parcels that could not be developed practically and feasibly. The 330 units shown on our concept plan is possible only if we utilized our parcel fully and optimally as shown on our submitted concept plan. We are aware that the City would need us to maximize density on our site in order to make Moffett Park walkable and dense and make the jobs/housing ratio work for the CEQA analysis. However, the changes to the MPSP render our parcel, and other residential land use designated parcels, incapable of supporting any development and density above their current uses. We believe that there are viable alternatives to provide bike and pedestrian access on the perimeter of our site, as proposed on our concept plan, to ultimately link to the Java Drive LRT station.

3. Limiting lot coverage to 70% (+15% for additional hardscape elements) and excluding publicly accessible open space from the net site area, further impedes the ability to develop sites utilizing podium courtyards and/or Type V or Type III construction which is the only construction type viable for residential construction in this market. No type of residential construction will be possible on that site with these lot coverage development standards.

4. "Floor Plate Reduction" and "Façade Step-Back" above the 7th story are not compatible with high density mid-rise residential apartment design. Efficient multi-family residential projects rely on stacked floor plates for continuity of building systems and acoustical relationships of adjoining uses. These development standards will further reduce density and feasibility and increase costs of residential construction.

5. The "Major Break" requirement as part of the building modulation within the Fine Grain Core Area currently requires a 20' deep recess into the building massing. This requirement will further reduce the potential residential density of the project. Alternatively, a 5-foot deep recess would allow for substantial and meaningful massing break while still accommodating a reduced depth unit design and maintaining the project's density goals.

6. The requirement for 4" offset from glazing to the exterior building finish will require the use of more complicated framing and waterproofing and will cause the project to incur significant cost above and beyond what is seen elsewhere in the market.

7. Requiring transformers to be located inside of buildings or underground is another development standard which make construction of residential projects impractical and infeasible. As PG&E and other utilities have routinely prohibited the installation of underground transformers with their jurisdiction, this language will force transformers inside of buildings into areas that are already scarce and in high demand in high-density buildings in order to accommodate other uses and program such as storage and trash and parking access. Given that these transformer rooms have strict exterior access requirements, the addition of these rooms will add larger areas of solid walls and doors to project facades at the street level where activation and glazing is the most desired and will make it difficult to provide storage, parking access or trash areas.

8. The use of terms like "shall" in the MPSP provides no flexibility or alternatives compliance for projects. We suggest that alternative terms such as "encouraged" or "considered" be used to meet the intent of a design requirement and provide flexibility to staff and applicants to achieve the goals of the MPSP.

The objections stated above are not exhaustive and highlight many of the critically concerning features, conditions and standards which render development of a residential project on our site infeasible. In order for the city to achieve the desired goals of 7,500 dwelling units in the South Java District, we would need development standards that accommodate and support the maximum and optimally feasible development of the residentially designated parcels. We look forward to scheduling further meetings with you and staff to discuss our concerns and propose alternative standards.

Sincerely,

Perry Harati
Miramar Capital

From: Mitch Price [redacted]
Sent: Tuesday, January 17, 2023 11:48:32 PM
To: Michelle King <MKing@sunnyvale.ca.gov>
Subject: Questions about Table 3.17-2 in the Draft EIR for the MPSP

Hi! I have a few silly questions about table 3.17-2 on page 297 of the draft EIR:

1. I checked the referenced table (page 9 of "Moffett Park Specific Plan CEQA Transportation Analysis" in Appendix I), and it shows a different mode share for non-driving external trips. It looks like the "Total" mode split on Table 4 of the Transportation Analysis has accidentally been transposed into the draft EIR as "External" mode split at build out, resulting in the "Bike-Walk" percentage being over-inflated.

2. Additionally, I am confused as to where the 587,222 average daily trips being generated comes from and was unable to find it in the Transportation Analysis report - is there an explanation of where this is calculated somewhere? Thanks!

REUBEN, JUNIUS & ROSE, LLP

Melinda Anne Sarjapur
msarjapur@reubenlaw.com

February 9, 2023

Delivered Via E-Mail and Mail

Michelle King, Principal Planner
Sunnyvale Planning Department
Sunnyvale City Hall
456 West Olive Avenue
Sunnyvale, CA 94086
Mking@sunnyvale.ca.gov

Re: Moffett Park Specific Plan - Draft Plan and Draft EIR Comments
Our File No.: 6414.08

Dear Michelle:

Our office represents the owner ("**Owner**") of real property located at 250 East Java Drive in Sunnyvale, California (the "**Property**"). The Property is located within the Moffett Park Specific Plan ("**MPSP**") area.

This letter provides the Owner's comments on the Draft MPSP and Draft MPSP EIR, which were released for public review on December 22, 2022.

On February 1, 2023, the Owners architects - DLR Group - met with members of the Sunnyvale Planning Department to discuss the potential impact of MPSP re-zoning on the Property and to relay initial comments regarding MPSP policies and design controls that have the potential to impact maximum residential development capacity at the Property.

We appreciate this opportunity to provide written feedback on the Draft MPSP and Draft MPSP EIR, and look forward to continued engagement with the Department and key community stakeholders as these materials are refined leading up to final approval.

As discussed, the Owner supports the Draft Plan's vision for creation of an ecological innovation district that will become an integral part of Sunnyvale, with active, unique and sustainable neighborhoods creating the potential for up to 20,000 new homes. The comments below are intended to facilitate this vision by ensuring feasibility of anticipated new residential development necessary to transform the plan area.

A. Draft MPSP Comments

Draft MPSP Section	Discussion	Request
Chapter 4.4, pg. 82 (General Land Use)	*Land Use Controls for MP-R District.* The Draft Plan states that allowable land uses in the future MP-R District are listed in the Sunnyvale Zoning Code. However, there is no existing MP-R District to draw from in the Sunnyvale Zoning Code.	Please provide proposed allowable land uses the future MP-R district within or as an attachment to the Draft MPSP.
Chapter 4.4 Chapter 10	*Plan Area Permitting Requirements.* The Draft Plan states that all development will be required to submit a Site Master Plan for review, and that neighborhood-serving commercial uses will be subject to permitting requirements in the City's Zoning Code. However, the current zoning code does not identify commercial permitting requirements for the future MP-R District, and the Draft Plan does not provides little additional detail on entitlement process for Plan area redevelopment. Draft Plan Section 10.3 states that Site Master Plan requirements are established in a separate set of guidelines.	Please provide commercial use permitting requirements for the future MP-R district within or as an attachment to the Draft MPSP. Please provide additional detail regarding the proposed Site Master Plan review and approval process, and if additional entitlements are anticipated to be required for residential development within the MPSP area. Please also provide a reference to the Site Master Plan requirement guidelines.
Chapter 4.4, pg. 82-83 (General Land Use)	*Residential FAR in the MP-R District.* The Draft Plan states that residential development in the MP-R District will be subject to a Total Maximum FAR of 350%, but indicates that no Base or Bonus FAR applies to residential development in this area. The Draft Plan also states that residential development is not subject to maximum density controls, and that instead maximum density is limited through detailed form-based design standards.	Application of a Total Maximum FAR functions as a de-facto residential density control by capping total allowable residential floor area within a given property. Please confirm that above grade parking levels would not count towards Total Maximum FAR. Please also confirm that community service Retail/Commercial space (not required on the Property would not count towards Total Maximum FAR.

		As the Plan aims to encourage high-density residential development and already incorporates detailed form-based density design controls (height/bulk/setback/open space), we suggest potentially eliminating the additional Total Maximum FAR limit in this district. Alternately, we suggest the following: • For purposes of calculating Total Maximum FAR, please clarify that Total Maximum FAR is to be based upon total, <u>current</u> gross parcel areas. • Allowing development that proposes a high-rise development of 85' in height or greater to achieve an additional FAR bonus (potentially 0.5:1) for areas above the 8th floor of buildings, with no associated requirement to obtain transfer of development rights from the Development Reserve; increased entitlement process (i.e. Development Agreement) associated with this bonus; or requirement for additional community benefits. This would incentivize development of the high-rise typology encouraged by form-based design controls within the district by allowing for additional residential area to offset increased development costs.

Section 5.2 (Site Design) Figure 32 (Parks and Open Space Framework)	*Certainty of Laneway Location.* The Draft Plan states that block breaks will be accomplished via creation of laneways equivalent to with a minimum width of 50' which may or may not be open to vehicular access. The Draft Plan states that the location of these laneways on Draft Plan figures are diagrammatic, flexible and will be determined through the Site Master Plan review process for proposed redevelopments. However, location of laneways is also to be determined to some extent through maximum lot size and dimensional restrictions. As properties within the plan area are anticipated to be redeveloped over time, there is a potential that the first site design to be approved will result in precedential laneway placement that negatively impacts the potential for future residential development on adjacent sites, or that the first site to be developed would be required to absorb a disproportionate burden of full laneway area dedication within their own parcel.	In order to ensure equitable division of existing land parcels, increase certainty in the future redevelopment process, and ensure a well-coordinated transportation network consistent with the Draft Plan's vision, the Owner requests that the Draft Plan provide a fixed location for future laneways and their operation. On the Property's block, the Owner suggests the following guiding principles: • A single east-west laneway be required at approximately the centerline of the block with vehicular access. • Laneways straddle existing property lines (e.g. a 52-ft wide laneway encroach no more than 26-ft inward from each existing property lines. • Laneways not be required in a manner that splits exiting parcels.
Section 4.9 (Dedication and Easement Requirements)	*Indeterminate Encroachment through Existing ROW Widening.* The Draft Plan requires redeveloped properties to make substantial public area dedications through easements or other means, including the area required to widen certain Plan area streets adjacent to private parcels. However, little information is provided on the existing width of public ROW and improvements within the Plan area, which is necessary for owners to confirm the extent of public land dedication that will be required on their frontages.	Please indicate the existing street and right of way widths throughout the plan area to enable existing owners to confirm the extent of additional public land dedication required along their frontages. For Java and Geneva (amongst other streets) the Owner suggests having the suggested ROW be overlaid relative to existing street surveys, to understand the encroachment/easement being required.

Section 5.2.3 (Lot Coverage)	*Lot Coverage*. The Draft Plan states that development in the MP-R District will be subject to a maximum lot coverage area of 70%. However, the term "lot coverage" is not clearly defined, and is controlled through other detailed form-based density restrictions such a public area dedication and minimum building setback requirements along public streets and future laneways. From the team's preliminary discussion with Planning staff on 2/1/23, it is our understanding that the intent is for this lot coverage restriction to apply above a building base of up to two levels (or 25 feet) high.	Please clarify that this 70% lot coverage requirement would begin Lot coverage be measured above a 'podium', at least two levels (or 25-feet) high. We further request either that: • the lot coverage requirement be increased to 80% of Net Parcel Area; or • for purposes of Total Maximum FAR and maximum lot coverage, the Net Parcel Area be based upon existing parcel dimensions (prior to open space dedications).
Section 5.3.4 (Usable Open Space) Section 5.4.3 (Green Roofs)	*Open Space – Amount and Credit* Under the Draft Plan, public open space dedication reduces Net Parcel Area, but despite the practical function of providing usable open space for both building residents and the community at large these areas are not credited against project usable open space requirements. Under the Draft Plan, building setback areas in addition to public open space dedication areas may not count toward project usable open space requirements. Under the Draft Plan, certain minimum green roof requirements apply.	We suggest allowing development to credit the area of public open space provided through required easements to be credited toward private usable open space requirements. We suggest allowing the area of required ground-level setbacks on a property to be credited toward private usable open space requirements of development on that property, regardless of minimum width dimensions. We suggest allowing development to provide additional publicly-accessible-private-open-space ("POPOS") areas beyond the public easement areas required by the Plan, and to credit the area of POPOS toward private open space requirements of the development at a reduced ratio (i.e. every square foot of voluntary POPOS provided

		credited as 2 square feet of common usable open space). Please clarify that the area of Green Roof provided may count toward usable open space requirements.
Chapter 4, pg. 85. Section 5.3.4	*Potential Usable Open Space Conflict Language.* The Draft Plan states that "all development must comply with the SMC Title 19 with regard to usable open space and landscaping." However, the Draft Plan provides usable open space and landscaping requirements under Section 5.3.4, and the existing zoning code does not have usable open space requirements specific to MP-R Districts.	Please clarify the specific usable open space and landscaping requirements applicable to development in the MP-R District under both the Draft Plan and Sunnyvale Municipal Code.
Section 5.3 (Building Design) Figure 30	*Clarification of Maximum Building Height.* Figure 30 shows maximum building heights throughout the Draft Plan area. This figure indicates that the Property is largely within a 160' height district, with a portion along the west edge shown as 170'.	Please clarify the map is accurately reflecting the proposed heigh limits on this Property, and clarify the proposed dimensions of split height district intended for the Property.
Section 8.3.1 (Vehicle Parking Maximums) Table 24	*Parking Ratio – Phasing.* The Draft Plan indicates that maximum parking amounts will be phased.	Please provide more information regarding the proposed phasing methodology. Would this be determined by set time periods within the overall Plan period or triggered by percentage of Plan area build-out?
Section 8.2.1 (Vehicle Parking Maximums)	*Parking Ratio – Shared Parking Bonus.* The Draft Plan allows development to exceed otherwise permitted maximum parking limits by up to 50%, provided that all of the additional spaces over the maximum "shall be shared with the public at all times."	Please clarify that this 50% bonus is tied to the per-unit maximum parking ratio in effect at the time the development is approved. (ex: At plan adoption, the residential maximum of 1 space per unit would increase to 1.5 spaces per unit).

		We request that the Draft Plan language be amended to allow shared public parking spaces to be made available to the public only during daylight hours or fixed hours (ex: from 7 a.m.-10 p.m.) rather than "at all times." This is to address security concerns that arise with public access to private residential development 24/7.
Global	*Economic Feasibility.* Creation of the Plan's vibrant new communities and ecological innovation district would be accomplished through the establishment of public easements, creation of ROW widening, open space and landscape improvements undertaken through redevelopment of individual parcels within the Plan Area. Accordingly, it is critical that the zoning and design controls adopted in connection with the Plan facilitate future residential redevelopment of existing sites under current and reasonably anticipated future market conditions. If development of these sites does not "pencil" for property owners, they will not proceed with redevelopment and the associated community benefits and exactions necessary to finance public improvements within the Plan Area would not be achieved.	We request that the Department evaluate the economic feasibility of residential development within the Plan area based upon typical building typologies incorporating the Draft Plan's detailed form-based density design requirements, horizontal site area restrictions, public opens space obligations, and proposed increases to development impact fee exactions for plan-area development. We further suggest that the Department conduct a workshop to coordinate and share comments specifically amongst potential residential developers within the Draft Plan area and to explore current incentives and barriers to the form of high-density residential development proposed by the Draft Plan.

B. MPSP Draft Environmental Impact Report Comments

DEIR Section	Discussion	Requested Modification
Project and Alternatives Selected	This section discusses the scope of development under the proposed project analyzed by the EIR and describes various alternative projects	The Owner strongly urges City adoption of the proposed project and rejection of all other alternatives discussed in this section, as the full

Section 7.0	considered by the City during review.	project scope is most closely aligned with the goals and policies evaluated under the MPSP.

Thank you for your consideration of these comments.

Very truly yours,

REUBEN, JUNIUS & ROSE, LLP

Melinda A. Sarjapur

Enclosures:

cc:

SIERRA CLUB
LOMA PRIETA CHAPTER

SCVAS
Santa Clara Valley Audubon Society

Citizens Committee to Complete the Refuge
SAN FRANCISCO BAY

February 10, 2023

Michelle King, Principal Planner
Department of Commercial Development
City of Sunnyvale
456 West Olive Avenue
Sunnyvale, CA 94086

mking@sunnyvale.ca.gov

Re: Draft Environmental Impact Report, Moffett Park Specific Plan, File No. 2021080338

Dear Ms. King,

Sierra Club Loma Prieta Chapter, Santa Clara Valley Audubon Society and the Citizens Committee to Complete the Refuge are environmental organizations with interest in the San Francisco Bay and our region's wildlife and natural resources. Due to the Moffett Park Specific Plan area's proximity to San Francisco Bay, new development in the Plan area raises significant concern. We therefore participated in every opportunity to provide public comment on the Moffett Park Specific Plan (MPSP) as it developed. We appreciate the efforts to address our wishes and concerns and thank the City for including "Non-CEQA effects" since the analysis of climate change and sea level rise on the project is important for planning where regulatory statutes come short. We submit the following comments on the MPSP and the associated Draft Environmental Impact Report (DEIR).

3.3 Air Quality

Please discuss the health effects of air pollution, such as gaseous emissions and particulate matter, and analyze cumulative impacts on air quality. Please include large projects in Sunnyvale and in nearby jurisdictions (Santa Clara, North Bayshore and East Whisman in Mountain View, Peery Park in Sunnyvale, Development in Moffett Field and the Salt Pond Restoration Project).

3.4 Biological Resources

Consultations with Wildlife Agencies

The Biological Resources analysis identifies a number of special-status species (Burrowing owls, bees, western pond turtles, roosting bats, salt marsh harvest mouse, dusky-footed woodrat) with the potential or likelihood to be present in the MPSP area and its vicinity. Standards for analysis of impacts and for

avoidance and mitigation measures should be specified, and permitting and reporting requirements for these species should be clear.

- The DEIR should identify and describe the regulatory responsibility of both wildlife permitting agencies, including the United States Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW). For each special-status species or biological resource, please identify which wildlife agency(s) should be consulted.
- The DEIR requires surveys and/or special-status Species Plans to be prepared for subsequent developments. However, the DEIR erroneously assigns City staff to review and approve such Species Plans, reports, and outcomes from surveys. Sunnyvale is not a qualified agency to approve avoidance and/or mitigation measures and special-status Species Plans for endangered, threatened or Species of Special Concern. Consultation with the responsible wildlife agencies is the appropriate level of protective action. The EIR should describe the consultation process and responsible agencies for each special-status species.
- For all subsequent projects that are planned on undeveloped parcels, or on any parcels located near open space or water features (wetlands, creeks) and other habitat areas, for each special-status species that has the potential to occur, additional environmental review should require consultation with CDFW and include:
    a. Criteria for the selection of qualified biologists,
    b. Criteria for evaluating potential disturbance or "take",
    c. Criteria clarifying and directing survey protocols,
    d. Avoidance periods and buffer distances,
    e. Criteria for requiring Biologist supervision of construction activities,
    f. Reporting requirements,
    g. Reporting of incidents that impact the habitat and/or special status species in question.

Recovery Plans

The DEIR and Appendix F should include reference to USFWS plans that guide recovery of the following federally listed species: the salt marsh harvest mouse, the Ridgway's rail (formerly California clapper rail) and the western snowy plover.

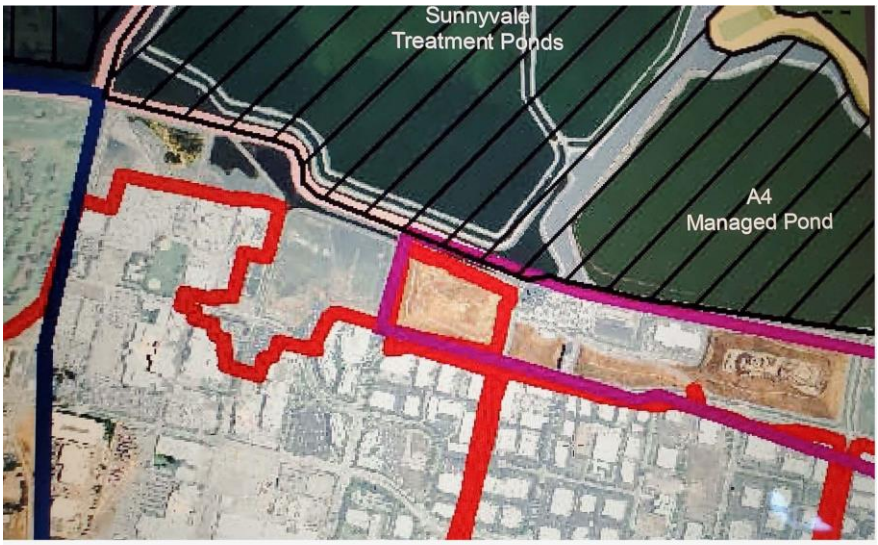
- Salt marsh harvest mouse (SMHM), Ridgway's rail (RIRA): The 2013 USFWS Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California[1] was prepared and approved to guide the habitat recovery of five federally endangered species, inclusive of the salt marsh harvest mouse and Ridgway's rail and certain other species of concern. The plan was largely constructed around the biology of the target species. It includes maps that broadly identify areas of sensitive habitat and lands of potential restoration to habitat for the target species. The entirety of the ECD and other lowland portions of the MPSP are within the boundary for consideration of actions aiding recovery (Figure 1).[2]
- Western Snowy Plover (SNPL): The DEIR's Special Status Animals map (p.104, Figure 3.4-4) should include the closest nesting location of SNPL on the Stevens Creek Shoreline Nature Study

[1] USFWS, Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California, 2013, https://www.fws.gov/project/california-tidal-marsh-ecosystem-recovery

[2] USFWS, Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California, 2013, Figure 111-21, Segment O, p. 273.

Area of the Midpeninsula Regional Open Space District (Midpen).[3] The DEIR should refer to the USFWS 2007 Recovery Plan for the Western Snowy Plover[4] for guidance for potential recovery actions in the MPSP Area.

Figure 1



Excerpt of Segment O, USFWS Recovery Plan for Tidal Marsh Ecosystems, Figure 111-21. Red line marks approximate inland limit for potential restoration.

Western Burrowing owl

The Burrowing owl population in the south Bay Area has suffered a significant decline and the breeding population is at a risk of extirpation. In the past four years, the Burrowing owl population of the South Bay Area has been sustained by deliberate conservation actions implemented primarily by the Santa Clara Valley Habitat Agency in an effort to accomplish the conservation goals of this adopted Valley Habitat Plan.[5] Burrowing owls have not bred in Sunnyvale in recent years, but wintering migratory owls use ground squirrel burrows at the landfill and along the levees (including observations by SCVAS staff and volunteers in January 2023), and may use undeveloped parcels within the MPSP area as well as marginal habitat areas along roads and in parking lots.[6]

[3] Midpeninsula Regional Open Space District, Stevens Creek Shoreline Nature Study Area Restoration Project, https://www.openspace.org/what-we-do/projects/stevens-creek-shoreline-nature-study-area-restoration-project

[4] USFWS, Recovery Plan for the Western Snowy Plover, 2007, https://westernsnowyplover.org/recovery_plan.html

[5] Sullivan, Edmund (2022) Western Burrowing Owl Program Update, Santa Clara Habitat Agency ,https://scv-habitatagency.org/DocumentCenter/View/1691/06

[6] In "Studies of Western Birds 1:218–226, 2008, Species Accounts (pages 218-226), the description of this California Species of Special Status includes, "developed environments pose a substantial risk to Burrowing owls from mortality caused by traffic (Klute et al. 2003, D. K. Rosenberg et al. unpubl. data). Owls nesting along roadsides or parking lots are at greatest risk, although owls foraged along roads over 1 km from the nest burrow (Gervais et al. 2003)." The document is available here: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=10405

Sunnyvale's 2019 "Burrowing Owl Habitat Suitability and Opportunities Report"[7] should be consulted in mitigating impacts to this species. The MPSP should also consider Burrowing owl conservation actions as part of public benefits allocation.

For Requirement 10.3.5-2:

- Please specify in Requirement 10.3.5-2: Qualified Biologist must have at least 2 years experience conducting surveys for burrowing owls
- A pre-construction survey 14 days prior to construction is too long an interval for both migratory and nesting Burrowing owls. Migratory owls may stay at a burrow for only a few days. Breeding burrowing owls may select a burrow, start a nest and lay eggs within 10-days. Surveys must take place no longer than a week before ground disturbance, and repeat if construction activities are halted or paused for more than a week.

Impacts of increased human presence and activities in natural areas

We remain concerned with potential impacts to special-status species, migratory birds and other wildlife species that is likely to result from the inevitable increase in human and pet activity on trails and levees, wetlands, and stormwater features, as well as at Baylands Park and the landfill hills. Science shows unequivocally that increased human presence and activity in wildlife habitat impacts wildlife. Human activity can flush birds, or deter birds and special-status species from using important resources along the bay,[8] and disrupt basking behavior that is critical to the survival of the Western pond turtle.[9] Even low impact human recreation can change the timing and spatial use of habitat by mammals.[10]

The DEIR implies the expectation - which we find difficult to comprehend - that residents and new employees will not substantially increase the use of trails, levees and other recreational facilities outside the MPSP (see discussion in section 3.16 Recreation). To the contrary, with 42,000 additional residents and 60,000 new employees, and the tremendous public interest in development at MPSP because of its proximity to the Bay, it is reasonable to expect here will be a significant surge in use of trails and levees adjacent to migratory birds habitat (including Burrowing owls) and wildlife habitat all along the Bay - a surge that will significantly exacerbate conditions stemming from existing encroachment and disturbance.

[7] Biological Constraints and Opportunities Analysis for the Sunnyvale Landfill and Baylands Park and Protecting Burrowing Owl Habitat on City Facilities (2015) Report to City of Sunnyvale Sustainability Commission https://sunnyvaleca.legistar.com/LegislationDetail.aspx?ID=2242556&GUID=A82784EA-D7EC-4F7E-9A4C-78799FD2BAE6&FullText=1

[8] Trulio, L. A., & Sokale, J. (2008). Foraging Shorebird Response to Trail Use around San Francisco Bay. The Journal of Wildlife Management, 72(8), 1775–1780. http://www.jstor.org/stable/40208460 and Lynne A. Trulio and Heather R. White "Wintering Waterfowl Avoidance and Tolerance of Recreational Trail Use," Waterbirds 40(3), 252-262, (1 September 2017). https://doi.org/10.1675/063.040.0306 and Phil Higgins, Balancing Public Access and Habitat Enhancement in the Baylands,11/16/21, webinar @~1:50:02; https://www.sfestuary.org/truw-pahlp/

[9] Basking Western Pond Turtle Response to Trail Use in Mountain View, California. Paul Eric Nyhof San Jose State University 2013 https://scholarworks.sjsu.edu/cgi/viewcontent.cgi?article=7849&context=etd_theses

[10] https://news.wsu.edu/press-release/2023/01/19/low-impact-human-recreation-changes-wildlife-behavior/

A 2020 book published by the California Fish and Wildlife Journal[11] and the scientific resources cited in footnotes 8-19, show that even low human use can have impacts, but seem to indicate that level of disturbance is directly associated with faster speed of movement. In addition, lighting interferes with wildlife movement and migratory behavior, and must be avoided in natural areas.

The impact of increased population to wildlife in the natural areas in and around the MPSP should be recognized and mitigation measures should be developed. We propose the following mitigation measures:

- Ensure that night lighting is avoided, and not added to trails on levees, near wetlands, or on and around the landfill hills,
- With the exception of commute trails (Such as Bay Trail and the East and West Channels trails), limit access to human-powered-only, and prohibit electronic or motorized mobility devices,
- Limit public access to some of the Baylands Levees. Sunnyvale resident and naturalist Kira Od provided the attached report[12] in which she identifies parallel levees that can be closed to public access with no impact to mobility and circulation (Figure 2). Ms. Od's comments and recommendations can be integrated into the EIR to mitigate some of the impacts of human encroachment and disturbance of wildlife and habitat,

Figure 2 **PROPOSED SEASONAL LEVEE CLOSURES**

[11] California Fish and Wildlife SPECIAL ISSUE Effects of Non-consumptive Recreation on Wildlife in California

[12] The Last Wild Place in Sunnyvale: Twenty-three Years of Experience, Observation, and Effort, Kira Od, 2019

Environmental Impacts Caused by Shading

The setbacks from the East channel are missing in Table 5 Building Setback Requirements.

The MPSP places the tallest buildings (Chesapeake) with allowable heights of 250', 275' and 250' near the East Channel and Baylands park. We believe this placement may have significant impacts including shading during the day and introducing Artificial Light at Night. Tall buildings adjacent to open space should be required to step-back[13] in height to reduce visual impact on valuable open space, to reduce shadows cast by the building and reduce impacts of light at night on the environment.

Height of buildings can also have a significant impact on riparian corridors, wetlands, open space, and recreation. Light is necessary for photosynthesis by riparian and aquatic vegetation. Water temperature in creeks is also affected and in turn, it influences pH and dissolved oxygen concentration, which affects the species composition and abundance of invertebrates and fish. The effect of shading on the structure and function of wetland ecosystems is greatest in small wetlands[14]. Sunlight is important in parks and open space, and in the urban landscape.

Chapter 6 Open Space and Urban Ecology, Table 15 defines the setbacks required along the East and West Channels. Section 5.3.2 defines the "step-backs." However the building step-backs are not clear for all facades and may not be adequate for reducing shading of open space and waterways.

- Please clarify the step-backs of building facades along the East Channel and West Channel and fronting on Baylands Park.

3.6 Energy

Life Sciences Energy Use

- Has the DEIR analyzed projected energy use for different projects and facilities that are likely to be constructed as R&D uses? Our concern is that Life Science labs have unique requirements. and use significantly more resources than office buildings (in the order of two to ten times more energy.)[15]

[13] What is a Building Step-Back? A building step-back is an architectural design element that is typically applied to the upper-story of a development. Typically, a step back requires that any portion of a building above a certain height is further pushed-in towards the center of the property

[14] Bunn, SE, Mosisch, T & Davies, PM (2002), 'Chapter 3: Temperature and light', *Riparian Land Management Guidelines, Volume One. Part A: Principles of Sound Management*, Land and Water Resources Research and Development Corporation (LWRRDC), Canberra, eds. S Lovett & P Price.

[15] A Deep Dive into Sustainable Life Science Buildings With SGA's Matthew Fickett: A typical existing laboratory building uses close to 500 kBTU/sf/year, while most new ones are below 200, and really exceptional ones might be closer to 45 or 50. That is obviously a tremendous improvement, but it only brings the lab building into the neighborhood of an ordinary office building's usage, which is almost always below 100 and often closer to 25. From that comparison, you can see that most lab buildings are using on the order of ten times as much energy per square foot as office buildings.

3.9 Hazards and Hazardous Materials

The DEIR has not adequately mitigated for the potentially significant adverse impacts posed by hazards and hazardous materials within the Plan area. We disagree with the findings and maintain that Impacts HAZ-2, HAZ-4 and HAZ-C remain significant, and there is substantial concern that the proposed mitigation is not feasible, therefore the impacts will remain significant, unmitigated, reasonably expected to occur.

The MPSP addresses hazards through the following seven requirements for future projects:

1. Environmental Site Assessment (ESA)
2. Site Management Plan
3. Phase II Environmental Site Assessment (ESA)
4. Remediation and/or Management Measures
5. Dewatering Management Plan
6. Asbestos Survey
7. Lead-based Paint Survey

These requirements are vague. The MPSP bases the determination whether or not an ESA should be prepared on "evaluation of the property history to determine if the property has been or is likely to have environmental impacts." However, considering only historical data, which in many cases may not be up-to-date and in some cases, quite old, is not sufficient to determine if contaminants remain on the surface or underground at a particular site. Project-specific sampling must be performed by independent qualified personnel in order to determine if a Site Management Plan should be required. In addition, thresholds for what is deemed "minor environmental impact" must be made by independent qualified personnel to determine if a Site Management Plan will be required. The conclusions made in the original ESA for a site are critical to determining if a Site Management Plan, a Phase II ESA, Remediation and/or Management Measures, and a Dewatering Management Plan are required. For this reason, the ESA must be based on current, project specific data as to what toxins and at what levels exist on each property in the Specific Plan area and what cleanup standards must be used.

The following aspects of the MPSP and the DEIR are of concern:

Hazard Assessment

A groundwater solvent plume is present at the Lockheed Plant One/Naval Industrial Reserve Ordnance Plant (NIROP) site,[16] which is identified as a Cortese List site by the California Environmental Protection Agency. Soil gas samples above the plume have concentrations greater than USEPA Regional Screening Levels (SLs) for the carcinogens TCE, vinyl chloride (VC), benzene, and chloroform, contributing to an estimated lifetime excess cancer risk for residential use of greater than one in one million. The Record of Decision (ROD) for the site has not been finalized; thus, it is unknown whether the yet-to-be-selected remedy will reduce hazard levels for specific populations. The finding of no significance for Impact HAZ-4 is premature and cannot be supported at this time.

[16] Naval Facilities Engineering Systems Command (NAVFAC). 2022. Revised Draft Soil and Soil Vapor Feasibility Study, Sites 1, 2, 3, 9, 10, 11, 19, and 21, Naval Industrial Reserve Ordnance Plant, Sunnyvale, CA, April 2022.

Environmental Screening Levels (ESLs) from the SF Bay RWQCB[17] are much more stringent and address more exposure routes and human and ecological receptors than the USEPA SLs used in the NIROP report. We request that the EIR and Specific Plan incorporate the requirement to use the latest California methodology in assessing hazards at proposed project developments.

We request that the DEIR accept the recommendation in Appendix G[18] to expand the existing network of monitoring wells into the eastern part of the project area, to better characterize historical contamination. Figure 15 of Appendix G shows existing well locations listed in the Santa Clara County (Valley Water) Well Database that could possibly be used to extend the network. There is no indication that any chemical measurements from these wells are publicly available, as the wells are not shown on the California Water Board's Groundwater Information System (GAMA) interactive map.[19] New wells should also be placed along the southern boundary of the project area to detect upgradient sources of groundwater contamination that could migrate onsite and impact future developments.

As previously stated, site investigations conducted under IMPACT HAZ-2 should not rely solely on historical records such as are typically used in Phase I/Phase II investigations to determine the need for sampling and analysis. Due to the extensive military and industrial use of the project area, it is likely that contaminants are present that have not been tested for in the past. In particular, the EIR should include provisions to require proposed developments to sample for the following.

- **Per-and-polyfluorinated alkyl substances (PFAS)** are ubiquitous in the environment, but significant contamination is often associated with municipal waste landfills, biosolids operations, and firefighting or fire training on military bases. Soil and shallow groundwater should be tested along the northern border of the project area across from the former Sunnyvale Landfill, and along the western boundary of the project area where the Navy has identified releases at the former Hanger 4 on Moffett Field Air Base[20].

- **Polychlorinated biphenyls (PCBs)** have multiple historical uses and may be present in soil or groundwater from electrical equipment dielectric fluid spills, weathering of PCB-containing paints or building materials, and many other sources. Testing should be conducted on soils in any areas of the site with past industrial or military use. The City of Sunnyvale requirements to test building materials during demolition will not detect this environmental contamination.

[17] San Francisco Bay Regional Water Quality Control Board. 2019a. Update to Environmental Screening Levels, January 24, 2019.

[18] SFEI, ESA, and Pathways Climate Institute. 2021. Sea-level rise impacts on shallow groundwater in Moffett Park: A technical addendum to the Moffett Park Specific Plan. Funded by the City of Sunnyvale. SFEI Publication #1062. San Francisco Estuary Institute, Richmond, CA. Appendix G to Moffett Park Specific Plan Draft EIR Appendices, Notice of Preparation (NOP) and NOP Comment Letters. August 2021.

[19] California Water Boards, Groundwater Information System (GAMA). https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/# Accessed 1/24/2023.

[20] Final Site Inspection Report. Air National Guard Phase II Regional Inspections for Per- and Poly- Fluorinated Alkyl Substances. Moffett Field National Air Base. June 2019.

- **Polycyclic aromatic hydrocarbons (PAHs)** are common soil contaminants due to releases from petroleum spills and vehicle exhaust. Testing for those chemicals was recommended in Appendix G of the DEIR.

Cumulative Impact of Hazardous Materials (Impact HAZ-C)

The cumulative impacts of hazardous materials on residents and workers within the Plan area have not been adequately identified, assessed or mitigated to levels that are less than significant. Existing contamination identified on the site exceeds USEPA SLs for both residential and commercial exposures. More of the Project Area is likely to exceed SF Bay RWQCB ESLs, which are more health-protective than USEPAs ESLs. Because the identified and potential contamination sites have not been fully investigated, and a ROD has not been finalized for the extensive Plant One/NIROP solvent plume, there is no factual basis to state that the cumulative impact after mitigation will be less than significant.

DEIR Appendix F (5), Impact Haz-C concludes there will be no significant cumulative impact of existing site contamination because "*Existing regulations are in place to reduce hazardous materials impacts to acceptable levels, preventing cumulative impacts…. Projects resulting in hazardous materials impacts would be mitigated to a less than significant level through compliance with existing regulations and implementation of project-specific measures (such as those identified in the Specific Plan Project Requirements identified under Impact HAZ-2*)." This statement ignores features of the site and the planned development.

The project requirements for Impact HAZ-2 through HAZ-4 apply to individual development proposals, but residents and workers in the commercial and industrial facilities may be exposed to contamination from multiple sources within the project area. Since many of the residents are expected to also work and recreate in the project area, the cumulative impact should be evaluated on a project area-wide basis.

Mitigation of Hazardous Conditions

The DEIR conclusion of no significant impact from future resident or worker exposure to VOCs in groundwater and soil gas is based on unrealistic assumptions as to the efficacy and timeframe of the mitigation actions. To this point, guidance from both the SF Bay RWQCB[21] and Santa Clara County[22] indicate that the use of a VIMS to reduce hazards cannot be allowed until active mitigation is complete.

> Santa Clara County: *"**SMP [Site Mitigation Program] typically requires cleanup (i.e., remediation) of the source of contamination, instead of mitigation (ex. VIMS)**. VIMS are considered short-term solutions to provide protection while active cleanup is ongoing."*

[21] San Francisco Bay Regional Water Quality Control Board (2022) Fact Sheet: Development on Properties with a Vapor Intrusion Threat https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/sitecleanup/2020_Fact_Sheet_Final.pdf

[22] Vapor Intrusion Mitigation Systems Guidance Document (2018) Santa Clara County Department of Environmental Health , Hazardous Materials Compliance Division https://hazmat.sccgov.org/sites/g/files/exjcpb471/files/report/Vapor-Intrusion-Mitigation-Systems-VIMS-Guidance-Document-Rev%2011.pdfhttps://hazmat.sccgov.org/sites/g/files/exjcpb471/files/report/Vapor-Intrusion-Mitigation-Systems-VIMS-Guidance-Document-Rev%2011.pdf

SF Bay RWQCB: *"In most cases, for new construction where a VIMS is needed to protect building occupants, we will not approve the VIMS until remediation to the extent feasible has been implemented.* ***This could affect the local agency's permitting decision for occupancy."***

The timeframe for remediation of halogenated solvent plumes is typically many decades. The required monitoring and treatment infrastructure may preclude future development in project areas above VOC plumes.

We request that the DEIR and Specific Plan add the SF Bay RWQCB[23] and Santa Clara County VIMS guidance[24] as project requirements for all future developments in the project area.

Impacts of Sea Level Rise on Subsurface Contamination

The SFEI et al. report of groundwater conditions at the project area[25] concluded that SLR could lead to groundwater reaching the surface in portions of the site by the end of the century, which could mobilize subsurface contamination. The report also states that "Changes to remediation strategies at individual sites may be required to ensure public safety if groundwater levels rise and cause contaminants to spread to new locations." We worry that the contamination could potentially spread to areas outside of the MPSP boundary and to the Bay.

The DEIR does not address the potential increase in transport of contaminants in soil vapors as groundwater elevations increase over time, which may occur earlier than the end of the century. Mobilization of contaminated groundwater plumes is also not analyzed. And the DEIR does not address recommendations A through D from the SFEI report for measures designed to adapt to groundwater rise, or the steps that were identified to fill data gaps that prevent adequate evaluation of site hydrology and contaminant migration. We recommend that the final EIR incorporate the proposed mitigation measures into the project's design.

3.10 Hydrology and Water Quality

The DEIR discussion of Existing Conditions, Groundwater, pp.201-202, inadequately informs the reader and decision-makers about the existing groundwater status in the Plan area. We recommend that you improve that discussion with the following.

1. Differentiate between shallow groundwater and deep groundwater.
2. Replace Figure 3.10-2 "Groundwater Depth in Moffett Park" with Figure 10 "Estimated depth to water in Moffett Park, based on an interpolation between measured values in the Geotracker database".[26] The latter, in the City's Groundwater and Sea Level Rise Addendum, provides the

[23] San Francisco Bay Regional Water Quality Control Board. San Francisco Bay Regional Water Quality Control Board. 2022. Vapor Intrusion Mitigation Guidance, Technical Resource Document. San Francisco Bay Regional Water Quality Control Board.

[24] County of Santa Clara Department of Environmental Health. 2018. Vapor Intrusion Mitigation Systems Guidance Document.

[25] SFEI, ESA, and Pathways Climate Institute. 2021. See also, May CL, Mohan A, Plane E, Ramirez-Lopez D, Mak M, Luchinsky L, Hale T, Hill K. 2022. Shallow Groundwater Response to Sea-Level Rise: Alameda, Marin, San Francisco, and San Mateo Counties. Prepared by Pathways Climate Institute and San Francisco Estuary Institute. doi.org/10.13140/ RG.2.2.16973.72164. While Santa Clara County was not studied in this report, the underlying environmental conditions are similar.

[26] Appendix G, Groundwater, Sea Level Rise Addendum.

reader with a more site-specific overview of the shallow groundwater landscape relative to the proposed plan and includes references to sources and dates of data used.

The DEIR discussion of Existing Conditions, Flood Hazards on p. 206 makes the following statement: "There are several projects in the process that would reduce the risk of flooding within Moffett Park, including: South San Francisco Bay Shoreline Phase III Feasibility Study – undertaken by the USACE, Valley Water, and the California Coastal Conservancy that is evaluating the feasibility of implementing levee improvements and habitat restoration that would benefit Moffett Park. The design and construction of improvements is unknown at this time."

This statement about the Shoreline Phase 3 Feasibility Study is inaccurate and thereby misleading.

1. Before a Feasibility Study can begin, Valley Water and the USACE must sign a cost-share agreement. That action has not occurred nor is there any agreement that it will at any time soon.[27] No Feasibility Study is underway. There is no Phase 3 Project.
2. Unlike nearby cities (Palo Alto and Mountain View), Sunnyvale has not prepared a technical shoreline vulnerability study. While the City has had multiple reports prepared on sea level strategy and resilience, none provide the technical analysis that assesses vulnerability as a starting point for a Phase 3 project.
3. The USACE has now reassessed Phase 2 (Palo Alto, part of Mountain View) to target the year 2060 for completion.[28] Phase 2 is prioritized ahead of Phase 3.

- Please correct the Existing Condition discussion in the EIR
- Discussion and impact analysis in the DEIR that refers to the Shoreline Phase 3 Project as an existing condition should be re-evaluated.
- Since the timing for design and construction of Phase 3 levee improvements has not been ascertained, and funding is not reasonably foreseeable, the MPSP and the DEIR should rely upon the levee in considerations of flood risk reduction.

3.11 Land Use and Planning

Residential Use

Residential use is not advisable for project parcels that have volatile organic compounds (VOCs) in groundwater or soil vapor far in excess of California Environmental Screening Levels (ESLs). The Proposed Land Use Map (MPSP DEIR Figure 2.3.1) shows a residential area between Lockheed Martin Way, 1st Avenue and Bordeaux Drive. A portion of this parcel is located above a groundwater solvent plume from the Lockheed Plant One/Naval Industrial Reserve Ordnance Plant (NIROP) military cleanup site.[29] Figure 1 shows the trichloroethene (TCE) groundwater plume from the Figure 2-15 of the NIROP report, overlaid on the Project Land Use Map. Soil gas samples within the proposed residential area have concentrations greater than USEPA ESLs for the carcinogens TCE, vinyl chloride (VC), benzene, and chloroform, contributing to an estimated lifetime excess cancer risk for residential use of greater than one in one million.

[27] Phone meeting E. McLaughlin with Rechelle Blank, Chief Operating Officer, Valley Water, 2/7/23
[28] Ibid. Rechelle Blank, Valley Water. 2/7/23
[29] Naval Facilities Engineering Systems Command (NAVFAC). 2022.

Commercial Use

Subslab soil gas and indoor air sampling has found VOC concentrations in excess of USEPA commercial use SLs at multiple vacuum degreaser facilities within the Lockheed Plant One site and within the boundaries of the NIROP solvent plume,[30] and in the vicinity of the Google Caribbean Campus.[31] This is not a complete list of sites in the project area that could potentially have soil gas contamination. Other potential areas with known or suspected hazardous chemical releases were identified in the Farallon Consulting report, Appendix F to the Draft EIR.[32] Subsequent projects should perform soil gas sampling at potential contamination sites.

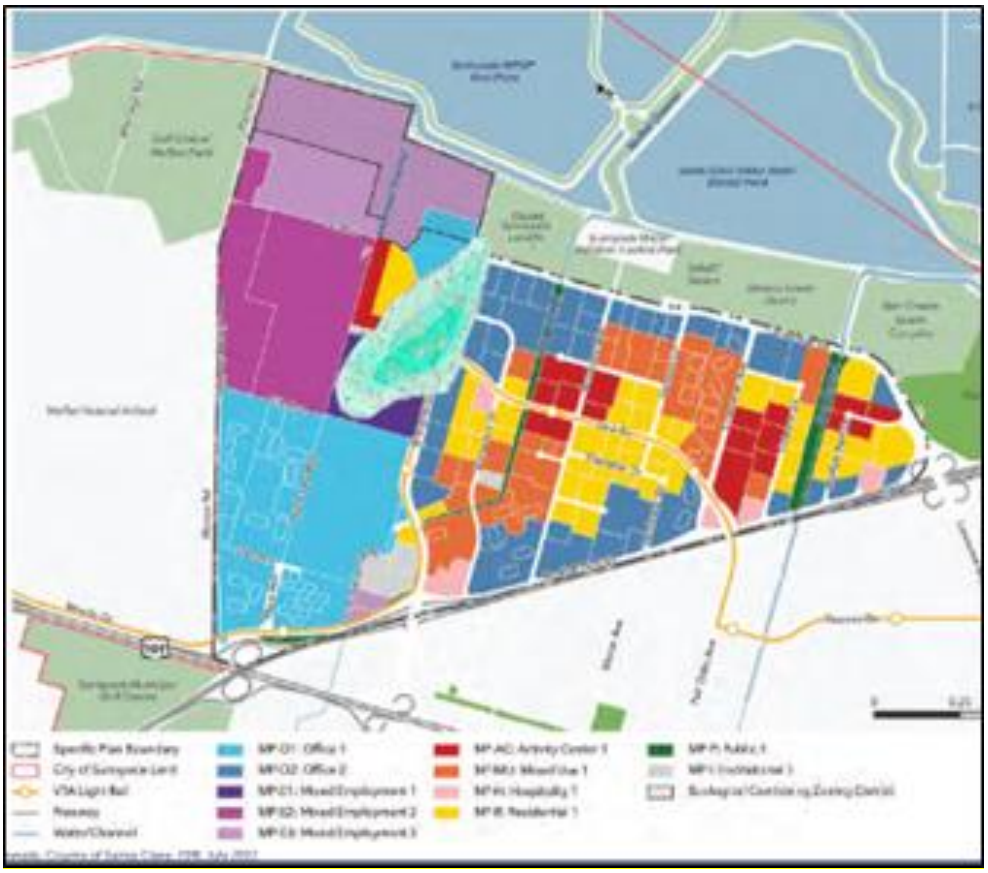


Figure 3. TCE shallow groundwater plume overlaid on DEIR Proposed Land Use Map

Landscape Area and Open Space

We have consistently expressed the importance of open space in the "Ecological Innovation District," so we are pleased that the MPSP proposes 200-plus new acres of parks and open space. However, it is not

[30]Lockheed Martin Corporation. 2022. Interim Vapor Intrusion Assessment Report, Lockheed Martin Space Plant One Site, Sunnyvale, California. Prepared by Cameron-Cole. April 2022.

[31] Cornerstone Earth Group. 2019. Site Management Plan. 100 and 200 Caribbean Campus Project. Prepared for Google. February 14, 2019.

[32] Farallon Consulting, LLC. 2021. Land Use and General Plan Review, Moffett Park Specific Plan Area. Sunnyvale, California. Appendix F to Moffett Park Specific Plan Draft EIR Appendices, Notice of Preparation (NOP) and NOP Comment Letters. August 2021.

clear to us that the MPSP provides adequate mechanisms for acquisition or dedication of public open space. Even the Bonus FAR mechanism, which requires community benefits, does not assure that any new open space would be produced. Therefore, we are concerned that the DEIR makes findings of significance based on the presumed addition and availability to the public of these parks and open space. If 200 acres of open space are not acquired or deeded for public use, project impacts on existing environmental resources (for example, recreation and biological impacts) may prove significant and unavoidable.

We are also concerned about the minimal landscape areas delineated in the proposed Plan and also that the MPSP's Lot Coverage and Paving Area requirements will severely constrain the greenscape benefits of landscape areas. The MPSP does not require ANY landscape area in the Activity Core MP-AC. In the Residential area MP-R, only 15% of the site is a landscape area. In Non-Residential areas only 5% landscape area (in the Fine Grain Core). Figure 28, pg 104 shows that the "fine grain core" area (referenced in Table 6) covers approximately 50% of the MPSP (excluding the Lockheed campus). We note that there is no requirement for any "landscape area" in this zone though there are guidelines for planting areas located in sidewalk and paved areas for this zone. Outside the "fine grain core" there is a requirement for 20% minimum lot area for landscape area. However, it is not clear whether surface parking and driveways (Paving Area) are allowed in this "landscape area."

Please consider the following Plan amendments to ensure that open space will be a required part of the ecological innovation district.

- Require that 50% of all community benefits for bonus FAR be for open space, with priority for ecologically beneficial open space. This is also important because as buildings get taller, the open spaces between them need to be larger in proportion.
- Please reduce the 25% of lot area for "paving area" allowed for non-residential development outside the "fine grain core" so that paved area and surface parking are minimized and landscape area is increased in the "eco-innovation district."

<u>Life Science Land Use</u>

Permitting of Life Sciences Land Use in R&D requires additional discussion and clarification in the EIR. Life Sciences lab buildings are categorized into four Biosafety Levels.[33] These reflect levels of bio-containment of infectious diseases and pathogens.

[33] U.S. Department of Health and Human Services Centers for Disease Control and Prevention (CDC) describes four Biosafety Levels:

- *BSL-1 labs are used to study agents not known to consistently cause disease in healthy adults. They follow basic safety procedures and require no special equipment or design features.*
- *BSL-2 labs are used to study moderate-risk agents that pose a danger if accidentally inhaled, swallowed, or exposed to the skin.*
- *BSL-3 labs are used to study high-risk agents that can be transmitted through the air and cause potentially lethal infection. Researchers perform lab manipulations in gas-tight enclosures.*
- *BSL-4 labs have the most stringent safety and security requirements. There are currently only four operational BSL-4 laboratory suites in the United States*

Moffett Park is located on a fill area with a high groundwater table and flooding risk, as well as liquefaction potential in major earthquake events.[34] In the event of a major earthquake, soils are predicted to liquefy resulting in rupturing and damage to underground utilities as well as potential major structural damage to the buildings. In the event of a major disaster, back-up systems may not be operable and containment may not be possible for biohazards.

Proposed mitigation: Require that emergency equipment and back-up systems be located higher than the 100-year flood level and preferably on the second floor or the roof so as to be safe from flooding.

- Please clarify which districts will be available for biotech labs.
- Will BSL-3 labs be allowed in the MPSP?
- Will there be separation requirements for BSL labs from housing in the MPSP? Cities have instituted separation requirements ranging from 250 feet to 500 feet for public health and safety.
- Will there be special setback requirements for BSL labs from the East and West Channels which are connected by tidal flows to San Francisco Bay and ecologically sensitive wetlands?

Suggested mitigations.

- Limit Life Sciences labs to BSL-1 and BSL-2. Consider allowing BSL-1 and BSL-2 labs with minimum setbacks of 500' from any parks and open space as well as residential, school or day-care sites.[35] [36]
- Site lab buildings out of low lying ground levels to avoid flooding.

We disagree that implementation of the Plan would not include any new or uniquely hazardous uses. See Section 3.11 Land Use and Planning for a discussion about the NEW potential for environmental accidents from biohazards. These are uniquely hazardous uses with the potential to affect the public and are not addressed in the MPSP or in the Sunnyvale General Plan.

Maximum Height Limits

Clarify that maximum heights are to the top of the tallest structures on a building. Usually, heights are set to the top of the roof parapet, or the top of the roof level, or the top of the mechanical equipment structure on the rooftop. However, exhaust stacks may be even taller than the intake and exhaust air from single-pass HVAC equipment. Therefore TOTAL height needs to be specified as the maximum allowable height, to the top of all equipment including exhaust stacks.

[34] DEIR pg 147: Soil liquefaction can be defined as ground failure or loss of strength that causes otherwise solid soil to take on the characteristics of a liquid….Moffett Park is located within a State of California Seismic Hazard Zone for liquefaction and Santa Clara County liquefaction hazard zone.

[35] Robinson, Rigel, Sept, 13, 2022, Memo to Mayor and City Council, City of Berkeley Consent Calendar, https://berkeleyca.gov/sites/default/files/documents/2022-09-13%20Item%2030%20Referral%20Keep%20Innovation%20in%20Berkeley.pdf

[36] Klearman, Sarah (2022) Berkeley, targeting R&D users, takes second look at local zoning codes, San Francisco Business Times, https://www.bizjournals.com/sanfrancisco/news/2022/09/29/berkeley-launches-initiative-to-grow-r-d-industry.html

3.14 Population and Housing

The CEQA Appendix G Guidelines do not include analysis of jobs/housing balance in the checklist of environmental factors that must be evaluated for all projects in California. Nevertheless, the intensity of the housing crisis in California and the Bay Area[37] has made jobs/housing balance an issue of critical public concern. Rapid jobs growth that outpaces housing production is seen as a significant contributor to housing disruption and inequality in the region.[38] The failure to analyze, describe, and mitigate the direct and indirect impacts of the proposed MPSP on the city-wide or regional jobs/housing balance is a significant omission.

New state laws,[39] and a doubling of Sunnyvale's RHNA allocation from the 5th to the 6th Cycle, strive to spur housing production. However, recent studies suggest that housing production alone may be insufficient to reverse the trends pushing workers and jobs farther apart.[40] In order to reduce housing inequity and displacement, better alignment between jobs and housing and also between jobs and workers are important parts of the puzzle.[41] [42]

The MPSP's Guiding Principle 2 envisions "improving the local as well as regional jobs-housing ratio." Objective 2 in the DEIR uses similar language, but focuses only on "improving the **regional** jobs-housing balance." Neither document makes *any* further mention of jobs-housing balance or ratio and the limited data provided appears inconsistent. Table 3.14.2: Projected Growth Citywide on DEIR page 259 indicates that General Plan Buildout will produce 43,865 jobs/employees, 203,985 residents and 82,122 households whereas the narrative above that table states that buildout of the General Plan is estimated to result in 121,689 jobs/employees and 197,785 residents (with no number of households specified). That inconsistency makes it impossible for the public to estimate the city-wide jobs-housing balance likely to result from the MPSP. Additionally, there is no data provided regarding the *current* city wide or regional jobs/housing balance, making it difficult to evaluate any improvement consistent with Objective 2 or Guiding Principle 2.

We ask that the DEIR provide accurate data about the current local and regional jobs/housing balance and the projected delta resulting from the proposed MPSP, analyze the city-wide job/housing fit with and without the proposed MPSP, and reduce or mitigate any significant impacts on job/housing balance and fit.

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[37] Bay Area Housing Crisis: Poll Finds 67% Saying It's Harder to Find A Home (2022) CBS News Bay Area, CBS San Francisco, https://www.cbsnews.com/sanfrancisco/news/bay-area-council-poll-housing-crisis-harder-to-find-home/

[38] Majid, Aisha, (2021) The downsides of being a tech hub: Housing disruption and inequality, https://citymonitor.ai/economy/the-downsides-of-being-a-tech-hub-housing-disruption-and-inequality, visited 2/7/23

[39] Karlamangia, Soumya, (2022) California Doubles Down on It's Housing Laws, New York Times https://www.nytimes.com/2022/09/12/us/california-housing-laws.html, visited 2/7/23

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3.16 Recreation

We dispute the contention in Impact REC-1 that the eventual addition of 200 new acres of park and open space in the Plan area would offset the project's demand on nearby park and recreational facilities and thereby avoid contributing to or accelerating substantial physical deterioration of nearby park and recreation facilities. The DEIR specifies that a determination of the project's impact on recreation depends on whether the project would "increase the use of existing … parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated."[43] By conflating "demand" with "use" in its conclusory recreation impact assessment, the DEIR provides inadequate analysis, fails to substantiate the conclusion that there will be less than significant impact regarding physical deterioration of existing regional parks and other recreation facilities, and fails to propose appropriate mitigation of impacts.

Significant park and recreation facilities currently located on the Bay shoreline (just outside of the Plan area), including Baylands Park and the Bay Trail, are of a character and function distinct from the parks and recreation facilities planned within the Plan area. As a result, any increase in their *use* due to proposed net population and employee growth is *unlikely* to be offset by the eventual addition of parks and facilities proposed in the MPSP.

- The recreational facilities along the Bay include commute trails that provide access to destinations outside the Plan area, primarily the Bay Trail.[44] The Bay Trail[45] transverses the Don Edwards National Wildlife Refuge. The acknowledged[46] and intended[47] increase in use of the Bay Trail by residents and employees originating in the MPSP area, both for commute and recreation, will very likely increase degradation and increase maintenance requirements for the Bay Trail. The cost of maintenance would thus fall on the refuge, a federal jurisdiction.
- Sunnyvale Baylands Park also provides recreation opportunities that are different in character from the parks and open space proposed within the plan area, including seasonal wetlands, reservable picnic and event areas for large groups, a ropes course, an area for flying drones and model airplanes, and a petting zoo open to the public for limited hours.

The City has repeatedly emphasized the benefits of connections to the Bay and nearby open space, trails, parkland, and recreation facilities to the new Moffett Park community.[48] Additionally, in the 2020

[43] DEIR section 3.16.2 Impact Discussion, page 280.
[44] Page 3 in San Francisco Bay Trail Design Guidelines and Toolkit https://www.sanjoseca.gov/home/showpublisheddocument/9817/636656973233730000 shows that Transportation is a primary public benefit, "Transportation: As a transportation facility, the Bay Trail serves as an important commute alternative for cyclists and pedestrians, and connects to numerous public transportation features, including ferry terminals, airports, light-rail lines, bus stops, Caltrain, Amtrak, and BART"
[45] US Fish and Wildlife Service, Moffett Bay Trail Facility Map, https://www.fws.gov/refuge/don-edwards-san-francisco-bay
[46] DEIR section 3.16.2 Project Impacts: "Future residents (as well as employees) in Moffett Park would increase the use and demand on existing park and recreational facilities," page 281.
[47] MPSP draft pg 206 demonstrates that the City views the Bay Trail as a major destination: "Wayfinding for bicyclists should be improved. This could include signage identifying bicycle routes and connections as well as directions to major destinations such as the Bay Trail."
[48] March 7, 2022 MPSP Open Space and Urban Ecology Workshop presentation, slides 27 and 28, highlighted proximity of nearby open space and facilities as well as proposed active transportation connections to reach them.

Community Visioning Survey, the highest-ranked key priority was "Connect people to nature and the Bay."[49] Thus it is likely and anticipated that the proposed 42,000 new residents and 60,414 new employees will use the Bay Trail or other existing recreation facilities *in addition* to new facilities within the Plan Area. The DEIR's narrow and conclusory approach, focused on a generalized demand for parks and open space rather than likely usage, has resulted in an inadequate analysis that is inconsistent with both expectations and intentions.

Further analysis is needed to identify existing conditions in these nearby facilities, evaluate the impacts (including physical degradation of facilities, overcrowding and excessive noise) of additional use by the net new residents and employees proposed in the MPSP as well as cumulative impacts with other developments along the bay, such as the North Bayshore Precise Plan and the Bayview Campus, and identify mitigations to minimize degradation of the facilities.

The existing conditions description should include such factors as daily use (including, for Baylands Park, the number of visitors, picnic and event space reservations, and drone operators) as well as maintenance conditions and requirements, and the adequacy of parking facilities. Mitigations could include such things as limiting open hours, daily capacity limits, a reservation system to regulate the volume of drone activity, and signage and fencing to limit off-trail intrusion, especially into sensitive habitat areas.

3.17 Transportation

Moffett Park is isolated from the rest of Sunnyvale by Highway 237. There are three overpasses that serve the area and these "gateways" are already at a Level of Service (LOS) of E or F during commute periods (DEIR Table 3.17-3 Intersection Level of Service Summary). Several other intersections within the MPSP are also impacted according to this summary. The Mary Avenue Overpass is currently not planned for auto traffic and there is no clear path to its being built in the near future.

We dispute the assumptions of Table 3.17-2: Project Trips and Mode Split at Buildout. While we are supportive of reducing driving within the plan area, it is not practical to assume that there would be ZERO internal trips using automobiles. Please revise this assumption to a more realistic scenario where a certain percentage of trips within the plan area will be made using an automobile.

We maintain that *Impact TRN-4: The project would not result in inadequate emergency access* remains significant. The MPSP has limited roadway access points for emergency vehicles and personnel. The existing "gateway" access roads are already impacted and additional development will further impact these points and severely limit emergency access. The planned Mary Crossing overpass may allow emergency vehicles, however, there is no clear path ahead to realizing this project.

Suggested mitigation: In section 10.6 Performance metrics, in the MPSP, add Item 8: Gateway Capacity: A traffic analysis should be conducted annually, with reporting to the City Council, on the traffic at each gateway, in both directions (incoming and outgoing) during commute hours. Future development should be

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See also, June 2020 presentation: Moffett Park Specific Plan Understanding the Future: Open Space, slides 10, 11, 30.

[49] pdf page 6 in the October 2020 Moffett Park Specific Plan Community Visioning Survey Results https://static1.squarespace.com/static/5e38a3dd6f9db304821e8e5e/t/5f8a157bbd7d5f4df5048d74/1602885003640/MPSP_CommunitySurvey_Summary_20_1016.pdf

made conditional to the gateways being able to accept the additional traffic. This should be used to make an informed decision on permitting additional development, guide future decisions on development and emphasize the importance of emergency access to the plan area.

Parking

The MPSP parking policies may not achieve the required reduction in driving that is needed to support the anticipated intensification of land use. We have the following suggested changes to the MPSP.

Parking structures should accommodate change of use in the future, from parking cars to housing people. This flexibility of re-purpose should be the model for all parking structures.

- New parking structures should be built to allow future re-purposing such as housing. In addition, new parking structures should be built so as to be able to respond immediately to crisis needs (shelter during major weather events, shelter post earthquake).
- Please consider using feasible strategies like parking cash-out[50] which Stanford, Lockheed, and Genentech[51] used to avoid building additional parking lots and to reduce automobile use. Please require paid parking by all employees. Please install a traffic cap.[52] Traffic caps work if enforced (for example, using pavement sensors that count vehicles throughput) and controlled (via pricing[53]) and feedback systems, such as increasing pricing and fines for exceeding the cap).
- Include the use of electronic toll payment, like FasTrak transponders for all parking and in garages in MPSP.
- Allow or encourage parking in-lieu fees to help pay for shared parking structures. The cost of the structures can be partially covered by revenue generated by parking fees.
- Add a requirement to include car-sharing spaces in residential buildings and require bike-sharing and micromobility-sharing in mobility hubs.
- Prior to building each parking structure, please study overall parking demand to evaluate how multi-modal behaviors evolve, and ensure that the added parking is indeed needed.

3.19 Utilities and Service Systems

Water Supply Assessment

In Appendix J, water supply was assessed through 2040 and "The City is projected to experience supply shortfalls under single dry-year conditions and multiple dry-year conditions due to the anticipated water supply shortfalls from the SFPUC due to the Bay Delta Plan." Please analyze the cumulative impacts of increased water usage from the MPSP and other large master planning efforts in Sunnyvale such as Peery Park past the year 2040. Also include water use estimates for anticipated Life Sciences Lab facilities (since Life Sciences Lab buildings require large quantities of water.)[54]

[50] http://www.aqmd.gov/docs/default-source/transportation/supplemental-documents/ca_parking_cash-out_program_an_informational_guide_for_employers_2021.pdf?sfvrsn=6

[51] https://www.greenbiz.com/article/how-genentech-used-parking-lot-fund-its-employee-commuter-shuttle

[52] https://transportation.stanford.edu/about/stanford-and-general-use-permit-faq

[53] https://mtc.ca.gov/planning/transportation/driving-congestion-environment/parking-curb-management

[54] https://www.a3p.org/en/a-new-water-management-strategy-for-the-pharmaceutical-industry/

Respectfully,

Susan DesJardin
Bay Alive Committee Chair
Sierra Club Loma Prieta Chapter

Gita Dev, Co-Chair
Peninsula Regional Group
Sierra Club Loma Prieta Chapter

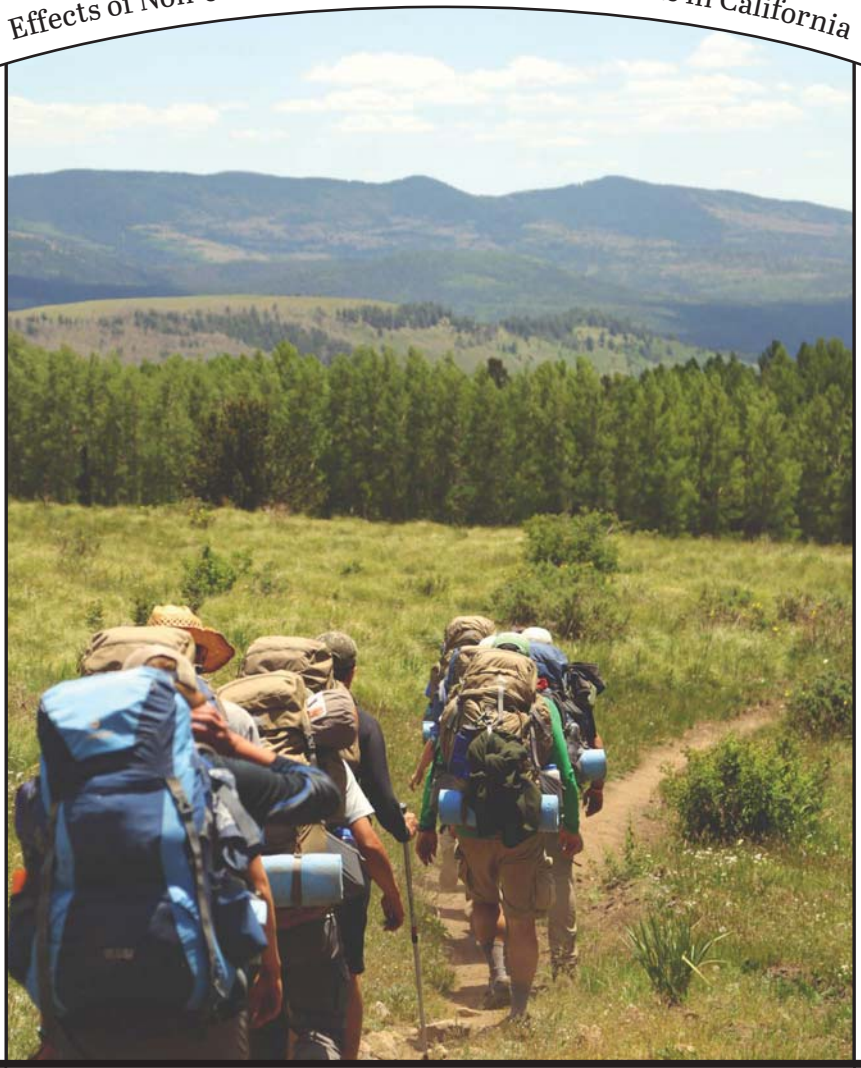
Matthew Dodder
Executive Director
Santa Clara Valley Audubon Society

Eileen McLaughlin
Board Member
Citizens Committee to Complete the Refuge

California Fish and Wildlife
JOURNAL

SPECIAL ISSUE

Effects of Non-consumptive Recreation on Wildlife in California



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California Fish and Wildlife, Recreation Special Issue; 6-10; 2020

Introduction

CAN OUR OUTDOOR ENTHUSIASM AND NATURE COEXIST?

RON UNGER, *Environmental Program Manager, Landscape Conservation Planning Program, Habitat Conservation Planning Branch, California Department of Fish and Wildlife*

[Note: As this special edition journal is published, our State, the nation, and the whole world are gripped by the corona virus pandemic. To slow its spread and not overwhelm limited healthcare resources, voluntary and mandatory directives for staying home, social distancing, and closing parks, reserves, and other public facilities have been put in place on a scale not seen for a hundred years, the time of the 1918 influenza (flu) epidemic.

Stories are emerging of more secretive wildlife seen in some park and urban areas normally filled with people, like the reports of bobcats roaming around empty Yosemite facilities, or an adult black bear roaming the nearly empty downtown Solvang. Hopefully, the pandemic and its horrible devastation will be over very soon, and we may again visit and appreciate our parks and wilderness areas. Hopefully, too, we may gain more information on wildlife's response to fewer visitors that helps us improve our management of parks and reserves in a way that protects wildlife and their habitat while also providing for great recreation experiences.]

"Everybody needs beauty as well as bread, places to play in and pray in, where nature may heal and give strength to body and soul alike" (The Yosemite, 1912). John Muir wrote so eloquently of the importance of taking time to be in, and play in, Nature to heal and nourish our spirit and help us to balance the challenges of our everyday lives. Now more than ever, people find a need to balance their work and domestic lives with the wonders, serenity, and invigorating challenges inherent in playing in Nature. In a world increasingly dominated by computers, cyberspace, and cities, people find a need to go and enjoy the Great Outdoors.

But what is the capacity of Nature to absorb the onslaught of millions of us hiking, riding, flying, boating, and otherwise tromping around the forests, fields, mountains, valleys, streams, and rivers on the other 40,000 or more species that also live in and depend on California? An increasing body of evidence is emerging that indicates non-consumptive recreational activities like hiking and biking, which don't involve harvesting of resources, can have harmful effects on species, their habitat, and efforts to protect them. As our population continues to grow and new and popular recreation technologies develop, California's natural areas are experiencing increased and changing recreation demands, such as increased numbers of hikers, nighttime group trail biking with lights, and electronic mountain bikes in wilderness areas.

Many federal, state, and local agencies' missions include non-consumptive, outdoor recreation, since it is often believed to be consistent with wildlife conservation. It is also widely believed that those who know and observe Nature are more likely to appreciate and protect her resources. Recently, however, several sites acquired primarily for conservation

have experienced extreme recreation pressures such as the Disney-like crowds coming out to see "superblooms" of native flowers of the desert in the spring or mountain biking occurring in areas where it is illegal along with the creation of several miles of unauthorized trails. So, how can we continue to provide for and manage appropriate, legal recreation opportunities while also protecting California's amazing and vast diversity of plants, fish, and other wildlife species and their habitats? How and where can we acquire separate lands for recreation access and for protecting habitat instead of frequently demanding too much recreation access on lands set aside for conservation of species and habitat? And, how can we facilitate various consumptive and non-consumptive recreation groups (e.g., hikers, mountain bikers, equestrians, off-highway vehicle users, hunters, anglers) and conservation groups (e.g., environmental activists, land trusts, resource agencies) to work together to advocate for acquiring and managing separate recreation and conservation lands instead of increasingly coming into conflict with one another over the use of the same lands for both purposes?

This special edition journal seeks to tackle this and related questions. In the introductory essay, "Non-consumptive Recreation & Wildlife Conservation: Coexistence through Collaboration," Dr. Ashley D'Antonio points out the unique need and opportunity California has for addressing recreation use as a social-ecological system (SES) based on its high biodiversity and quickly increasing recreation use of protected lands. Mitrovich, Larson, Barrows, Beck, and Unger, in "Balancing Conservation and Recreation," point to a need for recreation and conservation stakeholders to work together to ensure that sufficient areas are acquired for both uses and to help plan and manage conservation lands better to reduce adverse effects on wildlife and natural resources. They summarize some of the varied research going on in the field, on wildlife behavior and physiology, habitat degradation and fragmentation, reproduction and survival, community composition and richness, and other topics. Indirect effects like the shifts in day and night activity patterns between predators and prey lead to questions on what effects that has on wildlife interactions and possible changes that may lead to in a whole ecosystem. Two case studies cover visitor perceptions and values, and the importance of having groups with different values come together and work through their differences to build trust and facilitate better management decisions and stakeholder support.

The research paper, "Increased hiking and mountain biking are associated with declines in urban mammal activity," by Larson, Reed, and Crooks provides findings on how some wildlife can respond rapidly to changes in the levels of human disturbance, which may help planners design targeted trail closures to reduce recreation impacts in important areas. Townsend, Hammerich, and Halbur conducted somewhat similar research to that of Larson, Reed, and Crooks and present their findings in "Wildlife occupancy and trail use before and after a park opens to the public." Their research provides good insights into how differently various wildlife species respond to trail use by people, including strong differences in how soon and how much species may habituate to people's presence. Baas, Dupler, Smith, and Carnes make the case in "An assessment of non-consumptive recreation effects on wildlife: current and future research, management implications, and next steps" for doing more research to help wildlife and park managers more effectively manage and respond to non-consumptive recreation impacts on wildlife species and their habitats.

Elizabeth Lucas points out deficiencies and a need to improve how recreation is sited, monitored, managed, and enforced in protected areas in her paper, "Recreation-related disturbance to wildlife in California – better planning for and management of recreation are vital to conserve wildlife in protected areas where recreation occurs." She also provides a review

of several research papers in her paper, "A review of trail-related fragmentation, unauthorized trails, and other aspects of recreation ecology in protected areas." Elizabeth points out the need for sufficient funding, science-based approaches to managing protected areas, and educating the public on recreation effects on wildlife, to achieve real protection of species and to retain the benefits of the protected lands. Elizabeth suggests several funding options including a compelling argument for establishing a recreation equipment excise fee or tax like those paid for over 80 years now by hunters and anglers to benefit habitat conservation. With so much use of outdoor areas now by "non-consumptive" recreation uses, and with declining popularity of hunting activities in the population at large, is it time to institute such a change for recreational users to pay their share of conserving and managing habitat?

Together, the articles in this special journal edition cover a broad array of research on recreation effects on wildlife. They provide interesting perspectives and offer a variety of solutions. Learning how to best manage non-consumptive recreation to provide great outdoor experiences while minimizing harmful effects on wildlife will continue to evolve as we learn more from research and experience. We hope that you find this special edition journal useful in your own exploration of this important and emerging field.

"Keep close to Nature's heart… and break clear away, once in a while, and climb a mountain or spend a week in the woods. Wash your spirit clean." *–John Muir*

Introduction--continued

NON-CONSUMPTIVE RECREATION AND WILDLIFE CONSERVATION: COEXISTENCE THROUGH COLLABORATION

ASHLEY D'ANTONIO, PHD, *Assistant Professor in Nature-Based Recreation Management, Gene D. Knudson Forestry Chair, Department of Forest Ecosystems and Society, Oregon State University*

The most basic principle in the field of recreation ecology—an interdisciplinary field that studies the ecological impacts of recreational activities and the management of these impacts—is that if outdoor recreation is allowed in an area, impacts to that ecosystem are inevitable. It is also established that outdoor recreation has a myriad of benefits to society that range from economic growth, improved human health and well-being, community building, and increases in an individual's connection to nature. Moreover, outdoor recreation is one of the primary mechanisms by which humans interact with the natural world in contemporary society. As a result, many county, state, and federal park and protected area (PPA) managers around the United States (U.S.) are faced with mandates or missions that require conserving natural resources while also providing quality outdoor recreation experiences. Key challenges facing researchers, conservation practitioners, and PPA managers as they try to balance conservation goals with recreation access are: understanding the mechanism and the level and extent of these impacts; identifying what level of negative impact, if any, is acceptable; and deciding how to mitigate or manage these impacts.

Within recreation ecology, the impacts from recreation to ecosystem components such as soil and vegetation are relatively well studied. The negative impacts of recreation to environmental factors such as water, air quality, soundscapes, and wildlife are less well understood. Studying the relationships between non-consumptive recreation use and impacts to wildlife can be complex. Part of this complexity is because impacts to wildlife can be direct (e.g., harassment or feeding) and/or indirect (i.e., habitat modification) and at times can be hard to measure or observe (e.g., changes in stress hormone levels in response to recreation presence) as compared to soil or vegetation impacts. Additionally, impacts from non-consumptive recreation use can be interacting with, or compounded by, other ecosystem pressures. These added pressures include, but are not limited to, habitat loss due to development or changes in land use, pressures from consumptive recreation (hunting or fishing), and/or climate change. Moreover, impacts at the wildlife population or community level often require long-term studies, which are somewhat rare in recreation ecology but admittedly more common in the wildlife sciences.

Despite these challenges, there is a recent resurgence of interest in studying the impacts of non-consumptive recreation use on wildlife species. Meanwhile, there is a recognition that studies focusing only on the social or human aspects of a PPA system are insufficient to address current recreation and conservation issues, especially those related to wildlife. Many recreation ecologists, conservation scientists, and managers have begun to view outdoor recreation in PPAs as a complex social-ecological system (SES). As such, we must enhance our understanding of the interactions and intersections between both the ecological and social systems that make up our PPAs. Addressing wildlife conservation and recreation

access in PPAs requires SES-focused thinking and collaborative problem solving.

The rich social and ecological systems comprising California make this state an excellent place to begin to address recreation use through an SES framework. California is one of the most biodiverse states in the U.S. and while 47% of the state is currently protected, 97% of these protected lands are opened to human access. Non-consumptive recreation use in PPA has increased rapidly in recent years across the U.S. but especially in Western states. California State Parks saw a 10% increase in total visitation numbers from the 2015/16 to 2016/17 fiscal year and many California national parks have seen exponential growth in visitation in recent years. As the U.S population becomes increasingly suburban and urban, PPAs that provide refugia and critical habitat for wildlife face increasing pressure from land use change and suburban expansion. Within California, this trend is evident as the state's population continues to grow while land use change, extreme droughts, and development increases pressure on California's PPAs.

Currently, PPAs and open space are limited, and wildlife species and their habitat face many ecological pressures. We are on the cusp of a resurgence and upswell of research exploring non-consumptive recreation impacts on wildlife. However, to meet conservation objectives, additional research is still needed to best inform recreation management in PPAs. Conserving and protecting wildlife species while providing quality recreation experiences to society requires interdisciplinary and transdisciplinary teams of researchers, managers, practitioners, stakeholders, and the public working together towards shared goals and objectives. Because of the social and ecological complexities and uncertainties around recreation impacts to wildlife, no individual field of science or management entity will be able to address this issue on its own. As such, this special issue is timely and important as it adds to the body of literature aimed at understanding non-consumptive recreation impacts to wildlife. Additionally, this special issue serves as a starting point for cooperatively exploring the challenge of protecting wildlife while balancing non-consumptive recreation use. If we are to meet conservation goals related to wildlife and wildlife habitat, it may not be appropriate to allow recreation use in all PPAs and at all times. However, collaborative dialogues (informed by the SES framework) around wildlife conservation are essential to guide decisions related to where, when, and how non-consumptive recreation use should be permitted in our PPAs.

California Fish and Wildlife, Recreation Special Issue; 11-28; 2020

Balancing conservation and recreation

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Key words: California, equestrian, Habitat Conservation Plans, hiking, horseback riding, human dimensions, Natural Community Conservation Plans, mountain biking, trails, wildlife

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As California's population has grown to nearly 40 million people, and as the State's beautiful natural diversity draws tourists and explorers from around the world, outdoor recreation has also grown (California Department of Parks and Recreation 2013, 2017; Monz et al. 2019). New equipment and technology enable new activities, such as night-time mountain biking, while social media brings increasing numbers of people to areas seldom visited by people only ten or twenty years ago. With increased time and more sedentary work environments, our society is understandably demanding greater access to more land for outdoor recreation. However, since several species-protection challenges already exist throughout the State due to development, fragmentation, invasive species, altered fire regimes, and climate change, consideration of opening up additional wildlands for recreation presents new challenges to conservation.

Outdoor engagement with natural areas is recognized as a necessary part of people's well-being, yet recreationists are generally attracted to the same high-value open spaces and natural areas that harbor diverse plant and animal communities (Mancini et al. 2018). Accordingly, trails, access points, and associated infrastructure need to be planned and

managed appropriately to complement, rather than diminish, conservation values of lands dedicated to the protection of species and their habitats. In the absence of good planning, recreation-conservation conflicts are increasing, polarizing these two stakeholder groups and eroding their natural affinity and alliance. When conservation and recreation interest groups work together and conservation and recreation lands are planned and managed based on scientific research, a new opportunity emerges for a coordinated approach to protecting California's wildlife while also meeting the demand for high-quality recreational opportunities for diverse user groups.

Recreation and conservation interests would benefit from regular dialogue and collaboration with each other and with federal, state, and local land use authorities regarding regional and local land use planning, acquisitions, and management. A shared, basic understanding of applicable conservation objectives and regulations would provide context and perspective for recreational users and serve to help the two groups work together to ensure each of their interests are served rather than their respective needs being compromised. Without a close alliance among recreation and conservation interests, California risks having insufficient land areas set aside for the thousands of species that depend on California's natural areas, inadequate areas for recreation, and increasing conflicts between conservation and recreation needs. The necessary conversations, research, and determination to collaborate should be embraced and acted upon as soon as possible to help address these needs, reduce the potential for polarization among these stakeholders, and help ensure good land use planning and management decisions are made as development proceeds.

In this essay, we provide an overview of the mechanisms available to implement conservation in California and introduce many of the issues attributed to outdoor recreation when managing for wildlife and natural resources on conservation lands and other public open spaces. We then describe two case studies from our work in southern California that highlight the perceptions and values of outdoor recreationists when visiting conserved lands. The case studies also demonstrate what a successful balance between conservation and recreation uses can look like when moving from conflict to collaboration. We end with a discussion of what is required to achieve that balance and ways to minimize the impacts of outdoor recreation on wildlife and other natural resources.

CONSERVATION CONTEXT

As California's population grew from a few hundred thousand to nearly 40 million people in less than two hundred years, numerous species' populations have declined. Some, like the iconic grizzly bear (*Ursus arctos horribilis*), are now extinct in the state. Over 450 plant and animal species in California are now listed by the federal or state government as threatened or endangered (CDFW 2019). The cost of species recovery can be enormous, such as the tens of millions of dollars spent to save the majestic California condor (*Gymnogyps californianus*; Walters et al. 2010). To prevent further species declines, a number of laws and regulations exist to avoid, minimize, or compensate for impacts of human activities on species. In California, these include the federal Endangered Species Act (ESA), the California Endangered Species Act (CESA), the National Environmental Policy Act (NEPA), the California Environmental Quality Act (CEQA), among others. Approximately half of California is federally or state-owned lands with a variety of uses, from national forests and state parks to multi-use areas and reserves. In addition to these areas, an appreciable

amount of land is conserved in California as mitigation under ESA, CESA, CEQA, and other laws and regulations.

Successful conservation leads to the protection of species and habitat and the preservation of natural landscapes. Principal types of conservation lands in California include reserves acquired and managed as part of Habitat Conservation Plans (HCPs) and Natural Community Conservation Plans (NCCPs), national parks and monuments, state ecological reserves and wildlife areas, state parks, lands owned by private entities (e.g., land trusts), lands with conservation easements, and mitigation lands. The relative importance of conservation and recreation values to the management goals of these lands vary. For example, state and national parks generally emphasize recreational uses more than mitigation lands and ecological reserves. Sixteen HCP/NCCPs have been approved in California covering part or all of seven counties. Through the new Regional Conservation Investment Strategy (RCIS) Program established in 2017, one RCIS has been approved and an additional eight Regional Conservation Investment Strategies (RCISs) are currently in development or have been submitted for review and approval by the Department of Fish and Wildlife (for more information about RCIS and NCCP programs, see Appendix I). The nine RCISs together will cover part or all of 11 counties. There are also over 130 conservation and mitigation banks in the state, privately held conservation lands, and hundreds of mitigation sites. In total, tens of thousands of acres of habitat have been conserved in California through proactive investments and mitigation. Over one and one-half million acres will be conserved in California under approved HCP/NCCPs, benefiting hundreds of species listed as endangered or threatened under federal and state species protection laws.

OUTDOOR RECREATION

Millions of Californians and visitors recreate outdoors on natural lands within the state each year (Outdoor Industry Association 2019). Examples of outdoor recreation activities include hiking, trail running, mountain biking, horseback riding, backpacking, camping, and motorized activities. The positive effects of outdoor recreation are numerous. Stewardship values are enhanced. Appreciation of nature is magnified as people are exposed to the inherent beauty, complexity, and serenity of natural systems. The next generation of land stewards and conservationists are born out of the experience of being introduced to wildlands when young. Equally important, the mental health benefits of exposure to the outdoors and participation in nature are now well-recognized (Louv 2005; Thomsen et al. 2018). For a society that is increasingly becoming more urban and digital, the restorative properties of nature and the increased social well-being of individuals and communities is ever more important.

Despite these benefits, the negative effects of recreation on wildlife can be profoundly damaging to species and their habitats and must be considered when planning for conservation areas (Hammitt et al. 2015). Trails lead to habitat degradation and fragmentation, which increase when visitors go off-trail and informal trails proliferate. Harassment of wildlife, though often unintended, occurs with increased visitation to an area. Less obvious impacts to wildlife, not easily measured, have been tied to noise, light pollution, trash, and other factors associated with recreation activities.

In general, it can be difficult to accept that recreation activities, especially quiet, nonmotorized activities like hiking and mountain biking, can have harmful effects on wildlife. Many types of recreation cause little physical habitat change. Perhaps as a result, recreation

was widely assumed to be a "benign use" that is compatible with conservation goals (Knight and Gutzwiller 1995) and is permitted in the vast majority of protected areas worldwide (Eagles et al. 2002; IUCN and UNEP 2014). Many HCP/NCCPs include a general provision that allows for "low-impact nature trails" without strongly defining what that means and what types and levels of use would be acceptable, given the species that are to be protected. The viewpoint that recreation is a benign use may be changing, however. In recent years, researchers have found evidence that a variety of recreation activities and intensities can have detrimental impacts on wildlife (Geffory et al. 2015; Larson et al. 2016; Samia et al. 2017).

RECREATION EFFECTS ON WILDLIFE

Behavior, activity budgets, and physiology

Behavioral reactions, such as flight, flushing, or vigilance are some of the most commonly-observed and studied wildlife responses to recreationists (Larson et al. 2016). Changes in activity budgets have also been observed, with animals typically spending less time in activities such as foraging and caring for young and more time moving or being vigilant when recreationists are present (Schummer and Eddleman 2003; Arlettaz et al. 2015). Physiological responses, such as increases in stress hormones (Arlettaz et al. 2007) or decreased body mass (McGrann et al. 2006), are less obvious to observe, and can occur even when a corresponding behavioral response does not. It is critical not to assume that an animal is tolerant of recreation simply because it does not exhibit a visible response.

Habitat degradation and fragmentation

Recreation can degrade or fragment habitat, resulting in habitat that is otherwise of high quality being used less frequently or not at all. This is particularly concerning in highly fragmented or developed landscapes where remaining habitat is scarce and there is limited opportunity for wildlife to move to alternative areas. Researchers have observed avoidance of areas used by recreationists in species as diverse as grizzly bears (Coleman et al. 2013), wolverines (*Gulo gulo*; Heinemeyer et al. 2019), caribou (*Rangifer tarandus*; Lesmerises et al. 2018), capercaillie (*Tetrao urogallus*; Coppes et al. 2017), and dolphins (*Tursiops* spp.; Lusseau 2005).

Reproduction, survival, and abundance

Assessing recreation's impacts on wildlife population abundance or vital rates can be difficult and time-consuming, and is therefore largely unknown. In one of the few studies of population trends in relation to recreation, Garber and Burger's long-term study (1995) observed dramatic declines in North American wood turtle populations after the area was opened to recreation. Reproductive success is one of the better-studied population vital rates; negative effects of recreation on reproductive success have been observed in several species including elk (*Cervus canadensis*; Shively et al. 2005), penguins (Giese 1996; Lynch et al. 2010), and plovers (*Charadrius* spp.; Lafferty et al. 2006; Yasué and Dearden 2006). However, other studies have found that habituation can moderate impacts of recreation on reproductive success (Baudains and Lloyd 2007).

Community composition and richness

Within an ecological community, species respond to recreation differently. This can lead to changes in community composition if more sensitive species avoid areas with recreation or decline in abundance while the habitat use or abundance of tolerant species remains constant or even increases due to reduced competition. When the sensitive species are native and the more tolerant species are non-native, this can lead to dramatic declines of native species as compared to their non-native counterparts (Reed and Merenlender 2008). Overall species richness can also decline if sensitive species disappear from local communities (Bötsch et al. 2018).

Indirect effects

Recreation can also cause other changes that indirectly affect wildlife, many of which are not well understood. Shifts in diel activity patterns could change the way that species interact with each other or with their environment, potentially leading to increased inter-specific competition during nighttime hours or increased overlap between predators and their prey (Gaynor et al. 2018). Recreation can facilitate the spread of non-native species in freshwater, marine, and terrestrial environments (Anderson et al. 2015), which can have dramatic effects on native wildlife. Recreation activities also often involve infrastructure (e.g., parking lots, maintenance buildings, roads, ski lifts), which can lead to further habitat loss and fragmentation (Nellemann et al. 2010).

Examples of recreation impacts from southern California

Examples from southern California, where much of our work occurs, highlight some of the many ways recreation can impact natural resources. Results of ten years of camera-trap studies on conservation lands in Orange County indicate mule deer (*Odocoileus hemionus*) and coyotes (*Canis latrans*) are shifting the timing of activity due to the presence of humans on trails creating novel predator-prey conflicts for wildlife (Patten et al. 2017). Observed shifts toward more nocturnal activity by both species leads to greater temporal overlap in activity periods between mule deer and their principal predator, the mountain lion (*Puma concolor;* Figure 1). Greater overlap between coyotes and gray foxes (*Urocyon cinereoargenteus*) has also been observed, leading to predicted changes in predator-prey dynamics.

Bobcat (*Lynx rufus*) movement modeling using more than ten years of telemetry data in the 7,284-ha South Coast Wilderness of coastal Orange County highlights the importance of maintaining regional connectivity among isolated parcels and continued exclusion of human presence at culverts and other critical linkage points along the coast (Boydston and Tracey 2018). Within landscapes containing natural areas constrained by development, protected habitat and other high-value open space is a premium for wildlife. Providing for safe, unobstructed passage for wildlife among isolated parcels, especially at culverts and other pinch-points, is essential to enable access to high-value habitat within these otherwise constrained landscapes.

In heavily used open space areas, some wildlife appear to develop a tolerance for regular human activity on trails over time. However, patterns of wildlife habitat use can be disrupted by disturbances occurring outside this regular activity, such as large recreation

events, off-trail visitor behavior, or the proliferation of new social trails, even in areas that traditionally see high levels of visitor use. At a local scale, observations of breeding bird behavior before, during, and after a mountain bike race at a wilderness park in Orange County highlights elements of both sides of this phenomenon (Hamilton et al. 2015). In this example, breeding bird behavior continued uninterrupted in areas experiencing similar amounts of activity along the racecourse during the event as to what was experienced prior. As people gathered in numbers on and off the trail at the designated start/end staging area for the event, evidence suggests behavior was disrupted as the sheer volume and continual

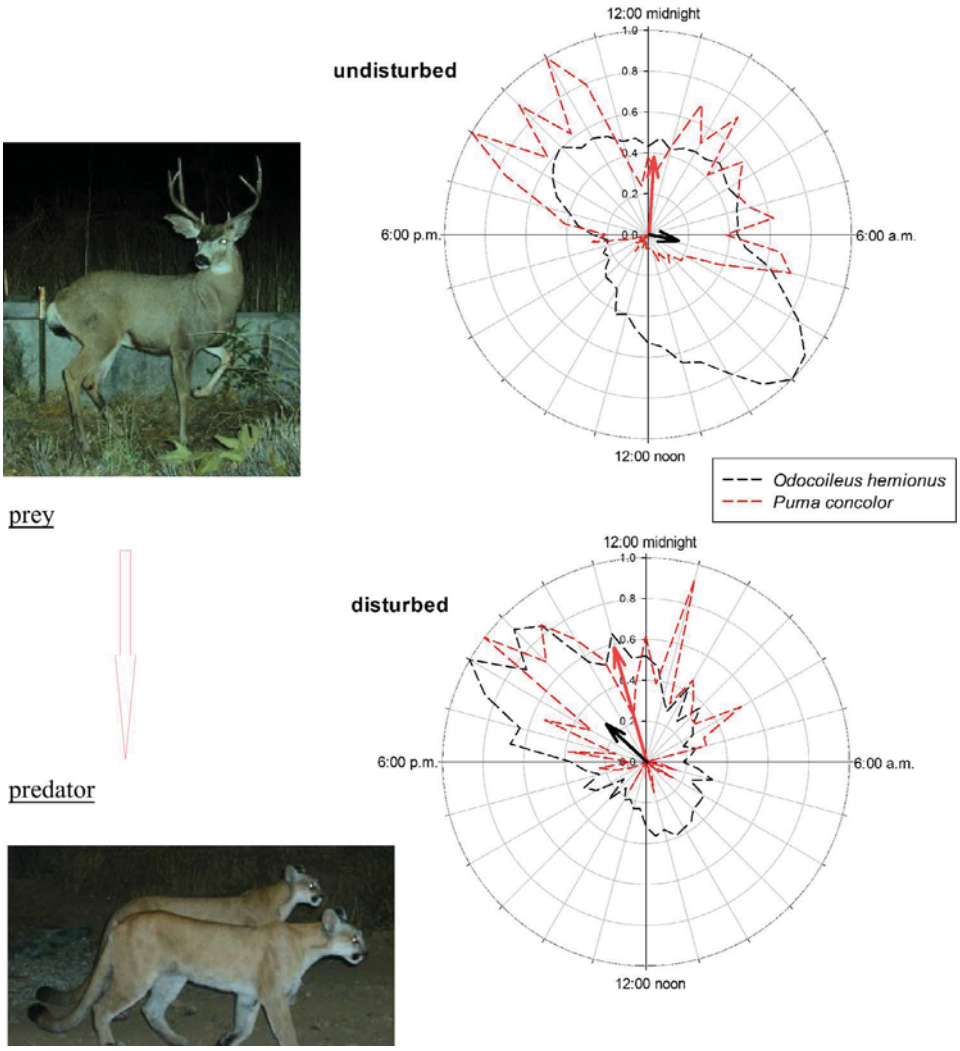

Figure 1. Diel activity of the mule deer and mountain lion with or without human disturbance. Arrows indicate time (direction) and proportional magnitude (length) of mean activity, and the "net" displays the spread of activity on a 24-h clock, binned at 30-minute intervals. Note the prey's (the deer) nocturnal shift when disturbance was present. (Figure credit: Patten et al. 2019)

presence of people gathered around the staging area was atypical for this location within the park.

CASE STUDY:

UNDERSTANDING VISITOR PERCEPTIONS AND VALUES IN ORANGE COUNTY

To successfully strike a balance, we need to know more about the human perspective of conservation. By surveying visitors to protected natural areas in southern California over the last couple of years, we learned there is potential for a shared vision of nature protection addressing the needs of both conservationists and outdoor recreationists. Clearly the issues are complex, but with good planning and communication, much can be done to support the creation of a collective vision for compatible conservation and recreation.

Natural Communities Coalition (NCC) is the non-profit management corporation overseeing implementation of the conservation strategy for the County of Orange Central and Coastal Subregion NCCP/HCP. Stretching from the Newport Coast to the Santa Ana Mountains, over 20,200 ha (50,000 acres) of conserved lands together with National Forest are embedded within the conservation plan's 84,000-ha (208,000-acre) planning area. The 75-year plan, signed in 1996, was the first landscape-scale NCCP in the state and one of the first multi-species HCPs nationally.

With 3.2 million residents in Orange County (Center for Demographic Research 2019), the demand for outdoor recreation on lands protected for conservation purposes is ever-present and increasing. Equally important is the recognized need and desire by the community to conserve the rich natural heritage of the southern California region. In Orange County, like in other high-value natural areas of the state experiencing rapid population growth, there is a strong need to strike a balance between conservation and recreation.

Recreation management is one of four main tenets of the regional landscape-level conservation strategy managed by NCC. Recognizing the increasing need to address this topic, NCC staff began focused and meaningful conversations with recreation ecologists and then followed with talking directly to park visitors to understand the human dimensions, that is, the motivations, desires, and values of visitors to the conserved lands. Partnering with Dr. Christopher Monz, Professor of Recreation Resources Management in the Department of Environment and Society at Utah State University, the organization surveyed close to 2,000 visitors in the spring and fall seasons of 2017 and in the spring of 2018 to better understand their perceptions, values, and characteristics (Sisneros-Kidd et al. 2019). In this process, the research team used a theoretical framework that allowed for the identification of internal constructs embedded within visitor questionnaires to reveal motivations and define different user groups. Through the work, two principal groups or clusters of visitors were discovered, those who are motivated most by the opportunity to experience nature immersion and those who are more focused on fitness-based recreation.

Surprisingly, given the urban-proximate setting, and in contrast to the expectations of local land managers, by almost two to one, recreationists were looking to experience nature immersion compared to those seeking fitness-based recreation. These visitors were more motivated by solitude and escape, learning about and experiencing nature, spiritual renewal, and the social experience, versus those in the fitness-based recreation group who

were motivated principally by challenge and outdoor exercise. Learning that the motivation and values of most visitors are more in alignment with resource protection than expected, we had to shift our thinking. Rather than focusing on direct conflict between recreation and conservation, we had to reevaluate how the conversation about balancing recreation and conservation is framed. Knowing it is often the most vocal and well-organized user groups who receive the greatest attention, whether from rangers at a local park or elected officials at a public meeting, we recognized it was of value for decision-makers to be informed of the findings and equally consider the motivations, values, and desires of the quiet majority in these public spaces and forums.

Digging deeper into the results of the work, we found people largely recognize the value of habitat and natural resource conservation; however, they too want to be part of the story. People do not want to be left "standing on the sidelines or looking over the fence;" they want to experience the rich natural resources that make California so unique. When asked how satisfied they were in their ability to achieve a variety of experiences during their visit to a park, visitors reported they were often left wanting more when it came to learning about nature and becoming more in touch with their spiritual values.

Visitor responses indicated they experience place attachment. When asked, they recognize the lands upon which they choose to regularly recreate are not necessarily unique relative to other protected areas. However, to them these lands and parks are special, meaningful, and important. Place attachment may be reflected in the high repeat visitation rates of visitors. More than half of those surveyed visited parks more than 50 times within the same year. Furthermore, many of the visitors live within neighboring communities. For almost half of the parks included in the study, more than 25% of visitors live within 3 miles of an entrance location (Mitrovich, unpublished data). To these people, the parks are a recognized and utilized part of their local community's resources.

Recreation is multidimensional and multifaceted, and we recognize a more sophisticated approach to finding solutions is warranted when seeking to minimize recreational impacts on sensitive natural resources. Impacts and motivations vary by user group, as does the attractiveness of different topography. From the surveys, we learned mountain bikers look to avoid crowds, are most knowledgeable about "leave no trace," most interested in more trails, and most likely of all user groups to be satisfied in their ability to get away from the demands of life when out on trails. Dog walkers, on the other hand, were least knowledgeable about "leave no trace," most avoided by other recreational groups, and least satisfied in their park experiences as it relates to their ability to learn more about plants and animals. Some hikers and runners were concerned about the number of mountain bikers they encountered in particular parks and along certain trails. Different topographic features attracted different users. Steep trails that offer high speeds and technical challenges are attractive to mountain bikers but can be off-putting to other user groups. In unregulated spaces popular with the masses and advertised through social media, trails can be degraded and spider, further fragmenting and degrading available habitat. The overlap between areas used for recreation and high-value wildlife habitat may be greatest with nature-based recreationists.

One positive take-home, as we look for solutions, is that visitors in urban landscapes are much more tolerant of crowded conditions than previously recognized by land managers. Parks in Orange County have seen a dramatic increase in use over the last decade, with increases of greater than 50% not uncommon over a 4-year period (Monz et al. 2019). However, at many parks considered to be "crowded" by land managers, over 80% of re-

spondents surveyed did not feel the presence of other people on the trail interfered with their activities or made them feel rushed or slowed them down during their visit. Equally, over 80% of respondents in 2018 did not feel the number of people at the park increased their risk of injury.

Although many folks are comfortable in a more crowded space, not everyone is comfortable with the changing dynamics and increases in observed use experienced over the last decade. Across both before-mentioned measures, there were respondents that felt the number of people at the park during their visit did increase their risk of injury at least some of the time, and other visitors and their activities interfered with their visit. Like wildlife, it appears people's tolerance of novel conditions is not fully universal and may differ across generations, by past experiences, and expectations (Shelby et al. 1983). When coupled with their understanding that off-trail activity is most impactful, the general tolerance of folks to increased visitation rates gives hope as we look for solutions to meeting increased demand while paying the necessary attention to detail to create the recreational opportunities valued by most that continue to honor the shared commitment and need for lasting conservation.

CASE STUDY:

CONFLICT TO COLLABORATION IN THE COACHELLA VALLEY

Now we turn to one example of how a region is addressing the question, what to do when trail users and sensitive species like the same habitat? Like other areas of southern California, the Coachella Valley in the desert and mountain regions of eastern Riverside County has seen a remarkable increase in the demand for outdoor recreation on trails, especially hiking and mountain biking. In this desert resort area, land of more than 100 lush golf courses, demand for golf is flat, while hiking has surged in popularity, in large part due to the influence of social media.

In 2008, the California Department of Fish and Wildlife (CDFW) and the U.S. Fish and Wildlife Service (USFWS) approved the Coachella Valley Multiple Species Habitat Conservation Plan/Natural Community Conservation Plan (CVNCCP) with a 75-year permit. Like other efforts in California and beyond, it was a visionary effort to balance conservation and development. The plan encompasses an area of almost 500,000 ha (1.1 million acres) from Palm Springs to the Salton Sea and beyond. Implementation of the plan is overseen by the Coachella Valley Conservation Commission (CVCC), made up of elected officials from participating cities, Riverside County, local water districts, and other agencies.

However, several years earlier, the conflict between trail users and agency biologists nearly derailed the CVNCCP. During development of the plan, proposals by state and federal wildlife agencies to impose seasonal closures on some trails galvanized trail users to organize and turn out in large numbers at public hearings. The proposal to close trails centered on concerns about the impacts of trail use on Peninsular bighorn sheep (*Ovis canadensis nelsoni*), a state and federally listed endangered species (Figure 2). In response, trail users read scientific literature, interviewed bighorn sheep biologists, and questioned the scientific basis of the trail restrictions. They used their newfound knowledge and spoke passionately about their concerns to elected officials, often quoting published scientists.

When the CVNCCP was approved in 2008, it did not include the trail closures that had been envisioned. Public input from trail users convinced decision-makers to avoid these measures. It also convinced conservation planners that a full trails management plan needed

to be developed for the CVNCCP. Unfortunately, the process also left trail users alienated and with a lack of trust in the state and federal wildlife agencies. Wildlife agencies were suspicious of trail users' motivations. It would be years before these attitudes changed. Trail users seeking nature immersion, who could have been a natural constituency for support of the conservation proposed by the CVNCCP, continued to question the scientific basis of the trails plan. Even after the CVNCCP was completed and fully permitted, the lack of trust remained.

To provide a forum for input from trail users and local governments, the final CVNCCP called for formation of a Trails Management Subcommittee, composed of a representative from each of nine cities involved in the CVNCCP, the Agua Caliente Band of Cahuilla In-

Figure 2. In some areas of the Santa Rosa and San Jacinto Mountains National Monument, seasonal trail closures are in place to allow bighorn sheep and other wildlife access to waterholes during the hot summer months. (Photo credit: CDFW)

dians, trail user groups (mountain bikers, hikers, equestrians), environmentalists, biologists from CDFW, USFWS, Bureau of Land Management, and other land management agencies. The group was charged with providing recommendations on trails management, annually reviewing the status of bighorn sheep, and communicating trails-related information to stakeholders. Their tasks required them to develop a shared understanding of relevant conservation objectives and regulations while they worked together to accomplish their charge.

A dedicated group of volunteers, the subcommittee took their responsibility seriously and worked hard. Meetings were well attended and often animated. Passions flared, and sometimes sparks flew. On occasion, meetings devolved and became acrimonious and full of

conflict. Trail users continued to question the scientific basis for trails management actions proposed by "the agencies." Agency biologists doubted the trail users' commitment to the protection of bighorn sheep and were reluctant to share data. Unfortunately, throughout the process, scientifically rigorous data on the effects of trail use on bighorn sheep was limited. The studies needed to understand the relationship between trail use and bighorn sheep had not been done. The CVNCCP was approved in 2008, the year the recession hit and resources for local, state, and federal agencies were further limited by lack of funding.

In 2011, the conflict between recreation and habitat ended up in the state legislature when CDFW closed the upper portion of the very popular Bump and Grind Trail to protect bighorn sheep. Though not a trail which offers the experience of solitude, the Bump and Grind provides a great cardio workout, with hikers numbering more than 1,000 some days. Questioning whether any studies to prove that hikers have an impact on the endangered bighorn had been presented, trail users went to their state legislators. Ultimately, a compromise was worked out and Governor Brown signed legislation in October 2013. The upper Bump and Grind is now closed for three months during the sensitive bighorn sheep lambing season, from February through April, and open for the remaining nine months of each year. The Coachella Valley Conservation Commission worked with CDFW to install a fence to discourage off-trail travel and educational signs about bighorn sheep.

Despite the challenges, the Trails Management Subcommittee persevered. They worked through the challenges, developed more trust, and learned to work together. They completed an update to the 2008 Trails Management Plan in 2014. The updated plan emphasizes the adaptive management approach described in the CVNCCP. It calls for research on the relationship between bighorn sheep habitat use and trail use, prior to construction of new trails. Technology has made such research more feasible, especially in the rugged and remote terrain of the Santa Rosa and San Jacinto Mountains National Monument. Since 2015, GPS collars have been placed on bighorn sheep, providing data on their movements and habitat use. The CVCC is now working on a study of bighorn sheep and trails, led by Dr. Kathleen Longshore of the U.S. Geological Survey and funded by a grant from CDFW. The trails subcommittee is actively involved with researchers in the development of the study protocol and review of all data. Field work began in fall 2019, with volunteers collecting data on recreational trail use and researchers comparing the human use data with bighorn sheep collar data.

Conflict has been replaced with collaboration. Although all of the best practices were not used initially, when they were used, they became lessons learned. If people understand why, they are more likely to go along with regulations (Marion and Reid 2007). Furthermore, when the need for regulation or constraints are understood, constraints can become a positive as they provide the basis for best practices and assure access via responsible use.

WHAT IS NEEDED TO ACHIEVE BALANCE? WHAT WORKS?

Several land management decisions are being made today with long-term implications for the state of biodiversity and human wellness within California. Without collaboration among recreation and conservation interests, California risks insufficient lands being set aside for the benefit of protecting species, insufficient lands for recreating, and poorly located lands for both purposes, with people and other species suffering the consequences. Recreation and conservation stakeholders need to talk and work with each other and with

ecologists and land planners early and often in the regional visioning and land planning process to ensure both interests get what is needed in a way that strikes a balance for species and habitat protection, and people's access to the outdoors.

To achieve a better land use future for conservation and recreation outcomes, we recommend early investment in working relationships. Increased early communication among all stakeholders, land planners, and managers, together with basing decisions on the best available science, can help reduce land use conflicts, the loss of species, and lower-quality recreation experiences. Groups should accept there will be situations when they collectively agree to disagree. However, the long-term commitment to work together will increase the likelihood of achieving goals and objectives for all interests. Most land conserved through public funding sources and/or mitigation and all HCP and NCCP properties have some form of Resource Management Plan (RMP) and/or Conservation Easement attached to them. It is critical RMP's are developed with a "clean slate" to identify critical sensitive species, regional context, and wildlife linkages up front. This, in turn, identifies potential areas appropriate for trails and other recreational uses, thus reducing debate and conflict later.

We also recommend establishing appropriate monitoring programs that are used to evaluate conservation and recreation outcomes and modify management plans to better achieve the original goals and adjust to changing conditions. The wide variety of nature-based recreational activities, timing and frequency of those activities, and numbers of people that participate in them, all result in a complex array of potential effects. Adding to that is the complexity of behavioral responses and sensitivities of different species to those activities. Recognizing this complexity and planning according to research findings that are available, and the anticipated growth or other changes expected, can help planners create conservation areas and recreation areas positioned to avoid future conflicts.

Opportunities to be inclusive and reach out to stakeholders as partners in the long-term management of protected lands are numerous. By simply involving everyone up-front, community members can be engaged early in the planning process and contribute to the search for solutions. Volunteers can help to enforce site rules using peer pressure. They may also be able to help with site maintenance, monitoring, and identification of possible management actions, such as when monitoring information indicates a problem exists. An open phone line to land managers is essential and over time naturally builds relationship and trust.

How can effects be minimized?

Using good science in the decision-making process is key, as is making data transparent and remembering the importance of educating the public throughout the process. Planning efforts should search for and incorporate relevant scientific findings. Despite the variability in species responses to different types and intensities of recreation, researchers have identified some ways to minimize the effects of recreation on wildlife:

- Monitor and prevent unauthorized trail creation and off-trail use. Many animal species respond more strongly to recreationists in unexpected places, such as off-trail (Stankowich 2008; Heinemeyer et al. 2019), so increasing the predictability of human presence by constraining people to the existing trail network may help mitigate negative effects.
- Limit nighttime access to parks and trails. Since people are primarily active during the daytime, many animal species avoid interactions with people by increasing the proportion of their activity that takes place at night (Gaynor et al. 2018). While the

implications of this shift for foraging success and interspecific interactions are largely unknown, limiting activity to daytime hours may be a way for humans and wildlife to coexist in parks and natural areas. Nighttime recreation is growing in popularity but may prevent animals from temporally avoiding people, and should be limited in general, and probably all together avoided in urban-proximate wildland areas where the existence of refugia is already severely limited spatially.

- Leave areas without trails, both within individual properties and at landscape scale. For the most part, research has not yet identified 'safe' levels of human activity that result in minimal negative outcomes for wildlife. Some species appear to respond to very low levels of human activity and would benefit from blocks of trail-free habitat; in one example, mountain lions, coyotes, and bobcats increased nighttime activity and decreased daytime activity in locations with levels of use as low as two people per day (Wang et al. 2015).
- Plan access points and infrastructure carefully. Parking lots and other facilities can increase the level of use at corresponding trails (Larson et al. 2018). On the other hand, a lack of parking space at popular trails can result in public safety issues if visitors park along busy roadways. Improper parking can also impact habitat, which can cascade to impact wildlife as well.
- Use seasonal trail closures during sensitive periods. For many species, the most sensitive period is the breeding period, when disturbance can lead to reduced reproductive success (Bötsch et al. 2017), which in turn can result in population declines.
- Collect visitor use data. Without some knowledge of the intensity and distribution of recreational use, it is difficult for managers to know where and when impacts on sensitive wildlife species may be occurring. Monitoring equipment can be costly to purchase and maintain, but basic measures like periodic manual counts at parking lots or trailheads can be helpful in tracking trends, and there are promising emerging approaches using information that visitors share on social media platforms, mobile devices, and fitness applications (Fisher et al. 2018; Monz et al. 2019; Norman et al. 2019).
- Consider diverse visitor perspectives and values. Employ contemporary scientific approaches so key components in the human dimension of recreation (e.g., perceptions, characteristics, and motivations) can be understood more formally and inform a planning process for long-term sustainable use.
- Determine thresholds of acceptability of key indicators of resource and social conditions. Recognize "carrying capacities" exist for protected lands and their identification is a key component in the planning process and essential to developing a range of possible management actions, from the spatial and temporal separation of different types of recreational uses to acceptance and identification of high and low intensity use areas within the greater protected open space network.

An opportunity is emerging to expand upon local successes and encourage a new dialogue among agencies, conservationists, and recreationists, both at the local level and regionally, in support of the expanded protection of natural lands throughout California. We encourage interested parties to continue to learn more about the use of conservation planning tools and visitor use management made available through the CDFW and USFWS, and Interagency Visitor Use Management Council (Appendix I). Forming partnerships allows stakeholder groups to work together to plan ahead of growth and build regional conservation

strategies for the increased protection of natural lands, addressing the long-term conservation needs of California's natural resources and the strong desire of people to experience nature.

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APPENDIX I: AVAILABLE CONSERVATION PLANNING AND VISITOR USE MANAGEMENT TOOLS

Natural Community Conservation Planning

The Natural Community Conservation Planning (NCCP) Program promotes collaborative planning efforts designed to provide for the region-wide conservation of plants, animals, and their habitats, while allowing for compatible and appropriate economic activity. https://www.wildlife.ca.gov/Conservation/Planing/NCCP

Regional Conservation Investment Strategy Program

The Regional Conservation Investment Strategy (RCIS) Program encourages a voluntary, non-regulatory regional planning process intended to result in high-quality conservation outcomes. The Program consists of three components: regional conservation assessments (RCAs), regional conservation investment strategies (RCISs), and mitigation credit agreements (MCAs). https://www.wildlife.ca.gov/Conservation/Planning/Regional-Conservation

Conservation and Mitigation Banking

Conservation and mitigation banking in California is overseen and undertaken by several Federal and State Agencies. The Banking Program coordinates with other agencies and stakeholders to develop statewide policy and guidance for the establishment and operation of conservation and mitigation banks. https://www.wildlife.ca.gov/Conservation/Planning/Banking

Biogeographic Information and Observation System (BIOS)

BIOS is a system designed to enable the management, visualization, and analysis of biogeographic data collected by the California Department of Fish and Wildlife and its Partner Organizations. https://www.wildlife.ca.gov/Data/BIOS

Areas of Conservation Emphasis (ACE)

ACE is a CDFW effort to analyze large amounts of map-based data in a targeted, strategic way, and expressed visually, so decisions can be informed around important goals like conservation of biodiversity, habitat connectivity, and climate change resiliency. https://www.wildlife.ca.gov/Data/Analysis/Ace

Visitor Use Management (VUM) Framework

VUM is a toolbox for visitor use management and addresses conservation issues. The framework also includes topic areas like capacity, indicators and thresholds, as well as the importance for monitoring recreation use. https://visitorusemanagement.nps.gov/VUM/Framework

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Recreation-related disturbance to wildlife in California – better planning for and management of recreation are vital to conserve wildlife in protected areas where recreation occurs

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Expanding levels of authorized and unauthorized non-consumptive recreation increasingly threaten sensitive biological resources in areas protected primarily or solely to conserve them. As California's human population grows, recreational use in protected areas grows commensurately. The majority of the documented effects on wildlife from non-consumptive recreation are negative; they include detrimental changes in behavior, reproduction, growth, immune system function, levels of stress hormones, and finally, to the survival of individual animals and persistence of wildlife populations and communities. This paper provides insights from the recreation ecology literature into these recreation-related disturbances to insects, amphibians, reptiles, birds, and mammals from hiking, jogging, biking, horseback riding, boating, and off-highway/all-terrain vehicles. The documented evidence of these disturbances to wildlife reveals the flaw in the prevalent assumption that recreation is compatible with biological conservation, the dual-role protected areas' core function. This assumption usually rests on the expectations of (1) allowing only ecologically sound siting of recreational areas and ecologically acceptable types, levels, and timing of recreation, and (2) providing sufficient monitoring, management, and enforcement of recreation to ensure the perpetuation of viable populations of focal sensitive species. However, it is rare that these expectations are met. The ultimate essential outcome of the information provided in this paper is the cessation of the extant recreation-related exploitation of dual-role protected areas. This calls for a societal course change involving: widespread, long-term, and continual multimedia dissemination of the science-based information about recreation-related disturbance to wildlife; application of a science-based approach to siting recreational areas and allowing only ecologically acceptable types, levels, and timing of recreation; and, perpetual personnel and funding explicitly for management at levels commensurate with recreational pressure. These measures would also improve the often cited economic, educational, and recreational/health benefits of dual-role protected areas.

Key words: dual-role protected areas, enforcement, fragmentation, management, multimedia education, non-consumptive recreation, perpetual funding, planning and siting of trail networks, recreational disturbance to wildlife, unauthorized trails

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Conserving habitats is a key strategy for conserving biodiversity worldwide (Pickering 2010). In California, the core function of many areas protected for conservation is to ensure the perpetuation of sensitive species (i.e., species whose persistence is jeopardized), as is appropriate for the nation's most biologically diverse state (CDFW 2015). The level of land conservation that California enjoys is intended to ensure that the state's globally renowned biodiversity remains intact. However, of all the states in the USA, California hosts the most listed species imperiled by recreation, in part because the strongest association of outdoor recreation is with urbanization (Czech et al. 2000), which is itself an important cause of endangerment (Reed et al. 2014). The anticipated growth of the state's human population from approximately 38 million in 2013 to 50 million by mid-century with a commensurate increase in recreational demands in protected areas will likely increase the continual challenge of conserving the state's wildlife (CDFW 2015).[1, 2] The dual role of protected areas to conserve biodiversity and provide nature-based recreational and educational opportunities for millions of people rests on the assumption that non-consumptive recreation is compatible with wildlife conservation, despite documented evidence to the contrary (Reed and Merenlender 2008; Larson et al. 2016; Hennings 2017; Dertien et al. 2018; Reed et al. 2019).[3] Ecologically sound types, levels, timing, and siting of recreation, and perpetual management of recreation at or exceeding a level commensurate with the recreational pressure, are vital to ensure the perpetuation of viable populations of focal sensitive species in "dual-role" protected areas.[4, 5]

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[1] Protected areas include locally-owned lands (e.g., county and city reserves), state-owned lands (e.g., ecological reserves, wildlife areas, state parks), federally owned lands (e.g., national wildlife refuges, wilderness areas), and privately owned lands (e.g., conservation easements, conservancy lands, mitigation banks and lands). Here, the focus is on protected areas preserved primarily or solely for the perpetuation of sensitive species (e.g., ecological reserves, protected areas established pursuant to Natural Community Conservation Plans and/or Habitat Conservation Plans, mitigation banks and lands).

[2] Wildlife means all wild animals: insects, fish, amphibians, reptiles, birds, and mammals.

[3] In contrast to consumptive recreation (e.g., hunting, fishing), non-consumptive recreation is generally assumed not to directly extract a resource; it includes nature and wildlife viewing, beach-going, kayaking, hiking, biking, horseback riding, and wildlife photography (Reed and Merenlender 2008; CDFW 2016; Gutzwiller at el. 2017). From here forward, "recreation" means non-consumptive recreation, unless otherwise stated.

[4] Focal species are organisms whose requirements for survival represent factors important to maintaining ecologically healthy conditions; identified for the purpose of guiding the planning and management of protected areas in a tractable way, focal species include keystone species, umbrella species, flagship species, and indicator species (Soulé and Noss 1998; Marcot and Flather 2007). Here, the term "focal species" is intended to include those species encompassed by the guild surrogate approach of conservation; this approach entails one member or a subset of members serving as a surrogate for other members of the guild (Marcot and Flather 2007).

[5] From here forward, "management" includes monitoring, management, and enforcement with the necessary authority. The level of enforcement necessary is dependent on the level of continual management implemented; generally, the more the management, the less enforcement is necessary. In addition, monitoring and management encompass both the natural resources and human users of the protected areas. The fiscal support to be secured includes personnel and all program costs.

Insights from studies

Purpose.—The purpose of the following discussion is to provide insights to disturbances to several wildlife species from non-consumptive recreation. Accordingly, the insights are exclusively from studies that document recreation-related disturbance to wildlife. This approach reflects the evidence that the majority of documented responses of wildlife species to non-consumptive recreation are negative, as demonstrated in two systematic literature reviews (Reed et al. 2014; Larson et al. 2016) and a literature review of over 500 articles written and reviewed by the scientific community (Hennings 2017). The insights are intended to (1) illustrate that scientific studies provide clear evidence of recreation-related disturbance to wildlife, (2) elicit awareness of and concern about the disturbance, and (3) stimulate action to address it.

Sources and scope.—The 71 articles and 13 reports[6] reviewed about the recreation-related effects on wildlife generally reflect Larson et al.'s (2016) finding that studies about such effects focus on mammals (42%) and birds (37%), followed by invertebrates (12.4%), reptiles (5.5%), fish (5.1%), and amphibians (0.7%); there are no insights herein from studies of fish. Larson et al. (2016) found that some of the least-studied taxonomic groups (i.e., reptiles, amphibians, and invertebrates) had the greatest evidence for negative effects of recreation. While not all the studies selected for this paper address wildlife in California, all the studies' scenarios could occur in the state as do all species types among the studied taxa (i.e., insect, amphibian, reptile, bird, mammal).

Not all of the studies selected for this paper address sensitive species. This is primarily because current research on recreation-related effects on wildlife includes few species of conservation concern (Larson et al. 2016). However, sensitive species may experience greater levels of recreation-related disturbance than described for common species in the study insights herein. This is because many rare and isolated species are specialists, and they may be more sensitive to anthropogenic disturbance, including recreational activities, than common and widely distributed species (Bennett et al. 2013; Reilly et al. 2017). Recreation-related declines of common species warrant attention because of their functional ecological importance – local depletions of common species can have broad consequences within the food web (Säterberg et al. 2013; Baker et al. 2018; Reed et al. 2019). Recreation-related declines or disturbance in an important common prey species may affect the species in higher trophic levels (Reed et al. 2019). More than a quarter of species become functionally extinct before losing 30% of their individuals (Säterberg et al. 2013; Baker et al. 2018; Reed et al. 2019); here, functional extinction occurs when the population size of the depleted species is below the level at which another species goes extinct (Baker et al. 2018).

The scope of this paper does not include studies about snow-based recreation, though all of the 14 articles addressing snow-based recreation that Larsen et al. reviewed reveal that non-motorized and motorized snow-based activities (i.e., skiing, snowshoeing, snowmobiling) can have significant negative effects. Nor does the scope of this paper include studies exclusively about the effects of dogs on wildlife; however, a literature review on the effects of dogs on wildlife concludes that (1) people with dogs on leash, and even moreso

[6] All the articles are published in peer-reviewed journals. Some of the reports were peer reviewed and all were written by or contributed to by professionals in the fields of biology or ecology, though none of the reports were published in peer-reviewed journals to this author's knowledge (e.g., Burger 2012; Hennings 2017; Dertien et al. 2018; Reed et al. 2019). This paper does not cite all the articles and reports this author read. And, the totals exclude documents that are not explicitly about recreation-related effects on wildlife (e.g., Tinkler et al. 2019; Taff et al. 2019; Wolf et al. 2019) and all newspaper articles.

off leash, are more alarming and detrimental to wildlife than any non-motorized recreational user group without dogs, and (2) people with dogs substantially increase the amount of wildlife habitat affected (Hennings 2016). Hennings (2016) also asserts that wildlife does not appear to habituate to the presence of dogs; effects linger after dogs are gone because the scent of dogs repels wildlife.

Management measures.—The study insights focus on the documented recreation-related disturbance to wildlife, not on management measures to prevent or minimize the disturbance. However, many of the reviewed articles and reports identify such measures, which range from full prohibition of human access, to time-of-access restrictions (e.g., seasonal or diurnal/nocturnal restrictions), to various measures based on disturbance thresholds. Disturbance thresholds are thresholds of various measurable parameters above or below (depending on the parameter) which wildlife is disturbed. Examples of disturbance thresholds are distance between trails and nesting sites, density of active trails, number of recreationists, number of recreational events per time frame, and duration of recreation. These thresholds may be used to establish management measures such as minimum widths of spatial buffers between recreational trails and wildlife.

A common theme among the management measures is that continual proactive and adaptive management is needed to protect wildlife from recreational disturbance, and that access closures should occur if the management fails.[7] Adaptive management is a cornerstone of large-scale multi-species conservation (CDFW 2014). An example of proposed management measures is Dertien et al.'s (2018) recommendation for a precautionary approach that adopts maximum values of quantitative disturbance thresholds observed for the taxa of concern, while excluding the extreme values of the thresholds.[8] This approach stems from the gaps in knowledge about quantitative disturbance thresholds of recreation; such thresholds are lacking for many species, taxonomic groups, and sources of disturbance.

Regarding spatial buffers, a general rule of minimum thresholds for distance to trails cannot be established for some species, as individual variability within species can be high and can differ among populations, types of topography, and frequencies and types of human intrusion (González et al. 2006). For example, Dertien et al. (2018) recommended a 200-m minimum buffer for ungulates; however, this would be insufficient for the circumstances of Taylor and Knight's (2003) study further cited below in which they found that mule deer (*Odocoileus hemionus*) showed a 96% probability of flushing within 100 m of recreationists located off trails, and the probability of their flushing did not drop to 70% until perpendicular distance reached 390 m. Two additional factors that influence the determination of spatial buffers are "effect zones" (i.e., areas within which wildlife is disturbed by recreational ac-

[7] Based on section 13.5 of the California Fish and Game Code and the Natural Community Conservation Planning Act (i.e., section 2805 of Fish and Game Code), adaptive management generally means (1) improving management of biological resources over time by using new information gathered through monitoring, evaluation, and other credible sources as they become available, and (2) adjusting management strategies and practices accordingly to assist in meeting conservation and management goals (e.g., conservation of covered or focal species). Under adaptive management, program actions are viewed as tools for learning and to inform future actions.

[8] The central tenet behind the precautionary principle is that precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. Generally, the four central components of the principle are: taking preventive action in the face of uncertainty; shifting the burden of proof to the proponents of an activity; exploring a wide range of alternatives to possibly harmful actions; and increasing public participation in decision making (Kriebel et al. 2001). There are subtle differences between the precautionary principle and precautionary approach, but their consideration is beyond the scope of this paper.

tivities on trails) and the density of the trail networks. The effect zones can extend several hundred meters on either side of the trails (Reed et al. 2019). The smaller a protected area is and the denser its trail networks are, the greater the proportion of the protected area is occupied by effect zones, and the less likely it is that spatial buffers such as those Dertien et al. (2018) recommended will protect the focal species from recreational disturbance (Wilcove et al. 1986; Ballantyne et al. 2014).

There are many sources that provide information about management of recreation in protected areas, or guidance on the design or siting of trails/trail networks. These sources include management framework tools designed to address recreational use, though they vary in their attention to the needs of wildlife (Hennings 2017).

Insects

In a study of the effects of walkers, runners, and runners with dogs on the federally endangered Karner blue butterfly (*Lycaeides melissa samuelis*; Karners) at the Indiana Dunes National Lakeshore, USA, Bennett et al. (2013) found that (1) Karners flushed in the presence of recreationists as they would respond to natural agents, such as predators; (2) recreation restricted host-plant choice by reducing host-plant availability, effectively rendering the quality of habitat within 10 m of the trail unsuitable; (3) recreation had the potential to reduce oviposition rate of virtual females by 50%, and therefore population growth rates; (4) the frequency at which recreationists negatively affected the females (including their oviposition) varied substantially with habitat extent, number of recreationists, and sensitivity; and (5) habitat extent was the primary predictor variable. The authors concluded that Karners will experience less recreation-related disturbance the farther their habitat extends beyond trails.

In a study conducted near Palo Alto, California, USA focusing on 10 native oak woodland species of butterflies, Blair and Launer (1997) concluded that even small perturbations by hikers and joggers in a recreational area led to (1) a loss in the number of butterfly species (species richness) of the original oak-woodland community compared to the number of these species in a biological preserve with no recreation, and (2) a lower number of butterflies (abundance) in the recreational area compared to the biological preserve. The authors also concluded that multi-use areas may not adequately preserve butterfly species diversity.

Herpetofauna

Responses of the Iberian frog to recreational activities.—In a study involving field research in the Guadarrama Mountains in central Spain and simulation modelling to assess the effects of recreation on Iberian frogs (*Rana iberica*), an endemic species in decline, Rodríguez-Prieto and Fernández-Juricic (2005) measured frog abundance and response to human disturbance. The authors found that Iberian frog abundance (a population-level parameter): (1) was significantly affected mainly by study site location and distance to the nearest recreational area, a proxy for human disturbance; (2) was positively related to distance from recreational area (i.e., as distance decreased, abundance decreased); and (3) increased as number of humans decreased. With respect to the effects of repeated disturbances (e.g., human approaching with a steady pace) on the individual-level parameters of

flight initiation distance[9] and time to resume pre-disturbance activities, the study showed that: (1) frogs' flight initiation distances were longer in areas with less vegetation cover; (2) though the flight initiation distances did not vary with repeated human approaches, the number of repeated human approaches affected the frogs' time to resume pre-disturbance activities, with second and third approaches increasing the time it took frogs to reoccupy the disturbed spot; and (3) there was an 80% decrease in the frogs' stream-bank use with a 5-fold increase in the direct disturbances per hour, and a 100% decrease in stream bank use with a 12-fold increase in human disturbances per hour. The authors concluded that direct human disturbance affects this species at the population level, and that it needs to be considered as a potential factor affecting amphibian populations with low tolerance for disturbance.

Responses of the yellow-blotched map turtle to human disturbance.—In a study along a 300-m reach of the Pascagoula River in southeastern Mississippi, USA, Moore and Siegel (2006) studied the effects from boating, fishing, jet skis, and direct anthropogenic damage to nests on the nesting and basking behavior of the yellow-blotched map turtle (*Graptemys flavimaculata*), listed as threatened under the U.S. Endangered Species Act. With respect to human disturbance of nesting turtles, the authors found that numerous turtles waited several hours near a sandbar before emerging from the water onto the beach to nest, and turtles that attempted to nest upon emerging onto the beach frequently abandoned their efforts and retreated to the water—of a total of 79 nesting attempts, only 15 successfully completed oviposition. With respect to human disturbance of basking turtles, the authors found that the number of turtles disturbed differed significantly with the type of disturbance; specifically, anglers that remained in the basking vicinity caused the most disturbance, and jet-skis caused less than an expected amount of disturbance; this was likely because of the anglers' closeness (compared to the jet-skis) to the basking logs and the long periods they remained, both of which caused turtles to bask less. Moore and Siegel (2006) concluded that: the interruption of nesting activities may have a severe impact on the viability of this population of turtles through changes in numbers of clutches; and, the interruption of basking and consequent reduction in the turtles' body temperature has the potential to negatively affect the ability of all turtles to process and digest food, and the ability of females to develop eggs during the reproductive seasons.

Responses of the common wall lizard to tourism.—In a study of common wall lizards (*Podarcis muralis*) conducted in areas with high and low levels of tourism within the same habitat in the Guadarrama Mountains in central Spain, Amo et al. (2006) examined whether the lizards differed in several parameters upon each human approach. The authors found that: (1) regardless of the level of tourism, lizards usually exhibited anti-predator behavior by fleeing to hide in refuges upon approach of a human; (2) in comparison to lizards inhabiting areas of low tourism pressure, lizards inhabiting areas with high tourism pressure, and therefore presumably escaping to hide in refuges more often, showed a poorer body condition and higher intensity of tick infection at the end of the breeding period; and (3) the intensity of tick infection was higher in male than in female lizards. The authors speculated that the higher intensity of infection probably resulted from the cumulative costs of high frequency of flight, since anti-predatory behaviors such as flight are costly in terms of losing time for other activities, including feeding—nutritional status can affect the capacity

[9] The flight initiation distance is the distance from an approaching threat (e.g., recreationist) at which an animal initiates moving away to escape from the threat. This movement is a fitness/energy cost to the fleeing animal. For the Iberian frogs, this was the distance between an approaching human and the frog when the latter jumped into the water in response to the human's approach.

of lizards to mount an immune response to infection. Furthermore, lizards with poor body condition had low levels of immune response, which may aggravate the deleterious effects of anti-predatory behavior on body condition. Female lizards in poor body condition produced offspring of small size, and body size of infant lizards can affect their probability of survival. Additionally, females with blood parasites also showed reduced fat stores and produced smaller clutches. By these effects on infants and clutch sizes, tourism may also negatively affect the maintenance of lizards' populations.

Responses of various reptiles to recreationists.—In a study to systematically assess recreationists' direct and indirect effects on sensitive wildlife species in 14 NCCP/HCP protected areas in San Diego County, California, USA, Reed et al. (2019) integrated monitoring of both wildlife species and recreationists (e.g., hikers, mountain biker, horseback riders).[10] The authors found that recreation was associated with declines in reptilian species' richness, occupancy, habitat use, and relative activity in the NCCP/HCP protected areas. Of the three species (all lizards) for which statistical analyses were feasible, two exhibited negative relationships between occupancy and human recreation—the orange-throated whiptail (*Aspidoscelis hyperythra beldingi*, an NCCP/HCP-covered species) and common side-blotched lizard (*Uta stansburiana*).

Birds

General responses.—In Steven et al.'s (2011) review of 69 peer-reviewed articles (50 of which were research conducted in protected areas) of original research on the effects on birds from non-motorized nature-based recreation, 61 articles reported recreation as having negative effects (i.e., negative changes in physiology, behavior, abundance, and reproductive success, the latter including the number of nests, eggs laid, and/or chicks hatched or fledged). The single documented positive effect involved an increase in the abundance of corvids (e.g., crows and ravens) in campgrounds. Walking or hiking, standing or observing birds from viewing platforms or standing next to a nesting colony, dog walking, running, cycling/mountain biking, and canoeing were all reported as negatively affecting birds. A large majority (85–93 %) of the studies that examined the effects of a single person, groups of two or more people, and/or avian population-level responses, reported negative effects. The population-level responses entailed effects on density, abundance, and reproduction.

In a study using data collected in 112 urban parks throughout Melbourne, Australia, Bernard et al. (2018) tested whether birds responded differently to bikers and walkers. They found that: (1) relative to their response to walkers, four of the 12 focal species studied initiated escape from bikers at longer flight initiation distances and two escaped with greater intensity (i.e., more likely to involve flying); (2) no species responded less to bicycles than to walkers; and (3) the flight initiation distance did not differ in response to speed of bicycle travel, though the difference in the two speeds used was only 1 m/sec. In concluding that

[10] An NCCP (Natural Community Conservation Plan) is a comprehensive, single- or multi-jurisdictional/utility plan that provides for regional habitat and species conservation at an ecosystem level while allowing local land use authorities to better manage growth and development. Upon issuing an NCCP Permit, the California Department of Fish and Wildlife (CDFW) can authorize take of selected state listed species and other species of concern, subject to the terms of coverage under the NCCP (CDFW 2015). An HCP (Habitat Conservation Plan) is the federal counterpart to an NCCP; the U.S. Fish and Wildlife Service prepares HCPs and issues HCP permits. The terms and conditions under which an NCCP/HCP's protected areas are conserved establish the types and levels of public access that are permitted (Burger 2012). The types and levels of public access vary among the NCCP/HCP protected areas from no access to guided-only access to open access. The species protected by NCCPs/HCPs are typically called covered species.

bikers can appear more or less threatening to birds than a single pedestrian, Bernard et al.'s (2018) results underscore that the responses of wildlife to recreational activities vary among species, sites, types of recreation, and exposure over time to the activities.

Songbirds.—Davis et al.'s (2010) study of the effects of mountain biking on golden-cheeked warblers (*Dendroica chrysoparia*, warblers) with nests near biking trails in the Fort Hood Military Base in Killeen, Texas, USA, and the Balcones Canyonlands Preserve in Austin, Texas, found direct and indirect effects. The direct effects included warblers flushing >20 m in response to encounters with passing mountain bikers. Indirect effects included abandonment of nests <2 m from the biking trails and a reduction in the quality of nesting habitat due to biking-related fragmentation and alteration of habitats. In comparison to the control sites, it was likely that habitat fragmentation resulting from trails in the biking sites caused the increased predation of warbler nests by rat snakes (*Elaphe obsoleta*) and other edge-adapted predators. The authors speculated that the biking sites, which were able to maintain viable populations of warblers at the time of the study, may not continue to do so with additional recreational use, fragmentation, and alteration of the habitats.

Forest birds.—Bötsch et al. (2018) examined how breeding-bird communities changed with distance to trails in four broad-leafed and mature forests in Switzerland and France; the forests were similar in size, structure, and trails, but widely different in levels of recreation (mostly walkers). The authors found that: in the forests with high levels of recreation, the density and species richness of birds decreased by 12.6% and 4.0%, respectively, at points close to trails compared to points farther away; cavity, ground, and open-cup nesters had fewer territories and species close to trails compared to farther away; and, above-ground foragers and ground foragers showed a similar pattern. None of these effects on density, species richness, nesting guild, or foraging guild occurred in the forests with low levels of recreation. Both high- and low-sensitivity species (i.e., long versus short flight initiation distances) had fewer territories and fewer species close to versus far from trails in forests with high levels of recreation; however, in forests with low levels of recreation, highly sensitive species exhibited only a slight tendency for fewer territories close to trails. The authors inferred from their findings that (1) human presence in forests disturbs avian community composition and abundance along trails in recreational areas, (2) the overall effect of recreational trails themselves depends mainly on recreational intensity and only slightly on species characteristics, and (3) the observed effects on birds in forests where recreation has occurred for decades suggest that habituation to humans has not outweighed the effects.

Raptors.—In a study along the Boise River in Idaho, USA, examining flight initiation distances of bald eagles (*Haliaeetus leucocephalus*) in response to actual and simulated walkers, joggers, anglers, bikers, and vehicles, Spahr (1990) found that the highest frequency of eagle flushing was associated with walkers, followed by anglers, bikers, joggers, and vehicles. Eagles were most likely to flush when recreationists approached slowly or stopped to observe them, and were less alarmed when bikers or vehicles passed quickly at constant speeds. However, the longest flight initiation distance was in response to bikers, followed by vehicles, walkers, anglers, and joggers. Hennings' (2017) literature review provides the following about bald eagles: pedestrians within 275 m caused a 79% eagle response rate; eagles did not resume eating for four hours after disturbance by walkers; a suggested minimum 600-m buffer around breeding eagles, beyond which response frequency dropped below 30%; an apparent threshold of about 20 daily recreational events after which eagles were slow to resume feeding, and after 40 events, feeding was uncommon; sub-adults were

less tolerant of disturbance than adult eagles; and recreation-related long-term effects can include reductions in survival, particularly during winter and especially for juveniles.

With respect to the tolerance (through habitat imprinting, genetic inheritance, or habituation) of golden eagle (*Aquila chrysaetos*) for recreational disturbance, Pauli et al. (2017) used an individual-based model[11] to assess the effects of walkers and off-highway vehicles on golden eagle populations. The primary modeling results indicated that, while golden eagles can develop tolerance for recreational disturbance, tolerance for even moderate levels of disturbance may not develop within a population at a sufficient rate to offset the effects of increased recreation on breeding golden eagles, particularly because this is a long-lived species with low recruitment. Pauli et al. (2017) conclude that, taken together, the simulation results suggest that recreation-related disturbance has a substantial effect on golden eagle populations and that increased recreation activity will exacerbate such effects. Given the results and the fact that non-motorized recreation decreases the probability of egg-laying in golden eagles (Spaul and Heath 2016), the authors asserted that trail management and a reduction in recreation activity within eagle territories are necessary to maintain golden eagle populations in locations where levels of recreation are increasing.

Shorebirds.—In a controlled study conducted in Scotland of the behavioral responses of the ruddy turnstone (*Arenia interpres*) to an approaching human, Beale and Monaghan (2004) found that birds supplemented with food flushed sooner from the human and searched for predators more frequently than birds not supplemented with food. That is, birds responding most were actually the least likely to suffer any fitness consequences associated with the disturbance. This study demonstrates the possibility of misconstruing the reasons for and implications of observed responses among all wildlife species. Traditionally and intuitively, species that readily flee from or avoid human disturbance are considered to be the most in need of protection from disturbance. However, species with little suitable habitat available nearby cannot show marked avoidance of disturbance even if the costs of reduced survival or reproductive success are high, whereas species with many nearby alternative sites to move to are likely to move away from disturbance even if the costs of the disturbance are low (Gill et al. 2001). It should not be assumed that the most responsive animals are the most vulnerable (Beale and Monaghan 2004). Gill et al. (2001) asserted that the absence of an obvious behavioral response does not rule out a population-level effect. In the same vein, it may be that species occurring in protected areas that are remnant fragments within urban landscapes are forced to utilize all components of the fragments, irrespective of their land-use intensity and land cover. This may occur if animals have nowhere else to go, and may be an explanation for instances when the relative abundance of birds is greater in urban and suburban reserves than in exurban reserves (Markovchick-Nicholls et al. 2008).

Mammals

General responses within NCCP/HCP protected areas in southern California.—In series of three studies about the responses of mammals to hikers and runners, bikers, horseback riders, dog walkers, and motorized vehicles, George and Crooks (2006), Patten et al. (2017), and Patten and Burger (2018) analyzed camera-trap data captured throughout areas protected under the 1995 County of Orange Central and Coastal NCCP/HCP (Orange County NCCP/HCP). All studies analyzed bobcat (*Lynx rufus*), coyote (*Canis latrans)*, and mule

[11] Individual-based models are simulation statistical tools that use empirical data to examine effects, such as anthropogenic population-level effects, that are difficult or impossible to study in a field setting.

deer, and Patten et al.'s (2017) analysis also considered mountain lion (*Puma concolor*), gray fox (*Urocyon cinereoargenteus)*, striped skunk (*Mephitis mephitis*), and northern raccoon (*Procyon lotor*). The authors found that: (1) mammal detections were negatively correlated with all types of recreationists; hikers and runners had the greatest negative association with wildlife, and equestrians had the least; (2) the overall trend is sharply negative: as human activity increased, mammalian activity decreased, regardless of species, type of human activity, or camera placement; (3) mammals were nearly four times as likely to be recorded on days with no human activity than on days with human activity at the same site; (4) detections of mammals decreased incrementally as the number of humans increased within a day, and fell to near zero probability at ≥60 humans per day; and (5) all seven species listed above exhibited short-term spatial displacement in response to events with more than 100 visitors.

Bobcats' negative associations were strongest with bikers, hikers, and domestic dogs. In areas of higher human activity, bobcat were detected less frequently along trails and appeared to show temporal displacement, becoming more nocturnal. Coyotes' overall activity was lower at the sites with the most recreation and was negatively associated with overall human, hiker, and biker visitations; and, a trend of temporal displacement in response to dogs was also evident. Generally, both bobcats and coyotes displayed a relatively wide range of activity levels at sites with low human use, but a lower and markedly restricted range of activity at those sites with the highest levels of recreation. Both coyotes and mule deer shifted their activities temporally over the long term. The mule deer's (a primary consumer) marked shift brought it into closer temporal alignment with its main predator (mountain lion) and the coyote's marked shift (secondary consumer) brought it into closer temporal alignment with a chief prey species (gray fox). These human-induced diel shifts involving animals in two trophic levels have important ramifications for predator–prey dynamics. Despite these studies' results, no evidence was found suggesting mammalian populations have declined in the Orange County NCCP/HCP protected areas between 2007 and 2016, even as human activity increased markedly across the study period. However, it is critical to consider this observation in light of: (1) the fact that, at least for the years 2007-2011, public access was controlled across most of the study area by permit-only entry, regular docent-led programs, and monthly self-guided wilderness access days—much higher levels of restrictions on public access than for most protected areas; (2) the authors' assertion that various mammalian species' avoidance behavior may yet drive mammalian populations downward upon further increase in human disturbance; and (3) the status of the Vail Colorado elk herd as recounted below—once a herd of 1,000 head diminished to 53 due to steadily increasing levels of recreation.

Overall, the results of the above three studies were similar to those of a study to assess recreationists' effects on sensitive wildlife species in 14 NCCP/HCP protected areas in San Diego County, for which Reed et al. (2019) used data from camera traps and a before-after-control-impact (BACI) experiment. Reed et al. found that bobcat, gray fox, mule deer, and northern raccoon were less active in areas with higher levels of human recreation. Bobcat habitat use was more strongly negatively associated with human recreation than urban development, which also decreased the probability of habitat use. The collective results for mule deer among the four studies suggest that mule deer may stop using some areas altogether if human recreation is too high. Reed et al. (2019) did not detect negative associations between human recreation and the habitat use or relative activity of the six following mammalian species of the 12 observed: coyote, striped skunk, ground squirrel, jackrabbit, brush rabbit

(*Sylvilagus bachmani*), and desert cottontail (*S. audubonii*). However, of special note are results from the protected area with the highest level of recreation (i.e., an average of 1,797 people per day) observed in the study, where the cameras captured only rabbits, and no other mid- to large-bodied wildlife species during 7.5 weeks of monitoring. Yet, this 2,449-ha protected area is considered a core biological area and regional wildlife corridor targeted for conservation (City of San Diego 2019). The BACI experiment conducted in another protected area showed a significant decrease in bobcat detection probability in a four-week period following a trail re-opening, suggesting that this species can modify its behavior (e.g., shift its activity patterns) rapidly after a change in human recreation. This is evidence that temporal closures have the potential to reduce disturbance during critical periods for some species. Although human recreation may not often extirpate mammalian species from urban habitat fragments, it can reduce habitat suitability and carrying capacity (Reed et al. 2019).

Responses to human voice.—Suraci et al. (2019) tested whether mammalian carnivores' responses to human voices alone can result in landscape-scale effects across wildlife communities, including cascading effects on the behavior of lower trophic level animals. The results of the study, which was conducted in the Santa Cruz Mountains of central California, USA, indicate that human voice alone does result in such effects. Where humans are absent or rare, large and medium-sized carnivores exhibit greater movement, activity, and foraging, while small mammals use less space and forage less. Where humans are present, the activity, foraging, and/or habitat use of large and medium-sized carnivores are suppressed, while small mammals increase their total space use and foraging intensity. The implications of these results are far-reaching, and include that, even in the absence of land development or habitat fragmentation, increased human presence can: (1) affect large carnivore movement, which could eventually limit carnivores' hunting and feeding behavior or force individuals to abandon high risk areas of their home range; (2) suppress activity of medium-sized carnivorous species; and (3) increase the abundance of small mammals that are prey to the large- and medium-sized predators, which could ultimately increase the abundance of small mammals in wildlife areas people visit (Suraci et al. 2019, citing other authors). Moreover, if the sublethal effects observed in the study in response to human voices alone are comparable to those effects (e.g., increased physiological stress, reduced reproductive success) that fear has been demonstrated to cause in predator-prey systems, they may amount to additional widespread but largely unmeasured effects of humans on wildlife populations (Suraci et al. 2019, citing other authors). Hennings (2017) provides additional insights about, and citations for studies on, the effects on wildlife from the human voice, concluding that conversational noise along trails can be very disturbing to wildlife.

Ungulates.— In a two-year study of elk (Cervus elaphus) in a herd near Vail in central Colorado, USA, Shively et al. (2005) found that elk reproductive success rebounded to pre-disturbance levels after the cessation of their exposure to back-country hikers during the calving season over the previous three years. Shively et al. concluded that, it seems prudent to protect elk during calving seasons, because, although the study provides evidence that elk reproduction can rebound from depressed levels when human disturbances are removed or reduced, there had been a linear decline in calf production in response to increasing levels of disturbance compared to controls without such disturbance, and it is not known if there is a threshold level of reproductive depression from which elk cannot recover. Recognizing that it is seldom easy to curb human activities that have become traditional, or to restore wildlife habitats once they have been developed, they recommended the continuation of

some closures imposed on parts of both the Vail and control elk herd study areas. However, a recent article in The Guardian reported that the number of elk in this same Vail herd dropped precipitously since the early 2010s with the steady increase in human recreation; once a herd of 1,000 head of elk, it had decreased to 53 at last count in February of 2019. The article explains that, for Bill Alldredge, one of the authors of the 2005 study, there is no other explanation than the increased levels of hiking, biking, and skiing in the area that supports this elk herd (Peterson 2019). This outcome adds to the already ample evidence that pregnant animals or those with young—especially mammals—are particularly sensitive to human disturbance (Hennings 2017).

In a study subjecting 13 captive female elk in the Starkey Experimental Forest and Range in Oregon, USA, to four types of recreational disturbances (all-terrain vehicles [ATV] riding, mountain biking, hiking, and horseback riding), Naylor et al. (2009) recorded the elk's resting, feeding, and travel times in response to the disturbances. The authors found travel time (a proxy for energy expense) increased in response to all four disturbances and was highest in mornings. The authors suggest that the elk's lesser response to each disturbance in afternoons was likely due to elk moving away from the disturbances in the mornings and avoiding them for the remainder of the day. Elk travel time was highest and feeding time lowest during ATV exposure, followed by exposure to mountain biking, hiking, and horseback riding. Resting decreased with exposure to mountain biking and hiking disturbance, and elk showed no evidence of habituation to mountain biking or hiking.

In a study of how bison (*Bison bison*), mule deer, and pronghorn (*Antilocapra americana*) responded to hikers and bikers on designated recreational trails at Antelope Island State Park in Great Salt Lake, Utah, USA, Taylor and Knight (2003) found the following: with respect to alert distance, flight initiation distance, and distance moved,[12] there was little difference in how each species responded to hikers versus mountain bikers (with an exception of mule deer flight distance), though each species exhibited its own degree of response in the three parameters tested; and all three species exhibited a 70% probability of flushing from on-trail recreationists within 100 m from designated trails. Trials were also conducted with only mule deer along a randomly chosen, off-trail route to assess the response of mule deer to hikers or bikers off designated trails. From these trials, the authors found that mule deer showed a 96% probability of flushing within 100 m of recreationists located off trails, and the probability of their flushing did not drop to 70% until perpendicular distance reached 390 m. There was little evidence of habituation to recreationists among the species at the time of the study. In fact, the pronghorn at the study site did not habituate to largely predictable recreational use over a three-year period following the opening of trails at the site, and used areas that were significantly farther from trails than they had prior to the start of recreational use.

Carnivores.—In a study of mammalian carnivores in 28 protected areas located in oak woodlands in northern California, USA, Reed and Merenlender (2008) found the following about carnivores' responses to recreationists. Generally, in paired comparisons of neighboring protected areas with and without recreation, the presence of dispersed, non-motorized recreation (hiking, biking, and horseback riding) led to a five-fold decline in the

[12] Alert distance is the distance from a stimulus at which an animal initiates vigilance behavior; more specifically in this context, it is the distance between a recreationist and an animal when the animal first becomes visibly alert to the recreationist. Flight initiation distance is defined in footnote #9. Distance moved is the distance an animal travels from its initial position until it stops (Taylor and Knight 2003).

density of native carnivores and a substantial shift in community composition from native to nonnative species. Specifically, a higher mean number of native species was detected in protected areas that did not permit recreation. By contrast, in protected areas that permitted recreation, more nonnative species were detected, domestic dogs were detected more frequently, and densities of coyotes and bobcats were more than five times lower. The authors concluded that the key variable for moderately sized protected areas (50–2000 ha) near urban development seems to be whether or not the site is open to public access.

In a study within three protected areas in Arizona, USA, Baker and Leberg (2018) found the following about how 11 mammalian carnivore species respond to varying levels of hiking, horseback riding, and border patrol activity. The study sites with the highest levels of human activity had significantly lower carnivore diversity, higher occupancy of common species (coyote, gray fox, and bobcat), and lower occupancy of all other carnivorous species. Generally, rare carnivores (e.g., mountain lion and kit fox, *Vulpes macrotis*), badgers (*Taxidea taxus*), and gray foxes avoided trails, whereas common species (except gray fox) preferred trails. Overall, edges of protected areas appeared to negatively affect occupancy of nearly all the study's species, and the presence alone of roads and trails, and not necessarily how much they are used, has a significant negative effect on the occupancy of most carnivorous species. In general, coyotes and bobcats were the carnivores least sensitive to human disturbance, gray foxes had a moderate negative association with human disturbance variables, and smaller carnivores and mountain lions seemed to be exceptionally vulnerable to human disturbance. Furthermore, the higher the level of overall disturbance in a protected area, the more sensitive carnivores were to disturbance variables.

Conclusions and Suggestions

With the expanding recreation-related disturbance to wildlife in protected areas, their dual role of conserving biological resources and providing nature-based recreational and educational opportunities for people presents a continual challenge to land managers and a continual threat to wildlife and the state's biodiversity, particularly sensitive species. The scientific literature provides clear evidence that recreation can disturb wildlife in several ways. Documented effects include detrimental changes to behavior, reproduction, growth, immune system function, levels of stress hormones, other physiological effects, and finally, the survival of individual animals and persistence of wildlife populations and communities. Having been observed on nearly every continent and in every major ecosystem on earth, recreation-related disturbance to wildlife is increasingly recognized as a threat to global biodiversity, and as having wide-ranging and, at times, profound implications for wildlife individuals, populations, and communities (Dertien et al. 2018). Yet, a prevalent assumption exists that non-consumptive recreation is compatible with wildlife conservation; sources that articulate this assumption in various ways include but are not limited to the Natural Community Conservation Plans/Habitat Conservation Plans (NCCPs/HCPs in the California Department of Fish and Wildlife's (CDFW) South Coast Region, Title 14 of the California Code of Regulations (§630(a)) about CDFW's ecological reserves, CDFW's 2016 State Wildlife Action Plan's Consumptive and Recreational Uses Companion Plan, Burger 2012, Larson et al. 2016, Dertien et al. 2018, and Reed et al. 2019. This assumption underlies the widespread acceptance of non-consumptive recreation in dual-role protected areas.

Is the assumption of compatibility flawed?—The assumption of compatibility rests on four expectations, which are often legal obligations (as with NCCPs/HCPs). First, recreation in protected areas is to occur only in ecologically sound locations. Second, only ecologically sound types, levels, and timing of recreation are acceptable. Third, monitoring is expected to regularly and reliably assess whether the types and levels of recreational activities in protected areas are disturbing the focal species to a degree that these activities should be curtailed or prohibited entirely. Fourth, changes in management are to occur promptly when monitoring determines them to be necessary (see footnote #5 for description of management). In short, the overarching expectation is that recreation would not hinder the achievement of the dual-role protected areas' primary conservation objective (i.e., perpetuation of viable populations of focal sensitive species). At least seven NCCPs/HCPs in the CDFW's South Coast Region explicitly deem recreation compatible or conditionally compatible; most articulate these expectations as conditions that recreational activities in protected areas must meet. Such activities are considered "conditionally compatible" with the protection of the covered species. However, the assumption of compatibility is flawed because: for example, designated trails and trail networks are often ecologically inappropriately planned, designed, or sited; and, even for authorized recreation, there is rarely adequate management to control the allowed types and levels of recreation such that they are compatible with conservation. While finding an appropriate balance between biodiversity conservation and recreation is complicated because recreation-related effects on wildlife vary among species and recreational activities (Larson et al. 2016), there are also societal factors at play that further complicate achieving an appropriate balance and compatibility.

Factors allowing inappropriate planning/siting and inadequate management - a societal conundrum.—The degree to which the above-listed expectations are met varies among NCCP/HCP permittees and other managers of dual-role protected areas, the primary limiting factors being fiscal constraints and each land manager's primary mission. As to the latter factor, for areas protected primarily or solely to conserve biological resources, a serious fundamental conflict with conservation arises when managers' primary mission is to provide recreational opportunities, and the protection of biological resources is a secondary or tertiary priority. As to fiscal constraints, land management budgets generally have not kept pace with the increasing levels of recreation in protected areas (CDFW 2015; Havlick et al. 2016). For example, the activities of the CDFW for resource assessment, conservation planning, and wildlife conservation at risk are "severely underfunded;" in 2005, maintenance, restoration, and management of CDFW's wildlife areas and ecological reserves were supported, on average, at the level of $13 per acre (0.40 ha) and one staff person per 10,000 acres. Many lands were operated at $1 per acre, with no dedicated staff (CDFW 2015—refer to Volume 1, Section 7.3). CDFW's fiscal shortfalls for managing its protected areas mirror the same among public agencies at the local, state, national, and international levels (CDFW 2015); these shortfalls result in continual grave shortages of management personnel and other resources.

California's State Wildlife Action Plan (CDFW 2015) and most of the literature about recreation-related ecological effects identify the economic, educational, and recreational/health benefits of protected areas. They also identify the benefits (e.g., economic) to protected areas from humans pursuing recreational activities. So, despite the documented recreation-related disturbance to wildlife, there seems to be an implicit assumption of a mutually beneficial relationship between protected areas and the humans who benefit from them. But,

the severe underfunding of management for protected areas renders mutual reciprocity in this relationship infeasible; the protected areas' wildlife are heavily on the losing side. This is particularly perplexing given the evidence that lack of adequate management negatively affects not only biological resources, but also societal benefits.

Regarding the human health benefits of protected areas, visible recreation-related damage to the terrain diminishes the level of benefit people enjoy while being in nature, as illustrated by a study examining the relationship between recreational impacts in protected areas and human mental/emotional states (Taff et al. 2019). The study's results demonstrate that, as visible recreation-related ecological impacts increased, sense of wellbeing and mental state decreased, especially in response to settings with unauthorized trails. Collectively, the results show that managing tourism in protected areas in a manner that reduces such impacts is essential to providing beneficial cultural ecosystem services related to human health and wellbeing (Taff et al. 2019). As Wolf et al. (2019) put it, the more attractive a site is, the more likely it is that it will be degraded, which in turn, may diminish the quality of the human experience, and thus, visitor satisfaction. To capitalize fully on the positive aspects of tourism (including recreation) for protected areas, the degradation of resources needs to be constrained to ecologically acceptable levels, and to levels beyond visitor perception (Davies and Newsome 2009; Wolf et al. 2019); otherwise, recreationists may think it unimportant to minimize their own impacts. Also diminishing the human experience are the closures to public access as a default reaction to lack of adequate management, and the liability resulting from injuries that can occur when people use unauthorized trails (Dertien et al. 2018).

There is a two-fold irony here: despite the prevalent emphasis on the societal benefits of protected areas and the purported reciprocal relationship between protected areas and humans, most agencies responsible for managing protected areas are chronically underfunded. And, promoting the pursuit of these societal benefits without protecting the dual-role protected areas' core function (biological conservation) from that pursuit actually undermines both the human experience and biological conservation. This is a societal conundrum that stems at least in part from a societal disconnection.

The factor of a societal disconnection.—A lack of public interest in and concern about protected areas figures into the societal conundrum. Public opposition to trail closures, caps on daily visitation, or reservation systems can be strong and could damage the support for conservation agencies and organizations (Reed et al. 2019), despite the ecological need for such measures for protected areas. A disconnection pervades our society with respect to recreation-related disturbance to wildlife (Marzano and Dandy 2012): 50% of 640 backcountry trail users surveyed in 2001 did not believe that recreation negatively affects wildlife, and recreationists generally held members of other user groups responsible for stress or negative effects on wildlife rather than holding members of their own recreational user group responsible (Taylor and Knight 2003). The results of a survey conducted in 2018 for the San Diego End Extinction (SDEE) initiative to elucidate what the San Diego public know, think, feel, and do in relation to species and habitat conservation, indicate that 71% of the 600 respondents are not knowledgeable about the problems San Diego's plants and wildlife face (Tinkler et al. 2019).[13] While the passage of California Proposition 68 in 2018 reflects the voters' broad support for clean water and access to open space, which were the main elements of the Proposition that promotional efforts emphasized, it is unclear how

[13] The respondents were San Diego County voters and were representative of the voter pool in terms of age, gender, ethnicity, and region, but voters tend to be less ethnically diverse and more educated than the San Diego County population overall (Tinkler et al. 2019).

much the biological conservation-related elements of the Proposition influenced voters.

Overall, it is probable that a large majority of the general public are unaware of or in denial about the disturbance to wildlife from non-consumptive recreation, much less the distinctions between areas protected primarily or solely for conservation and areas otherwise designated as open space (e.g., recreational fields, golf courses, small community parks). Information on these topics is not widely available, and what is in the literature, may not be reaching a broad audience even among conservation scientists and wildlife ecologists (Larson et al. 2016). What then can be done to address this unawareness as a step toward enabling dual-role protected areas to meet their conservation objectives despite the expanding recreational pressure?

Suggested plan of action.—To enable dual-role protected areas to meet their conservation objectives despite the expanding recreational pressure, the optimal approach is to: ensure that all recreational areas (e.g., trails and trail networks) are planned, designed, and sited using ecologically sound criteria; and, to continually employ sufficient proactive and adaptive management to prevent or at least minimize recreation-related disturbance to wildlife; such management would curtail the need for regular enforcement. This approach also has the potential to yield general public support for management, particularly if information provided about management challenges includes data and supporting graphics, specifically about fragmentation, to enhance the public's understanding of the challenges of poorly designed trail systems and the creation and use of unauthorized trails (Leung et al. 2011; Taff et al. 2019; Wolf et al. 2019). But this approach requires perpetual personnel and funding explicitly for management, which in turn points to the urgent need for public advocacy to secure fiscal support for management resources (i.e., fiscal support that is sustainable, perpetual, and at levels commensurate with the recreational pressure; footnote #5). How can this be achieved?

How people perceive their and others' recreation-related effects on wildlife may influence their general perspectives on such effects (Marzano and Dandy 2012). Shifting this perception-perspective nexus over time toward a common value of respecting wildlife may eventually mend some of the aforementioned societal disconnection. A shift in perspectives on the purpose of protected areas is also needed to one of understanding and acknowledging that their core function is conservation (Davies and Newsome 2009; Patten et al. 2017). The only chance there is of influencing people's perceptions is making the pertinent scientific information readily available. So, it is essential to implement a concerted campaign to disseminate science-based information about recreation-related disturbance to wildlife. Such a campaign needs to be well orchestrated, widespread, long-term, continual, and multimedia; this includes social media per Greer at al.'s (2017) conclusions about its efficacy in this context. In addition to the general public/voters (including recreationists), the following parties would be both the audience and the distributors within each of their fields and beyond: the media, environmental organizations, elected officials, policy and land-use decision makers, land management agencies and organizations, outdoor recreation merchants and associations, educational institutions, and researchers. The coverage would be framed as stories aimed to evoke appreciation for the diversity of sensitive species and the many ways they respond to our presence, and provide opportunities for what people can do to lessen the recreation-related disturbance to wildlife, which will benefit not only wildlife and other biological resources in the protected areas, but also the human experience there.

While the objectives of the campaign would be to influence people's perspectives in favor of wildlife and to modify recreational behaviors, policy, planning, and decision-

making accordingly, the final goal would be to cultivate support for and harness the power of advocacy to gain the political will and action needed to secure perpetual fiscal support for management resources. Implementing such a campaign would not be easy nor fast and would take diligent oversight, as suggested by William Craven, the chief consultant for nearly 20 years of California's Senate Natural Resources and Water Committee. In an interview with the California Native Plant Society, he stated, "the best way to achieve your policy objectives is to make sure your policy objectives are funded. For example, small but important programs for the [California Department of Fish and Wildlife] are literally budget dust in the California budget, but unless someone is there to pay attention and connect the dots between the budget and the state laws, we don't get a complete resolution…[P]ositive changes in state law that everyone works so hard to accomplish are really much more effective when someone monitors the budget process to make sure those changes get as much funding as possible" (CNPS 2020). But, it seems that the choices are either to never reverse or at least halt the downward trajectory of wildlife in protected areas experiencing damaging levels and types of recreation or to ambitiously implement such a campaign toward a societal course change (Waterman 2019 for the term "course change").

Several of the results of the survey conducted for the SDEE initiative hint at a potential to mobilize a critical mass of people who learn about the recreation-related disturbance to wildlife and the associated urgent need for resources to address it, and assist in information dissemination. While the survey conducted for the SDEE initiative revealed a knowledge deficit among the respondents regarding problems plants and wildlife face, its results also indicate that, over a 12-month period, 74% of respondents voted in favor of laws to protect the environment, 31% volunteered to improve the environment, and 21% donated money to protect San Diego County's environment; in addition, approximately 70% were willing to pay additional local taxes to protect the environment, and a majority of the respondents were willing to pay up to $50 per year (Tinkler et al. 2019).

One avenue available for advocacy to secure perpetual fiscal support specifically for management of protected areas is assessing recreational fees and taxes. With respect specifically to the management of CDFW-owned protected areas, CDFW's 2005 and 2015 State Wildlife Action Plans recommended implementation of recreational fees and taxes beyond fishing and hunting licenses that would allow non-consumptive recreationists to support wildlife conservation and management of the resources they use and enjoy (CDFW 2015, 2016). To generate funds for the management of all protected areas, a long-successful model could be employed: since the 1930s, hunters have been paying federal excise taxes on the sales of sport hunting and shooting equipment to generate funding for habitat conservation (CDFW 2015). Eighty years later, these taxes plus sales of angling equipment had generated more than $10 billion towards conservation (CDFW 2015). Thus, hunters and anglers have been the primary funding sources for conservation efforts in California and North America (CDFW 2015). Considering the disturbance to wildlife from non-consumptive recreationists, it is past time for them also to pay their way for the use of protected areas through paying taxes on equipment for hiking, biking, riding, etc. to support management of these activities. A secondary benefit of such fees and taxes is that they may establish a direct connection for recreationists between their use of protected areas and the costs of protecting the protected areas, and thereby possibly diminish their disconnection from their disturbance to wildlife.

Other avenues for advocacy to secure fiscal support for management of protected areas include bond measures and voluntary contribution funds (VCF), though neither would necessarily provide a reliably perpetual source of funding. VCFs are sponsored by legislators

to be enacted by the legislature; a VCF in this context would be explicitly and solely for the management of the protected areas in California, including CDFW's lands (with protected areas and management defined as described in footnotes #1 and #5, respectively). The funds must be administered such that they are made available timely. This would be similar to the VCF for California's Rare and Endangered Species Preservation Voluntary Tax Contribution Program which has funded work benefiting California's native at-risk plants, wildlife, and fish since 1983 (CDFW 2019) and now raises around $500,000 annually (FTB 2019).

Mainstream online and print media carried several articles in 2018 and 2019 about the overcrowding at and underfunding for the national parks (e.g., Simmonds et al. 2018; Waterman 2019; Wilson 2019); coverage such as this provides a good foundation of information. Articles like Yong's (2019) about the effects of the human voice alone on wildlife and Peterson's (2019) about the effects of hiking on elk represent steps in the right direction toward mainstream media honing in on specific impacts on wildlife from recreationists in protected areas. Coverage on species local to where people live is important and may make a stronger and more lasting impression with greater potential for shifting the perception-perspective nexus than species or settings remote from consumers of the media. Organizations like San Diego Zoo Global, which spearheaded the SDEE initiative (Tinkler et al. 2019), could significantly assist the campaign by engaging their media engines on behalf of local wildlife threatened by recreation.

A societal quid pro quo for protected areas?—At some point, the exploitation of protected areas resulting from recreation-related disturbance to wildlife, without commensurate reciprocity with care for the protected areas, may outweigh the benefits of public access to protected areas (Bennett et al. 2013). Many protected areas have already reached this point. Without adequate resources to combat the challenge of the obligation to conserve wildlife exposed to ecologically damaging levels and types of recreation, including unauthorized activities, the challenge will persist indefinitely at great risk of jeopardizing the protected areas' ability to meet their conservation objectives.

Regarding the pressure local, state, and federal government agencies have undergone for decades to acquire additional open space for recreation and to expand public access in existing protected areas (Wells 2000 in Reed and Merenlender 2008), elected officials and land-use decision makers need to address the demands, but not at the expense of biological conservation in protected areas. Some of the protected areas (e.g., the NCCP/HCP reserves) represent long-negotiated compromises for the sensitive species they are intended to protect in perpetuity. For some protected areas, no ecologically sound further compromise (e.g., expansion of public access) is possible; while recreation may be considered conditionally compatible in such protected areas, if open to public access at all, the extant levels of recreation may strain their ability to meet their conservation objectives. Protected areas that represent the final compromise for the species they support are particularly vulnerable to their wildlife values being compromised due to inadequate management (CDFW 2015). Ultimately, for wildlife that avoids human activity, it is unlikely that dual-role protected areas are entirely sufficient or justifiable for meeting conservation objectives; limiting or prohibiting recreation in strategic circumstances and locations within protected areas is necessary to achieve conservation objectives (Reed and Merenlender 2008; Bötsch et al. 2018; Dertien et al. 2018; Reed et al. 2019). Of course, this presumes sufficient management to maintain whatever recreational limits are set.

In summary, in the interest of wildlife in California and, more broadly, conservation within protected areas everywhere, the necessary actions with respect to non-consumptive

recreation are to: (1) widely and continually disseminate science-based information about the recreation-related disturbance to wildlife; (2) apply the science to all planning for, policy- and decision-making about, and management of, recreation in dual-role protected areas; and (3) secure perpetual fiscal support for management of recreation in dual-role protected areas commensurate with the recreational pressure.

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Increased hiking and mountain biking are associated with declines in urban mammal activity

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Outdoor recreation can have negative consequences for many wildlife species (Larson et al. 2019, 2016; Monz et al. 2013; Sato et al. 2013). Increasingly, parks and preserves are embedded in a landscape of urban and suburban development (Radeloff et al. 2010), intensifying the exposure of remaining wildlife populations to human activity (Larson et al. 2018). In California, several research groups have studied wildlife responses to recreation in parks and preserves within densely populated coastal cities. Some of the resulting studies have documented negative effects, including declines in native mammal occupancy and detection rates (Patten and Burger 2018; Reed and Merenlender 2008) and reduced daytime activity (George and Crooks 2006), while others have found limited effects of recreation on wildlife occupancy and detection rates (Markovchick-Nicholls et al. 2008; Reilly et al. 2017). Managers need context-specific understanding of the nature and severity of recreation effects on wildlife to sustainably manage recreational use in protected areas, the vast majority of which are open to the public (Leung et al. 2018; UNEP-WCMC and IUCN 2019).

Experimental tests of recreation effects on wildlife can provide valuable insight into species' responses to human activity by minimizing variation in other factors that affect wildlife, such as residential development and vegetation composition. However, fewer than one-third of studies of recreation effects on wildlife include an experimental component (Larson et al. 2016), and a large proportion of experimental treatments exclusively measure immediate reactions of wildlife to an approaching human, often using flight initiation distance (e.g., Ikuta and Blumstein 2003; Jorgensen et al. 2016; Keeley and Bechard 2011). These immediate responses cause increased energy expenditure and can trigger trade-offs between

foraging and flight behaviors (Duchesne et al. 2000), but it is less clear how they may translate into longer-term habitat degradation due to the regular presence of recreationists. It can be logistically difficult to experimentally alter the level of recreation on a trail segment or within a defined area, but when successfully implemented such studies have documented increased presence of nest predators (Gutzwiller et al. 2002) and reduced numbers of bird territories and bird species richness (Bötsch et al. 2017).

Conservation of mammals in densely populated and fragmented habitats such as southern California requires an understanding of the suitability of remaining habitat patches (Crooks 2002; Ordeñana et al. 2010), many of which receive high levels of recreational use (Larson et al. 2018). In this study, we assessed whether increased recreation rates were associated with reduced habitat suitability for native mammals. We conducted an opportunistic, quasi-experimental study of recreation effects on mammals using a before-after-control-impact (BACI) design, taking advantage of the closure and re-opening of an existing recreational trail in an open space park in San Diego, California. We expected that at impact locations (sampling points on the trail that was closed and re-opened), hiking and mountain biking would increase and wildlife activity would decline after the trail re-opened, while human and wildlife activity would remain similar at control locations (sampling points on trails consistently open throughout the study) within the same reserve.

The study was conducted in Black Mountain Open Space Park (32.984, -117.117) in San Diego, California, USA, which is owned and managed by the City of San Diego. The park is 951 ha, comprised primarily of coastal sage scrub and chaparral vegetation communities with some riparian and native and non-native grassland habitats. Dense suburban communities surround the park, and it contains approximately 32 kilometers of multi-use trails visited primarily by hikers and mountain bikers. The park also permits leashed dogs on the trails.

We established a total of seven sampling points on official and unofficial trails within the park in January 2017. Two points were located along the Miner's Ridge loop trail ("impact points", Figure 1), which was closed to public access from January 2017 until April 2018 for testing and remediation of elevated levels of arsenic detected in the soil. Five points were located along nearby trails not affected by the closure ("control points"; Figure 1). Point locations were selected as part of a larger project using a spatially balanced random design using the RRQRR algorithm on rasterized trail network data (Theobald et al. 2007).

To monitor human and mammal activity, we installed one motion-triggered camera (Bushnell TrophyCam HD Aggressor) at each sampling point, housed in metal security boxes and affixed to metal poles pounded into the soil facing recreational trails. We did not bait the cameras to avoid influencing animal activity (Wearn and Glover-Kapfer 2019). Cameras were programmed to take two photos per trigger with a five second delay between triggers. We began monitoring human and mammal activity at the impact points in late October 2017, leaving cameras running continuously until after the trail re-opened in April 2018. At the control points, we collected data between November 2017 and February 2018. After the trail re-opened, cameras operated at all seven sampling points for at least four weeks, ending in June 2018 (Table 1).

The seven cameras captured over 80,000 photos during the study period. Many of these were "false triggers" caused by rapidly growing vegetation, high temperatures, and wind, mostly in the mid-morning to late afternoon. Therefore, we randomly subsampled 20% of photos between 11 am and 5 pm at all sampling points to reduce time spent sorting

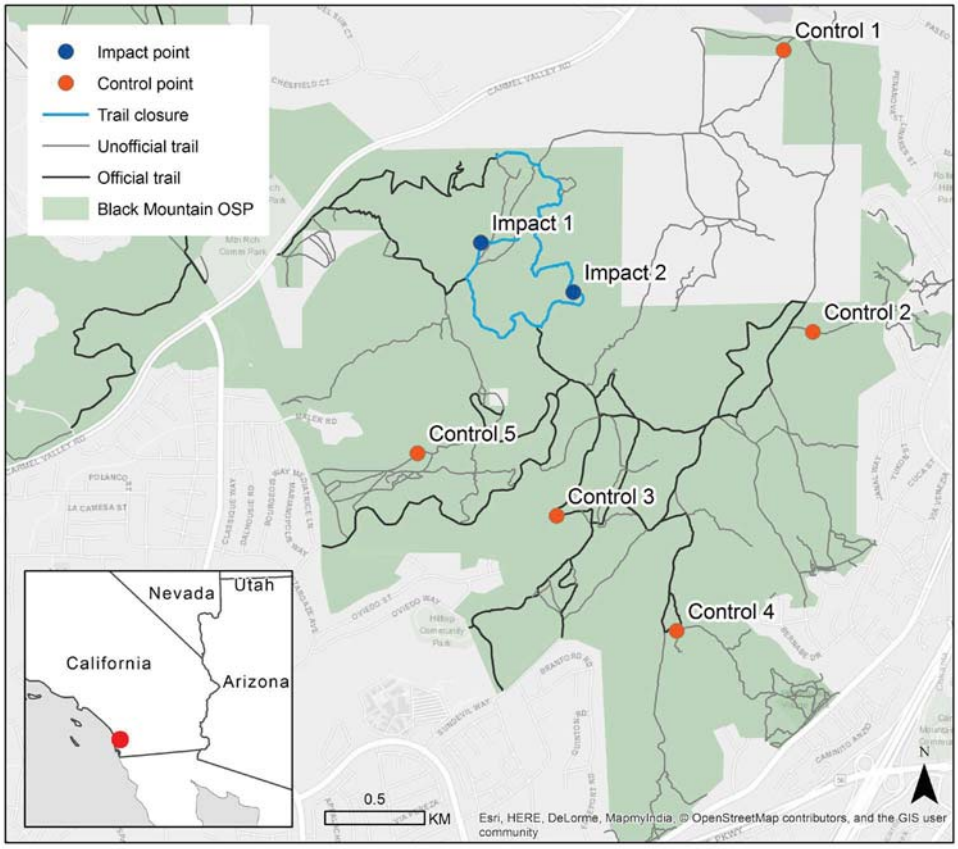

Figure 1. Location and sampling design of the before-after-control-impact (BACI) study conducted in Black Mountain Open Space Park in San Diego, CA, USA.

Table 1. Dates of camera data collection before and after the trail re-opened at impact and control sampling points at Black Mountain Open Space Park. Cameras were not installed or did not operate correctly on all days between the first and last sampling day; the "total days" columns report the number of days on which cameras were operational.

	Sampling effort before trail re-opened			Sampling effort after trail re-opened		
Point	First day	Last day	Total days	First day	Last day	Total days
Impact 1	1 Nov 2017	17 Apr 2018	134	19 Apr 2018	31 May 2018	43
Impact 2	1 Nov 2017	17 Apr 2018	168	19 Apr 2018	28 Apr 2018	27
Control 1	12 Dec 2017	1 Feb 2018	26	18 May 2018	30 May 2018	13
Control 2	12 Dec 2017	1 Feb 2018	26	4 May 2018	31 May 2018	28
Control 3	18 Nov 2017	13 Dec 2017	5	4 May 2018	30 May 2018	22
Control 4	18 Nov 2017	22 Dec 2017	26	4 May 2018	30 May 2018	28
Control 5	19 Nov 2017	22 Dec 2017	21	4 May 2018	31 May 2018	29

photos. Photos were organized in the Colorado Parks & Wildlife Photo Warehouse (Ivan and Newkirk 2016). Humans appearing in photos were categorized by activity (pedestrian, cyclist, equestrian, or vehicle) and animals were identified to species, except for brush rabbit (*Sylvilagus bachmani*) and desert cottontail (*S. audubonii*), which are difficult to distinguish in photos and were both labeled "rabbit."

To assess changes in human activity before and after the trail re-opened, we compared mean people per day at impact and control points using a non-parametric Wilcoxon-Mann-Whitney test since the data are counts. To assess changes in mammal habitat use before and after the trail re-opened, we used single-species occupancy models for each mammal species with sufficient detections using the R package *unmarked* (Fiske and Chandler 2011). Detection data were pooled into 5-day sampling occasions, resulting in ten survey occasions with five before and five after the trail re-opening. We did not include habitat covariates because minimal changes in habitat occurred between the sampling periods and because our primary goal was to investigate the interaction of treatment (control or impact sampling point) and time period (before or after the trail re-opened). Therefore, treatment and time period were the only variables included in the models, and we included the interaction (treatment*period) to test whether species showed a response to the trail re-opening. When a species was predicted to occur at all or nearly all sampling points, we assessed changes in detection probability rather than occupancy as a measure of relative activity or frequency of habitat use (Lewis et al. 2015; Wang et al. 2015).

Across all sampling points and time periods, there were an average (± 1 SD) of 12.2 ± 21.7 hikers, 7.2 ± 10.0 cyclists, 1.7 ± 3.2 dogs, and 0.01 ± 0.2 horseback riders per day at each sampling point, as well as infrequent motorized vehicles (park staff or utility personnel) at one sampling point where the trail was drivable. These recreation rates are relatively low compared to other parks and preserves in the region (Larson et al. 2018). People did not cease using the trail while it was closed, with the two impact points averaging 18.0 ± 15.8 and 20.4 ± 14.9 people per day during the closure (Figure 2). However, human activity approximately doubled at the impact points after the trail re-opened, averaging 38.2 ± 28.9 and 38.9 ± 19.6 per day (time period differences: $P < 0.001$). At the control points, human activity was similar between time periods (all $P > 0.33$) except for Control 5, which averaged 5.7 ± 8.1 people per day before and 23.2 ± 13.0 after the trail re-opened ($P < 0.001$). Control 5, located on an unofficial trail, is not part of the most obvious loop routes that could be made using the closed trail, but it could be connected with a longer loop route using unofficial trails, and therefore may have experienced depressed visitation rates during the closure period. Therefore, we ran additional occupancy models in which Control 5 was considered an impact point to ensure our results were robust to this possibility.

Mammal species we detected included rabbits (*Sylvilagus spp.*, total photos n = 537), coyotes (*Canis latrans*, n = 409), bobcats (*Lynx rufus*, n = 135), California ground squirrels (*Otospermophilus beecheyi*, n = 22), black-tailed jackrabbits (*Lepus californicus*, n = 4), raccoons (*Procyon lotor*, n = 2), and mule deer (*Odocoileus hemionus*, n = 1). However, only the bobcat, coyote, and rabbit were detected frequently enough for analysis. Bobcats were detected at six out of seven sampling points, and coyotes and rabbits were detected at all seven points; accordingly, we used detection probability rather than occupancy as our primary variable measuring changes in frequency of habitat use for all three species. At sampling points where they were detected, each species was detected at least once before and after the trail re-opening.

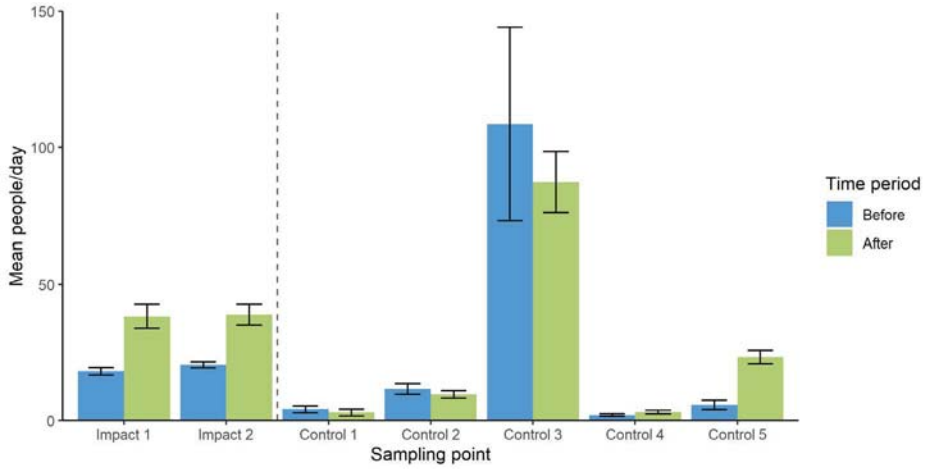

Figure 2. Human activity (mean people per day) before and after the Miners Ridge Loop trail re-opened at impact and control sampling points at Black Mountain Open Space Park. Error bars show one standard error. Differences between time periods were significant ($p < 0.05$ using a *t*-test) at Impact 1, Impact 2, and Control 5. The vertical dotted line divides the impact points (left) from the control points (right).

Occupancy models showed that detection probability was reduced at impact points after the trail re-opened for bobcats and coyotes, while remaining approximately the same at the control points (Figure 3). The effect was particularly strong for bobcats, with detection probability dropping from 0.90 ± 0.09 to 0.40 ± 0.15 at impact points after the trail re-opened while detection probability at control points increased slightly from 0.53 ± 0.13 to 0.65 ± 0.12. The interaction of treatment*period for bobcats was significant (z = 2.15, P = 0.03). Coyotes were detected at impact points during nearly every occasion before the trail re-opened (detection probability of 1.00 ± 0.001) but afterwards detection probability dropped to 0.70 ± 0.14, while detection probability increased slightly at control points from 0.79 ± 0.09 to 0.82 ± 0.08. However, the interaction term was not significant for coyotes (z = 0.14, P = 0.89). Rabbit detection probability did not differ significantly in relation to time period or treatment (interaction term z = 0.52, P = 0.61). Results did not change for bobcats or rabbits when Control 5 was considered an impact rather than a control point, but for coyotes patterns became less clear, with detection probability dropping more at control than impact points after the trail re-opened.

The number of sampling points was small due to the opportunistic nature of our study, limiting our ability to detect an effect of altered recreation rates on wildlife activity. Therefore, the fact that we still observed reduced activity rates by bobcats and, to a lesser extent, coyotes is particularly notable. Our findings echo those of previous studies in the region, which have found that these species and other mammals avoid human presence on short time scales (same-day occurrence; Patten and Burger 2018), and restrict their activity

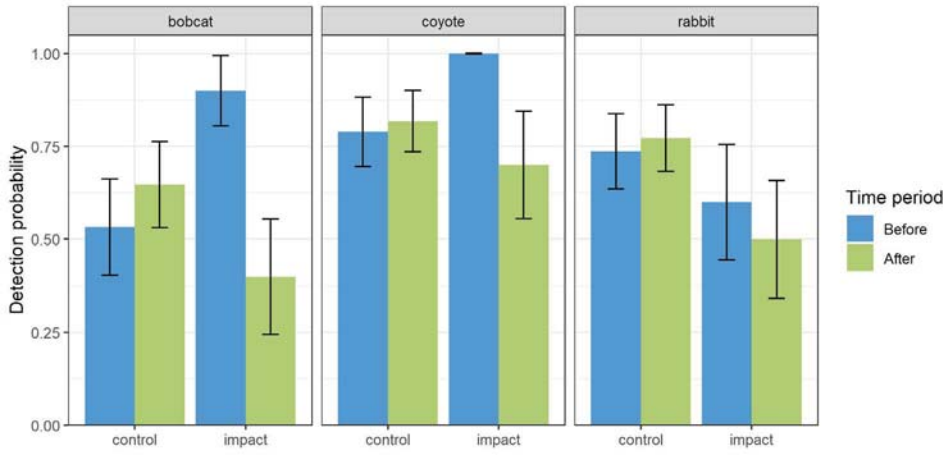

Figure 3. Predicted detection probabilities from single-species occupancy models for bobcats, coyotes, and rabbits before and after the Miners Ridge Loop trail re-opened at impact and control sampling points at Black Mountain Open Space Park. Error bars show one standard error. The interaction term for treatment*period was significant ($P < 0.05$) for bobcats.

in high human-use areas (George and Crooks 2006). We observed greater responsiveness in bobcats than in coyotes. While both carnivore species have shown sensitivity to recreation in previous studies (Patten and Burger, 2018; Reed and Merenlender 2008), coyotes can be relatively tolerant of human disturbance due to their adaptable behavior and omnivorous diet (Riley et al. 2003; Ordeñana et al. 2010). We did not observe changes in rabbit activity rates in connection with increased human activity, or by extension, reduced predator activity. Their smaller home ranges compared to bobcats and coyotes may mean that they are less able to shift their within-home range habitat use in response to short-term changes in human and predator activity.

Previous studies have also found that these species may shift their diel activity patterns to be more nocturnal in areas with higher human use (George and Crooks 2006; Reilly et al. 2017; Wang et al. 2015; Nickel et al. 2020). While shifts in diel activity patterns may have occurred in our system, overall activity levels were lower after the trail was re-opened, indicating than any temporal shift did not completely mitigate effects of human presence. However, despite changes in activity levels (as measured by detection probability), we did not observe changes in the occupancy status of the sampling points, suggesting that while the habitat may have been somewhat degraded, it was not completely unsuitable after the trail re-opened. Given the relatively small size of the park and its highly developed surroundings, reduced use of impact points by bobcats and coyotes likely indicates a partial shift in habitat use to other areas of the park. Bobcats slightly increased their use of the control points after the trail re-opened, perhaps suggesting such a shift, though this difference was negligible for coyotes.

Future experimental manipulations at larger spatial and temporal scales could help assess the consistency of our findings, increase the precision of estimated detection probability parameters, and assess responses of additional wildlife species. The opportunistic nature of our study design resulted in spatial separation of the impact and control points,

which may have limited their ability to serve as true replicates due to spatial autocorrelation (Legendre 1993). A true experimental design with randomly assigned treatment and control locations would provide stronger evidence of recreation effects, such as the study by Bötsch et al. (2017) which documented reductions in bird territory establishment in response to low levels of recreation compared to areas with no recreation. Coordination with volunteer groups and docent-led programs or using recorded human voices (e.g., Suraci et al. 2019; Ware et al. 2015) could make it more feasible to experimentally apply treatments that simulate higher levels of recreation.

Though the level of human activity approximately doubled after the trail was re-opened, we speculate that the difference may not have been obvious to recreationists. Forty people per day, approximately the average level of use after the trail re-opened, is still low compared to many other San Diego-area parks and preserves (Reed et al. 2019). However, this difference appears to have been perceptible and meaningful to wildlife, and perhaps crossed a critical threshold of disturbance causing reduced rates of use of the trail. Accordingly, habitat degradation near trails due to human disturbance is likely common across parks and preserves across the region.

Our findings highlight that wildlife can respond rapidly to changes in the levels of human disturbance, even when they have experienced similar levels of disturbance previously. Data collection for the 'after' period started immediately after the trail was re-opened and continued for four weeks. The observed reduction in detection probabilities suggests that bobcats, and to a lesser degree coyotes, may respond to changes in the relative intensity of human activity by rapidly altering their fine-scale habitat selection. Rapid avoidance responses to recreation have been previously documented for mountain caribou (Lesmerises et al. 2018) and bottlenose dolphins (Lusseau 2004), but it is not clear how short-term behavioral avoidance may translate to fitness or population impacts (Bejder et al. 2006). Higher recreation intensity was presumably not novel to these individuals since the trail had been open to recreation for many years prior to our study, which suggests that the animals were not fully tolerant of prior levels of human disturbance. It is therefore possible that for these species, habitat degradation from recreation could be relatively quickly reversed if human activity was limited to lower levels, or spatially or temporally constrained. Land and wildlife managers often use seasonal closures to protect wildlife during periods of heightened sensitivity such as the breeding period (Burger and Niles 2013; Coleman et al. 2013; Richardson and Miller 1997), but the efficacy of these closures is rarely tested. The rapid response we observed suggests that targeted temporal closures could be a promising approach for reducing impacts of recreation.

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Author contributions:
Conceived and designed the study: CLL, SER, KRC
Collected the data: CLL
Performed the analysis of the data: CLL
Authored the manuscript: CLL
Provided critical revision of the manuscript: CLL, SER, KRC

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An assessment of non-consumptive recreation effects on wildlife: current and future research, management implications, and next steps

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Most research on the effects of non-consumptive recreation on wildlife to date has focused on birds and mammals. This research typically focuses on behavioral responses of individuals despite practical limitations in extrapolating ecological outcomes from individual behavior. Data gaps therefore present difficulties in integrating wildlife-protective policies into public access management. These gaps are exacerbated by a lack of wildlife studies that include data on public use patterns of open space areas. In a survey of park and open space managers in the San Francisco Bay Area, few of the entities surveyed restricted recreational access permanently or seasonally to address biological constraints; yet most indicated the presence of sensitive plant or animal species on their lands or stated conservation as one of their organization's purposes. To better bridge the gap between research and management practice, more research is needed on species beyond birds and mammals. This research should extend beyond noting behavioral response and should integrate investigation of outdoor recreation use patterns.

Key words: California, non-consumptive recreation, open space, parks, public access management, San Francisco Bay Area, wildlife

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Throughout the state of California, there exists a large diversity of designated open space and protected areas that allow public access and outdoor recreation. Based on data from the Survey of Public Opinions and Attitudes on Outdoor Recreation in California, the average number of days of outdoor recreation participation among adult Californians

is 96 days per year (California State Parks 2012). Based on California's population of approximately 27.4 million adults in 2008, California State Parks estimated approximately 2.6 billion days of outdoor recreation by adults during that year; that figure would be higher based on current population estimates. Within regional, state, or national parks, outdoor recreation participation (i.e., adults and children) totaled an estimated 478 million days, and for non-park natural and undeveloped areas there were an estimated 368 million annual days of outdoor recreation participation (California State Parks 2011).

A large portion of outdoor recreation activity consists of frequent use in the same areas by the same visitors. Much of it is relatively close to visitors' homes, and with California's warm, Mediterranean climate, outdoor recreation use often occurs near dawn and dusk, the times of day when multiple wildlife species are most active. Many areas where outdoor recreation occurs also provide occupied or potentially suitable habitat for special status wildlife species. California includes a variety of habitats that are occupied or potentially occupied by 181 state or federally listed wildlife species (CDFW 2019).

Non-consumptive forms of outdoor recreation (defined as those activities that do not include fishing and hunting) can impact wildlife species and their habitats in a variety of ways. There may be loss of individuals along trail corridors through incidental recreational use, such as crushing burrows or destroying nests. Non-consumptive recreation may also affect habitat. For example, recreation facility development can remove habitat, and recreational use of facilities can result in water quality degradation, soil erosion, and ground cover loss (USDA 2008). Presence of humans may cause displacement or change in behavior of wildlife, both temporary and permanent, through proximity to habitat, habitual use of an area (e.g., trails), or through direct harassment (Trulio et al. 2013; Shannon et al. 2014). There may also be effects on wildlife behavior from nighttime outdoor recreation activity, including light and sound pollution, or other disturbances associated with these recreational activities. Littering can have both direct and indirect effects (Boarman 2002), and bringing pets to open space and other types of protected areas may also cause direct and indirect impacts to wildlife species (Reed and Merelender 2008; Reilly et al. 2017).

However, despite more than 40 years of research on this topic, significant information gaps exist. The purpose of this article is to: 1) summarize what is known about effects on non-consumptive recreation on wildlife, 2) summarize current management practices used by park and recreation agencies in the San Francisco Bay Area to manage public access to protect wildlife, and 3) suggest additional research that will help fish and wildlife managers as well as park and open space managers more effectively manage and respond to potential impacts of non-consumptive outdoor recreation on wildlife species and their habitats.

CURRENT STATE OF THE KNOWLEDGE

Overall state of the knowledge

To preliminarily identify potential data gaps and long-term trends in the literature, we searched Google Scholar for articles containing the keywords "non-consumptive recreation" and "wildlife" at ten-year increments from 1980 to 2019. We subsequently performed the same query substituting "plants" for "wildlife." We identified 515 results containing the keywords "non-consumptive recreation" and "wildlife" between 1980 and 2019. Of these, 26 (5%) were published in the 1980s, 82 (16%) in the 1990s, 170 (33%) in the 2000s, and

237 (46%) in the 2010s. The same search with "plants" substituted for "wildlife" yielded 298 results between 1980 and 2019—15 (5%) in the 1980s, 44 (15%) in the 1990s, 105 (35%) in the 2000s, and 134 (45%) in the 2010s.

It is clear that the number of articles related to non-consumptive recreation and plant and wildlife management has increased over time, and that wildlife is consistently more studied than plants. More granular trends in the literature are less immediately apparent. We therefore identified several comprehensive literature reviews from the last 40 years to better understand which topics in plant and wildlife management are most often studied. In particular, we sought out reviews that would elucidate long-term trends in which types of recreational activities are the most studied, whether response variables are typically quantified at the individual or population level, which taxa are the most studied, and other trends that may inform the scope of future research. Due to the higher volume of studies available on wildlife than plants, we focused our efforts on wildlife-centered articles.

Boyle and Samson (1985) conducted a comprehensive review of the state of knowledge in which they identified trends in studies containing original data on terrestrial vertebrates in North America (n = 166). These articles most often studied birds (103, 62%), followed by mammals (70, 42%), with few studies of herpetofauna (7, 4%). Boyle and Samson reported negative effects for most activities and taxa, postulating potential mechanisms such as direct disturbance and indirect effects such as habitat degradation, noting that the latter may result in simpler vegetation profiles and overall loss of habitat diversity. Positive effects on overall biodiversity were reported in a few studies, but these positive effects typically corresponded with increased abundance and diversity of common species well-adapted to frequent disturbance by humans. Based on data gaps identified through their review process, Boyle and Samson concluded that primary shortcomings in the literature included a lack of experimental, rather than observational data, and a need to move from assessment of disturbance and mortality to analysis of long-term ecological effects (Boyle and Samson 1985).

A more contemporary review conducted by Larson et al. (2016) analyzed 280 articles on the effects of non-consumptive recreation and wildlife. This review was broader in scope than that of Boyle and Samson, including a wider swath of recreational activities and all taxa globally. Although these results are not directly comparable due to differences in scope, Larson et al. identified similar trends to Boyle and Sampson 31 years earlier. The researchers found that articles remained mostly observational, with only 30% of articles containing an experimental component. Among the articles included in their review (n = 280), mammals were studied the most often (114, 42%), followed closely by birds (101, 37%). A wide gap was observed between mammals and birds and invertebrates (34, 12%), herpetofauna (17, 6.2%), and fish (14, 5.1%). Notably, the authors found that the majority of species studied with International Union for Conservation of Wildlife (IUCN) status were classified as species of least concern, and that endangered, critically endangered species, and data-deficient species were the least often studied. Similar to Boyle and Samson, most studies evaluated identified significant effects of non-consumptive recreation on wildlife, with negative effects being the most frequent. Most studies that showed unclear results as to whether effects were positive or negative had a behavior-based response variable, demonstrating the challenges associated with interpreting behavioral responses (one of which is the potential for wildlife to habituate to recurring, non-threatening recreational use), and the implications for long-term ecology and land management (Larson et al. 2016).

Most studies on the effects of non-consumptive recreation on wildlife were conducted

in North America (Larson et al. 2016). In a paper on recreation impacts on wildlife submitted to the federal Interagency Visitor Use Management Council (IVUMC), Marion (2019) summarized the current state of research, with results falling into five broad categories. The categories included: 1) type of recreational activity; 2) recreationist behavior; 3) impact predictability; 4) impact frequency and magnitude; and 5) impact timing and duration. In regard to category one, Marion found mixed results on impacts from slow versus fast (e.g., walk, run, mountain bike, motorized vehicles) recreation activities. Regarding category two, he found visitors who directly approach wildlife are perceived as threatening, and wildlife are less disturbed by recreation travel that is slow, quiet, and in directions parallel to or away from them. Marion also found that wildlife are able to adapt to and tolerate consistent nonthreatening recreational activities, but unpredictable recreational activity in less visited off-trail locations can cause greater impact (category three). Repeated human interaction and disturbance of wildlife can exceed a threshold of tolerance that causes wildlife to leave a preferred habitat (category four). In regard to category five, Marion found wildlife show locational and seasonal sensitivities to recreation. Marion then describes multiple strategies to manage recreation to minimize impacts on wildlife, which are summarized later in this paper.

California-focused research

California plays an important role in this body of research due to its abundant biodiversity and large areas of protected and/or publicly-owned lands. California has been relatively well-studied, with most research focused on birds, and more recently mammalian carnivores. The discussion below is not intended to be exhaustive but rather to summarize the findings of representative research efforts with implications for recreation and wildlife management and provide context for on-the-ground practices and recommendations, with a focus on California.

In the San Francisco Bay Area, several studies on avian wildlife have emerged in recent years. A 2008 study on foraging shorebirds and trail use found no change in behavior or species diversity during trail use (Trulio and Sokale 2008). These findings indicate foraging shorebirds at regularly used trails may habituate to human activity. However, other experimental studies have found that shorebird numbers decreased with human presence on trails (Trulio et al. 2013), and that trail uses such as jogging and dog walking can increase flight distance (Lafferty 2001). Differences in shorebird response to human disturbance are likely attributable to the birds' degree of habituation to human disturbance. Studies indicate that shorebirds in areas of more frequent human disturbance display less response to human activity; although, birds tend to use these areas at lower rates than areas with less disturbance (Josselyn et al. 1989). Trulio et al. (2013) recommended keeping trail users at least 50 m from foraging habitat. They also suggested that infrequent trail use may be more disruptive to birds then frequent trail use, indicating that habitation may occur as referenced above. Similarly, Miller et al. (1998) found the composition and abundance of birds to be altered in a Colorado grassland and forest setting, with an area of influence of approximately 75 m (zone where human activity may displace wildlife from suitable habitat).

As exemplified by these studies, even the least intrusive non-consumptive recreational activities, such as hiking and picnicking, have the potential to affect wildlife. Reed and Merenlender (2008) examined this possibility in the context of mammalian carnivores in the Northern San Francisco Bay Area. They consistently found that sites where quiet, non-

consumptive recreation is permitted had lower density of native mammalian carnivores than areas with no recreation. All recreational sites showed a shift in carnivore detections toward non-native carnivores such as domestic dogs and cats (Reed and Merenlender 2008). These results corroborate the relatively consistent finding that the mere presence of humans and their introduced domestic species may prove detrimental to native wildlife, regardless of the types of recreation in which they engage.

The finding that community composition shifted toward non-native species such as domestic dogs where recreation was permitted suggests a need to better understand the effects of dogs on native wildlife and the efficacy of various dog management strategies. This need is furthered by the outsized role dogs tend to play in open space management efforts. To follow up on their previous findings, Reed and Merenlender (2011) further studied the effects of different dog management policies in recreation areas. They found no significant differences in mammalian carnivore abundance or species richness between recreational sites with no dogs, sites with on-leash dogs, and sites with off-leash dogs. They did, however, identify significant differences between all three types of sites and reference sites with no recreation, suggesting that the presence of humans is a more important influence on species diversity and carnivore density than that of dogs (Reed and Merenlender 2011).

MANAGING PUBLIC ACCESS TO PROTECT WILDLIFE

To better understand whether trends identified in the literature are translated to open space management practice, we obtained information from local park, recreation, and open space area managers on how they address public access and its potential impacts on wildlife. Due to the abundance of literature focusing on the region and the richness of open space availability and biodiversity in close proximity to urban populations, we focused this effort on the San Francisco Bay Area.

Case study on San Francisco Bay Area open space management strategies

To assess current practices in addressing biological constraints in public access management and to identify how principles elucidated in the literature are applied in practice, we conducted a case study based on information obtained from ten open space management entities in the San Francisco Bay Area. Four of these were special districts, four were county agencies, and two were non-profit organizations. Each organization is identified numerically in the following discussion for the purposes of anonymity. All organizations were contacted by email in September 2019 and provided a survey with a standardized set of questions on public access management approach in areas known to contain sensitive biological resources. Each organizations' webpage was subsequently queried for supplemental information.

Five of ten organizations contacted via email responded to initial outreach efforts. Of these, three indicated that they restrict recreational access to some or all of their lands based on the presence of sensitive biological resources (County Two, Special Districts Two and Three). The other two respondents said they do not restrict access on any of their lands (Special District Four) or that they entitle open space preserves but do not hold land in the long-term or provide access opportunities (Non-Profit One).

County Two's response suggests limitations in their capacity to restrict public access for the purposes of addressing biological constraints. This County was in the process of de-

veloping a dog policy to determine where dogs are permitted and where leashes are required. In describing this policy, County Two representatives did not specify any biological factors being considered. Outside of its dog policy, the County indicated that they may restrict park access due to wet weather or public safety concerns; but that they generally do not restrict access for biological reasons apart from seasonally fencing off a small portion of one park for nesting shorebirds. In describing their shorebird protection efforts, representatives stated that they only restrict access insofar "as that is allowed."

Webpage queries of all 10 organizations demonstrated that a management approach similar to County Two's was common. There was little indication of restricted recreational access such as permit-only areas or seasonal park or trail closures to address biological constraints, with dog policies being the most common strategy to protect wildlife. Most permits were related to facility rental or special event production, with some parks containing sensitive plant species also providing scientific collection permits. Furthermore, most seasonal trail closures cited severe weather and trail washouts, and few were explicitly tied to biological concerns. Among the organizations surveyed, restricting the presence of dogs in parks was the most common strategy used by land managers to reconcile potential incompatibilities between non-consumptive recreation and sensitive species protection. Virtually all organizations had some type of dog policy in place or were in the process of establishing a dog policy. More than half of them specifically cited disturbance of wildlife or other biological constraints when describing dog access restrictions. Policies ranged from outright prohibition of dogs to requirements that dogs be kept on leashes.

Special District One was a notable exception to the patterns described above. In addition to restrictions on dogs, this organization employed a variety of methods, including permit-only access areas and seasonal trail and road closures. Special District One maintains one area that can only be accessed by permit holders. This area provides habitat for special-status avian species and other non-special status wildlife species. Recreational activities in this area are restricted to camping, hiking, horseback riding, and backpacking, and permits must be purchased in advance. Hunting is not allowed. Additionally, Special District One closes portions of one park annually for raptor nesting, and at the time of writing, one other park had trail closures for unspecified habitat protection. Special District One indicated in its response to outreach efforts that it annually and occasionally employs this technique as needed, closing trails and roads based on the presence of wildlife during sensitive windows such as nesting or mating. Moreover, correspondence with this District indicated that they purchase lands in collaboration with conservation organizations and place these lands under easement, and that when these lands become publicly accessible, permissible recreational activities are limited to those compatible with applicable habitat conservation plans. In addition to these strategies and similarly to other organizations, Special District One provides restrictions on where and how dogs may be present on their land. Biological considerations incorporated in this District's dog policy included prohibition on dogs where specified by conservation easements and in sensitive habitats such as marshes and wetlands.

The two non-profit entities included in this study had management practices that were among the most wildlife-protective. Non-Profit One indicated that opportunities for public access on their lands are very limited due to their high conservation value and the organization's emphasis on preserving biodiversity—suggesting an approach placing higher value on conservation than recreation and incidentally allocating recreational opportunities where compatible with biological constraints. Perhaps the most unique management strategy

identified in our case study was employed by Non-Profit Two. This organization divided their lands into two distinctive types of preserves—with the primary purpose of one type being public outreach and education, while the other type primarily served conservation purposes. While conservation and restoration activities are held on both types of preserve, the former includes more opportunity for educational events, hiking, and community volunteer days than the latter, where public access is limited due to resource constraints.

In our outreach and website queries, we looked for permit-only access areas, seasonal trail closures, restrictions on dogs, and other management strategies. Few of the public entities included in this case study restricted recreational access permanently or seasonally to address biological constraints, with surveyed non-profit organizations doing so more holistically. Yet, most public entities indicated the presence of sensitive plant or animal species on their lands or stated conservation as one of their organization's purposes. Although this case study examines a small, non-representative sample of management entities, these findings suggest that the public land management agencies that responded to our query may be constrained by mission and purpose in their ability to limit public access relative to other organizations such as non-profits with a singularly focused purpose of resource protection.

ADDITIONAL RESEARCH NEEDS

Several implications emerge from our review: 1) research efforts need to extend beyond noting individual behavioral responses; 2) more research is needed on species beyond birds and mammals; and 3) impact studies needs to be more frequently integrated with research on outdoor recreation use patterns.

The studies we reviewed indicate that although some research has been conducted on the effects of non-consumptive recreation on wildlife, the scope is generally narrow. There is a need for additional information on other taxa, given the number of listed species that are not birds or mammals. Moreover, recreational impacts on special status plant species are consistently less studied than those on wildlife, despite the high number of listed plant species, and the fact that habitat degradation (including impacts to vegetation) is a potential mechanism for recreation's impacts on wildlife. One example of such an investigation is the Spring Mountains National Recreation Area Landscape Analysis (USDA 2008). This report included an evaluation of spatial impacts from current and future recreation facilities on habitat loss for 30 special status species, most of which were plants. Another example is the Marin County Road and Trail Management Plan (Marin County Parks and Open Space District 2014) which included an analysis of illegally constructed mountain bike trails on special status species, most of which were plants.

Our findings suggest that individual wildlife response to recreational activity is studied more often than population-level response. One exception is experimental, longitudinal research conducted by Riffell et al. (1996), who evaluated the effects of repeated intrusion by hikers to avian communities in Wyoming's Medicine Bow National Forest for 10 weeks during the breeding season over 5 years. Their study found no cumulative or yearly declines in seasonal species richness, mean richness, or mean total abundance. They did find that repeated intrusions altered the composition of the community represented by the most common species, but no widespread impacts on avian community structure were documented. Continuing this line of research will be important to evaluate recreation impacts at the population level. This is particularly crucial given the nature of Federal and State regula-

tory schemes for endangered species, which typically take a population-based approach to species protection. Moreover, conducting research at the population level eliminates the need to interpret individual-level responses' implications for broader conservation efforts. Extrapolating individual response to a population-level context can prove difficult (Bejder et al. 2009; Caro 2007), and eliminating the need to do so reduces uncertainty for decision-makers.

Population-based outcomes should continue to be incorporated in future studies to facilitate stronger understanding of recreation's implications for conservation. While this is a more difficult undertaking than simply investigating behavioral responses, this type of research is needed to inform policies implemented by land managers. Useful models for conducting long-term, quasi-experimental research that addresses the larger question of population viability in the context of known threats, including non-consumptive recreation, to special status species exists in previous studies and can be used to inform future research.

Additionally, the taxa studied need to be prioritized to include additional groups. Mammals and birds have been studied more often than other taxonomic groups since non-consumptive recreation became a popular topic of research in the 1980s, and continue to be the most studied today. This does not necessarily correspond with greater conservation or research needs, especially considering the high number of amphibian, reptile, and invertebrate species with special status as designated by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service (~61% of listed species in California). If park and open space managers are to make informed, high-impact conservation decisions using the limited resources available to them, research efforts must be prioritized based on conservation need rather than focusing on the most visible species. Similar work is needed to provide frameworks for prioritizing research dollars in wildlife and open space management.

Before embarking on a new vein of research to address these above areas, it may be useful to consider comments offered by Dr. David Cole and William Hammitt, from their textbook, *Wildland Recreation: Ecology and Management*. From Hammitt and Cole (2015):

> The relationship between amount of recreational use and wildlife impacts is not well understood. Very few studies have systematically examined the effects of varying numbers of visitors on wildlife. Even fewer wildlife studies have determined an accurate population count of organisms prior to the introduction of recreation…..Previous research indicates the complexity of the relationship by stating that the number of visitors cannot be considered in isolation from species requirements and habits, setting attributes, and type of recreational use. Various aspects of use intensity are also involved, including frequency and regularity of use and number of people at one time.

Thus, the third area where additional research is needed is integrated research that links specific outdoor recreation patterns to effects on species distribution and abundance. Some of this is occurring via research by Larson, Reed, Merelender, and others. For example, Larson et al. (2018) correlated recreational use levels with habitat occupancy for seven special status species for 18 reserves in San Diego County. This is a thorough research effort that integrates a model to predict recreation use levels with whether habitats for special status species are occupied. A more comprehensive and robust effort is needed that extends this type of research to a variety of habitat types and recreational use levels

throughout California. Finally, the effectiveness of the "regulatory toolkit" that park, recreation, and open space managers have to control outdoor recreation use is well-established for federal lands, but its applicability to protected areas in close proximity to urban areas is largely unknown. Marion (2019) mentions strategies on how to address recreation impacts to wildlife including: reducing use, modifying the timing and location of use, modify the type of use, visitor behavior and expectations, and maintain and/or rehabilitate the resource. In regard to modifying visitor behavior, there is an entire body of research that focuses on how well visitors comply with wilderness and other protected area regulations (Lucas 1981; Washburne 1982; Duncan and Martin 2002; Marion and Dvorak; Martin and McCurdy 2010), and a review of low impact education programs (Marion and Reid 2007), such as Leave No Trace, suggests these programs can be effective at altering visitor behaviors that can cause impacts to natural resources. However, what has not been well investigated is how widespread such programs are implemented by park, recreation, and open space managers, and their applicability to open space preserves near urbanized areas.

Furthermore, it is important for research to go beyond theory and be adopted into practice by land managers. Research findings must be placed into a conservation and management context, with actionable priorities and recommendations for park, recreation, and open space managers. Researchers should engage with park and open space managers to ensure that science-based policies are enacted. Although limited in scope, our case study indicates some potential disconnects exist between the scientific community and on-the-ground open space management entities. For example, a large portion of the San Francisco Bay Area open space management and wildlife conservation efforts focused on developing sound dog policies; yet our research on the matter suggests that the effects of dogs are secondary to those of the presence of humans. Therefore, it may be of higher impact to examine ways to limit human activity in areas with sensitive biological resources through trail routing, permanent and seasonal park closures, and other methods.

Researchers and managers should therefore work together to develop, implement, and test science-based strategies. Social science-based methods should be included when testing approaches to better understand compliance with and attitude towards various management approaches as well as park use patterns. Several studies described above (Duncan and Martin 2002; Martin and McCurdy 2009) integrated these methods into their research but were focused on compliance with wilderness regulations.

Taylor and Knight (2003) demonstrated a potential approach for researchers to integrate study of park user perceptions into their work. They used a behavior-based model to study ungulate response to hikers and mountain bikers in a state park in Utah and, importantly, analyzed visitors' perceptions of their own effects on wildlife. They found that recreationists tend to attribute adverse effects on wildlife to other recreationists' actions and not their own. These results illustrate the importance of park user education as well as collaboration between the natural and social sciences in recreation and wildlife management.

Another example may be found in research conducted by Jefferson County Open Space District in Colorado, which has documented "heat maps" of recreation use for trails that bisect their open space areas. This information can then be overlaid with known or potential occurrences of special status species. Accurately collected recreation use data such as these would help biologists and park and open space managers better understand the relationship between overall park use patterns and wildlife impacts, an area of research that we found to be notably understudied.

To move toward sound management practice that effectively accommodates demand for public access and need for species protection, methodological changes and research prioritization are needed. Through review of literature related to the effects of non-consumptive recreation on wildlife and a survey of local agencies' integration of science-based methods into open space management efforts, we found that significant data gaps exist in both science and policy. New frameworks are needed to prioritize conservation efforts, which identify sensitive resources and integrate these into management efforts. Additional research using population-based response variables is necessary to quantify effects and determine whether management strategies are effective. A holistic approach incorporating conservation status and public recreational use patterns is needed to prioritize finite research and management resources.

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Author Contributions

Conceived and designed the study: JB
Collected the data: AS
Performed analysis of the data: AS
Authored the manuscript: JB, KD, AS
Provided critical revision of the manuscript: JB, KD, RC

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Wildlife occupancy and trail use before and after a park opens to the public

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We investigated changes in wildlife trail use and occupancy from baseline conditions after a park opened to the public; we were curious if wildlife would alter either their use of the trails or the surrounding areas or both in response to the park opening. We generated single-season occupancy estimates as a site-wide occupancy metric from 23 camera traps placed at 0.5 km intervals throughout the park and wildlife and human detection rates to measure intensity of trail use from 10 camera traps placed every 500 m on the trail. We compared the findings from the four seasons before to the four seasons after the park opened to the public. Human trail use increased sharply after opening and then lessened, but was markedly higher than prior to opening. Bobcat (*Lynx rufus*), coyote (*Canis latrans*) and gray fox (*Urocyon cinereoargenteus*) did not alter trail use relative to study area occupancy. Two species, black-tailed deer (*Odocoileus hemionus*) and gray squirrel (*Sciurus griseus*) altered trail use, and puma (*Puma concolor*) and wild turkey (*Meleagris gallopavo*) altered both trail and study area use. All species, except for the raccoon (*Procyon lotor*) and wild turkey, recovered to pre-opening conditions, by the winter (that is, after approximately 9 months) following opening.

Key words: camera trapping, occupancy, open space, recreational impacts, trail use

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Protected open space is considered important for conserving wildlife and providing public recreational opportunities in the San Francisco Bay Area. Recreation is often supported by concomitant trails and infrastructure, that is, that existing trails and fire roads are used by the public and, in turn, additional infrastructure is required to facilitate access. To conserve wildlife effectively, it is important to understand how wildlife may be affected by human use of the landscape even when those uses appear benign. Wildlife often share the use of trails with humans, their dogs, cyclists, motorized vehicles, and equestrians, while also

preferentially using roads and trails for movement (Whittington et al. 2005). The extent to which non-motorized recreational human uses impact wildlife that rely upon open space (for breeding, movement, foraging, etc.) is the subject of this study. Wildlife may be disturbed by human presence on trails and, as a result, vacate the surrounding landscape despite the landscape's capacity to support them. An alternate scenario may be that wildlife avoid or reduce trail use (that humans are using) but remain resident in the surrounding landscape in response to human trail use.

Wildlife can be both negatively or positively associated with human presence and zones of urbanization. Recreation has been shown to have behavioral impacts on wildlife, such as reduced feeding times (Cassirer et al. 1992), detrimental stress responses (Barja et al. 2011), reduced temporal occupancy (Wang et al. 2015), but also the reverse (Ordeñana et al. 2010; see also Reilly et al. 2016 for a review of the literature). With pressure on open space providers to accommodate human recreation and increase accessibility, understanding how access and intensity of human use affects wildlife provides essential information towards making decisions that effectively balance wildlife conservation with human interests.

We examined how public presence may affect wildlife trail use and occupancy in the surrounding landscape in the North Sonoma Mountain Regional Park and Open Space Preserve (hereafter, "Park/Preserve") in southeastern Sonoma County, California. A camera trapping array (grid) encompassed the Park/Preserve to assess changes in single season occupancy estimates (that is, we use occupancy as an index of prevalence or a surrogate of abundance in the study area; O'Brien et al. 2010; Royle and Nichols 2003; MacKenzie and Nichols 2004; MacKenzie et al. 2006; but see Burton et al. 2015 and Steenweg et al. 2018, 2019 for cautionary discussions). Additional cameras were placed on the trail to assess wildlife and human use (that is, through detection rates as a measure of intensity of use); trail construction had been completed by the time the study began.

Below we outline the key hypotheses to address the following question: How does human trail use affect wildlife trail use and occupancy in the study area?

$H_{ø}$: Wildlife did not change their use of trails or residency (abundance) within the Park/Preserve after it is opened to the public. Wildlife occupancy estimates (abundance) from the grid and the trail detection rates do not change after the Park/Preserve opens to the public.

H_1: Wildlife use trails less but are still resident within the study area after the Park/Preserve is open to the public. Wildlife trail detection rates decrease after human trail use increases but occupancy estimates (abundance or residency) does not change in study area after the Park/Preserve opens.

H_2: Wildlife reduce trail use and vacate the study area after the Park/Preserve is open to the public. Both wildlife trail detection rates and site-wide occupancy decrease within the Park/Preserve after it opens to the public.

H_3: Certain types of wildlife (e.g., carnivores or ungulates) may be differentially affected by the presence of humans. With regard to trail and Park/Preserve use, see H1 and H2.

H_4: Wildlife resume a similar intensity of trail use and abundance within the study area after a period of time post-opening compared to pre-opening measures (latency to habituation). Wildlife trail detection rates decrease initially after opening, but then return to the pre-opening levels after a period of time. If wildlife do leave the study area for a period of time (lower abundance), these measures (trail detection rates and occupancy estimates) will both decrease initially after Park/Preserve opening but then recover to pre-opening levels.

METHODS

Study area

The 3.4 km^2 study area, North Sonoma Mountain Regional Park and Open Space Preserve (Park/Preserve; 38.3235 N, 122.5756 W, parks.sonomacounty.ca.gov/Visit/North-Sonoma-Mountain-Regional-Park/Park-Map/) is located in Sonoma County, California, USA (Figure 1). Sonoma County Agricultural Preservation and Open Space District (SCAPOSD) acquired the property and built the 5.95 km trail that ranges in elevation from 244 m to 750 m between June 2010 to September 2012. The Park/Preserve was then transferred to Sonoma County Parks in 2014 and opened to the public on 14 February 2015. Cattle grazing occurred before and during the study in portions of the site that supported grasslands; the site had no exclusionary fencing dividing up the site.

This area is subject to a Mediterranean climate characterized by wet, cool winters and dry, hot summers. Habitats included non-native grasslands (warm grasslands), oak-bay woodland (montane hardwood), redwood forest, mixed forest with madrone (montane hardwoods), and remnants of coast live oak forest/woodland and California bay forest (Biodiversity Portfolio Report, https://www.bayarealands.org/explorer/#, Conservation Lands Network Explorer 2016, 1 December 2016; Bay Area Open Space Council 2011). Matanzas and South Fork Matanzas creeks run through the study area. The topography is characterized by the steep hillsides of Sonoma Mountain. The surrounding land use matrix is composed of low-density rural development, protected open space, vineyards, and grazed grasslands.

Study design

A north-south grid of 23 motion and heat-differential triggered camera traps, HCO SG550V IR Scouting Cameras [and replacement Bushnell Trophy Cams (model#119636c)] were set in a randomly-generated fixed array at 0.5 km intervals covering the entire Park/Preserve ("grid cameras"). We adjusted six camera coordinates by less than 200 m to fit within the study area prior to going in the field (see yellow circles on Figure 1). Species-specific single-season occupancy estimates were generated for four seasons before and after the Park/Preserve opened to the public (see Table 1). We placed ten additional cameras at 500 m intervals along the trail ("trail cameras"; Figure 1). We calculated seasonal trail detection rates (detections per 100 trap nights) as a measure of intensity of wildlife and human use for four seasons before and after the Park/Preserve was opened to the public (see Appendix I for a list of human use categories).

Camera trapping methodology.—We followed a camera trapping and data management protocol, which is a modified version from TEAM Network 2009 and O'Brien 2010. Grid cameras were uniquely identified by line letter and number (e.g., A1, A2, A3, etc.; Figure 1). We placed camera traps within 100 m of the pre-determined coordinate during field deployment. Camera traps were attached to a wooden stake or tree with a nylon strap. Camera height was standardized to detect a mammal approximately gray fox size at a distance of 2 m at a perpendicular angle. Eight of the ten trail cameras were mounted on trees, and, after the Park/Preserve opened, were outfitted with security boxes to prevent theft. We recorded location (GPS coordinates), habitat within which the camera was placed (open, closed, or mixed), and elevation during deployment. Habitat (vegetative structure) included just three

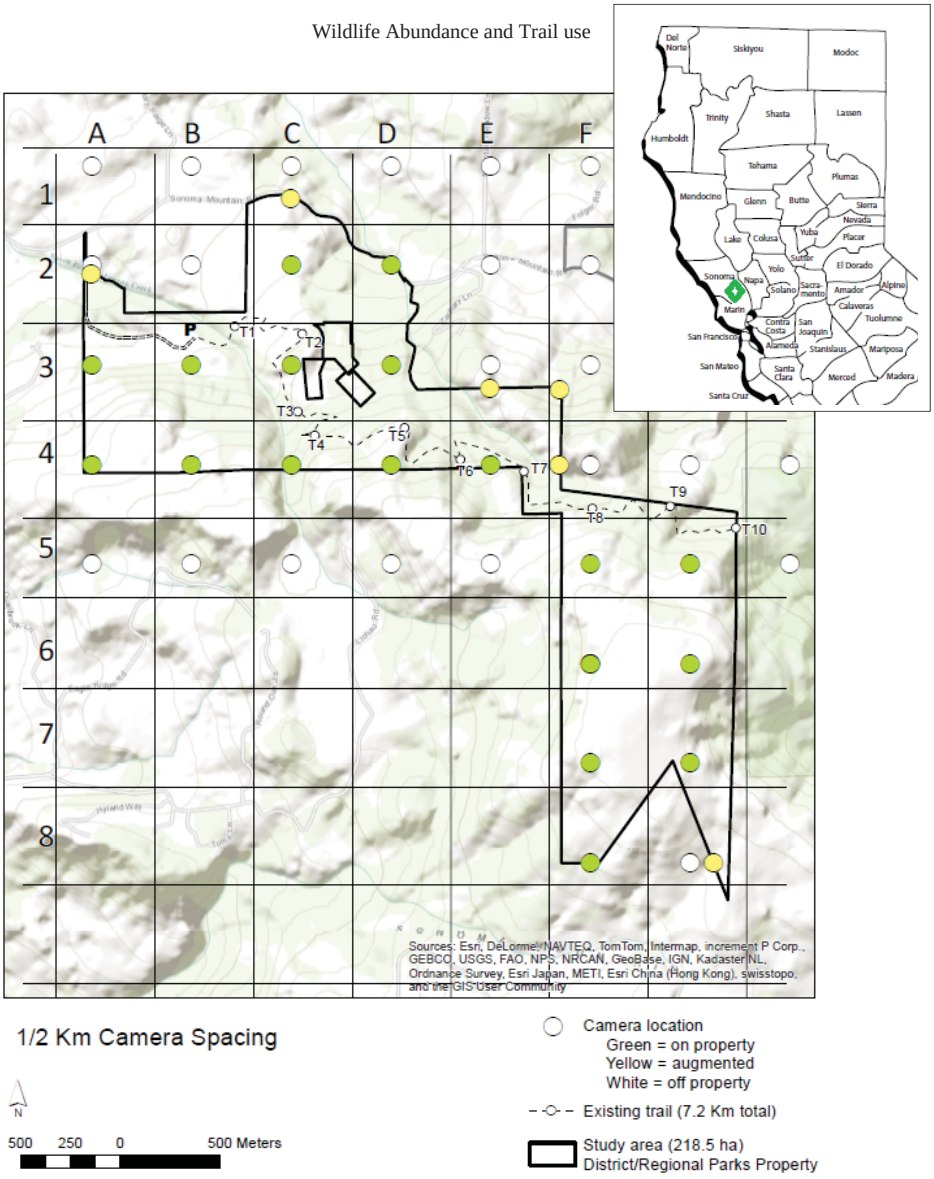

Figure 1. Camera layout for grid (yellow and green circles) and trail cameras (T1-T10) with study area location (green diamond in inset map of California counties); North Sonoma Mountain Regional Park and Open Space Preserve, California, USA, 2014–2016.

Table 1. Seasons before and after park opening, beginning and end dates for seasonal analysis, and effort (trapnights) for trail (n = 10) and grid (n = 23) camera arrays in North Sonoma Mountain Regional Park and Open Space Preserve, California, USA, 2014-2016.

Before or after opening Park/Preserve	Season	Begin and end dates	Trail trapnights	Grid trapnights
Before	Spring	1 March–30 May 2014	591	1,251
Before	Summer	1 June–31 August 2014	601	1,266
Before	Fall	1 September–31 November 2014	656	1,508
Before	Winter	1 December 2014–13 February 2015	606	1,106
Opening		*14 February 2015*		
After	Spring	1 March–30 May 2015	245	1,019
After	Summer	1 June–31 August 2015	16	701
After	Fall	1 September–31 November 2015	540	1,200
After	Winter	1 December 2015−15 January 2016	146	587

categories: closed (closed canopy), mixed (mixture of open and some overhead canopy such as oak woodland intergrading with grassland or chaparral), and open (no overhead canopy usually grassland). All cameras were set to take three images per trigger (event), a five second interval between events, 6 MP image size, high sensitivity level, and time stamp "ON." We adjusted image size and sensitivity as needed to match field conditions and improve data collection.

To verify camera station functioning during set up and maintenance, we took photographs of whiteboards with date, camera station identification, region, and subregion. We maintained camera stations regularly for proper functioning. We downloaded images from SD cards into a Windows Explorer embedded file system; EXIF image data was exported using PIE software (Picmeta v.6.75, www.picmeta.com/) into .csv files. We (authors and C. Lafayette) catalogued images to species or highest taxonomic order attainable; one of the authors (SET) vetted for accuracy during data preparation. Birds and other non-mammalian taxa were not identified to species nor included in the analysis. We categorized humans into several categories including pedestrian, cyclist, or equestrian (see full list in Appendix I). Unidentifiable images ("unknowns") and blanks were recorded as such.

Statistical analyses

We prepared a species detected list for the study area and trail compiled from before and after the Park/Preserve opened (Appendix I). We calculated single-season occupancy estimates from the camera grid and trail detection rates (detections per 100 trapnights) for terrestrial mammals (squirrel-size and larger) and wild turkeys (*Meleagris gallopavo*) from the cameras placed on trails (only). Trail cameras were not used in calculating occupancy estimates.

We calculated camera trap days ("trapnights") as the number of 24-hour periods (0000 to 2359) that the camera trap was functioning for each season [spring (March-May), summer (June-August), fall (September-November), and winter (December-February)]. We aggregated trapnights by grid and trail (Table 1) and compiled detection histories for grid cameras.

We recorded detections as the maximum number of individuals for each species in an image in a burst of three (an "event"), which are taken when the camera trap was triggered by movement and/or heat differential. For example, in a burst of three images, one image recorded two deer, in the next, three deer and in the final image, a deer; 3 deer would be recorded for that detection (maximum number of individuals in an image detected during one event).

Occupancy Analysis.—An occupancy estimate (ψ) for each species detected for the season was obtained using the program PRESENCE (v3.2, www.mbr-pwrc.usgs.gov/software/presence.html; Hines 2016). We used single-season occupancy models to estimate initial occupancy estimates (ψ) and detection probabilities (ρ) for each species (Mackenzie et al. 2003). Occupancy models account for imperfect detection and provide unbiased estimates of occupancy. To apply these models, detection histories were compiled for each species at each camera station as a series of ones (detection) and zeroes (non-detection). Each day (24-hour period commencing at 0000) the camera station was up was considered a (re)survey. Each day the camera station was "down" or not functioning was treated as a missing value.

Two pre-defined models were run, and the model with lowest delta Akaike's Information Criterion (AIC) was used to estimate probability of detection and occupancy (Hines 2016) . The first model assumes the same occupancy probability for all camera station locations and that detection probability (ρ) was constant across both camera station location and survey occasions (i.e., two parameters). The second model assumes that all camera station locations have the same probability of occupancy (ψ), but that ρ varies between the surveys—although at each survey occasion, ρ is the same at each camera station location. The software PRESENCE uses AIC to rank models (Burnham and Anderson 2002), which relies on rules of parsimony. In this case, twice the log-likelihood values at the maximum likelihood estimates were used to calculate the AIC values in model weighting.

Comparison of seasonal occupancy estimates and detection rates.— Single-season occupancy values were compared from the season before to the season after and plotted in a seasonal time series to compare to trail detection rates relative to occupancy estimates. We added linear trend lines in several time series figures to show trend from the first season (spring 2014) to the last season of the study (winter 2015-2016).

RESULTS

We set up camera traps during February 2014 and maintained them regularly until the study ended in mid-January 2016. Camera placement elevation ranged from 252 to 737 m in closed, open, and mixed habitat. Of the 23 grid cameras, four (17%) were set in closed habitat, four (17%) in mixed, and 15 (65%) in open habitat; of the 10 trail cameras, five (50%) were in closed habitat, two (20%) in mixed, and three (30%) in open habitat. The trail was located largely within closed habitat. The Park/Preserve was open (warm grasslands, 50%) with remainder mixed and closed (41.8% montane hardwoods and 6% redwood forest; Biodiversity Report, www.bayarealands.org/explorer/#, Conservation Lands Network Explorer 2016).

The composition of the wildlife community changed little from before and after the Park/Preserve opened (Appendix I). Common and expected species including large and medium-sized carnivores were detected; a California Species of Special Concern, the American badger (*Taxidea taxus*), was detected within the study area after the Park/Preserve was opened. Several rare and data-deficient species that may occur in this region were not

detected [e.g., the western spotted skunk (*Spilogale gracilis*), ringtail (*Bassariscus astutus*), porcupine (*Erethizon dorsatum*), and black bear (*Ursus americanus*)].

Seasonal analysis and effort

We generated seasonal Park/Preserve occupancy estimates and trail detection rates for eight seasons (four seasons before and after, Table 1). Trail camera trap nights averaged 425 (range = 16–656) per season. Grid trapnights averaged 1,080 (range = 587–1,508) per season. Seasonal trapping effort varied due to stolen (and replaced) camera traps, data loss due to theft of SD cards, and increased trail use filling up the SD cards with images.

Before and after seasonal comparison of occupancy estimates

Five wildlife species exhibited changes in occupancy estimates in the first season after the park opened; opossum increased (*Didelphis virginianus)* and raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), coyote (*Canis latrans*), and puma (*Puma concolor*) declined (Figure 2a) in the spring post-opening. Seven wildlife species exhibited changes in summer occupancy estimates; five decreased: striped skunk, gray fox (*Urocyon cinereoargenteus*), coyote, puma, and wild turkey (*Meleagris gallopavo*), and two increased [opossum and bobcat (*Lynx rufus*), Figure 2b] in the summer post-opening. Four wildlife species exhibited changes in occupancy estimates in the fall following opening; three decreased (gray fox, puma, and wild turkey) and one increased (opossum; Figure 2c). Only one wildlife species, raccoon, exhibited changes (increased) in occupancy estimates in the winter post-opening (Figure 2d).

Trail use

Even though the trail was not officially open to the public, some pre-opening trail use by "humans" (pedestrians, staff and trail crew) as well as their dogs and cyclists was observed in consistently low numbers (Figures 3a-c). The Park/Preserve did not allow dogs, and dog detection rates remained low throughout the study period (Figure 3c). Human trail detection rates increased dramatically immediately after the park opened; 4,393 detections per 100 trap nights (spring 2015) from 148 the season prior to opening (winter 2014–15, Figure 3a). Cyclists increased from an average of 53 (range 4–64) pre-opening to 228 (range 77–338) post-opening. Aggregated wildlife trail detection rates decreased after Park/Preserve opening (Figure 3d).

Comparing Wildlife Occupany in the Park/Preserve and on the Trail

We compared wildlife species' intensity of trail use (trail detection rates) with occupancy estimates seasonally before and after park opening.

Black-tailed deer. —Black-tailed deer occupancy increased post-opening (Figure 4a) and trail use decreased for two seasons then returned to pre-opening levels (see Figure 4b).

Gray squirrel.— Gray squirrel occupancy was stable both before and after the Park/Preserve opened to the public (Figure 4a). Gray squirrels decreased trail use post-opening summer, fall and winter from pre-opening levels (Figure 4c).

Striped Skunk.— Occupancy of striped skunks decreased (slightly) post-opening

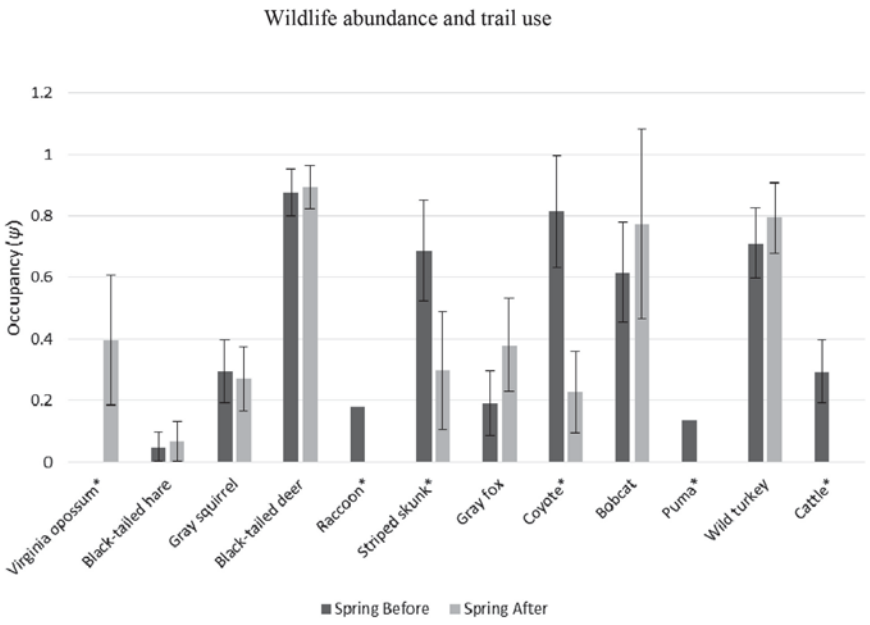

Figure 2a.

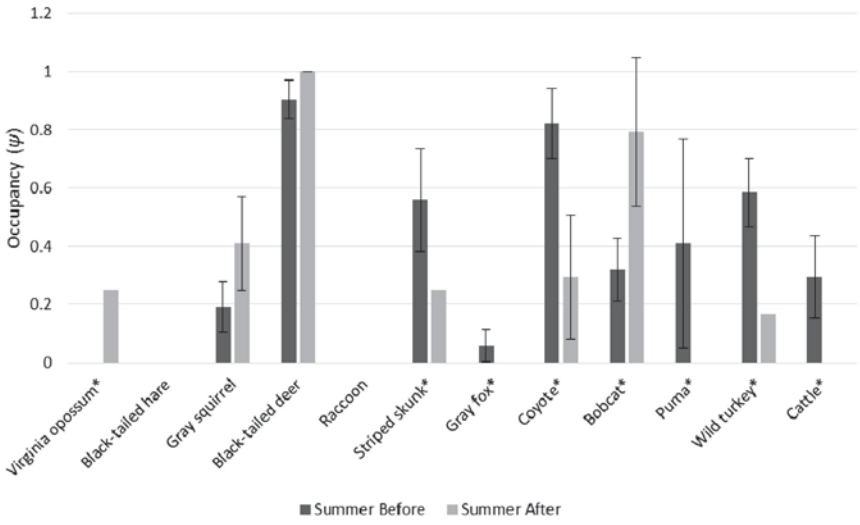

Figure 2b.

Figure 2a-d. Single-season occupancy estimates (error bars = ±SE) for wildlife species (* = difference noted between before and after occupancy estimates) in the a) spring before (2014) and after (2015), b) summer before (2014) and after (2015), c) fall before (2014) and after (2015), and d) winter before (2014_15) and after (2015_16) in North Sonoma Mountain Regional Park and Open Space Preserve, California, USA.

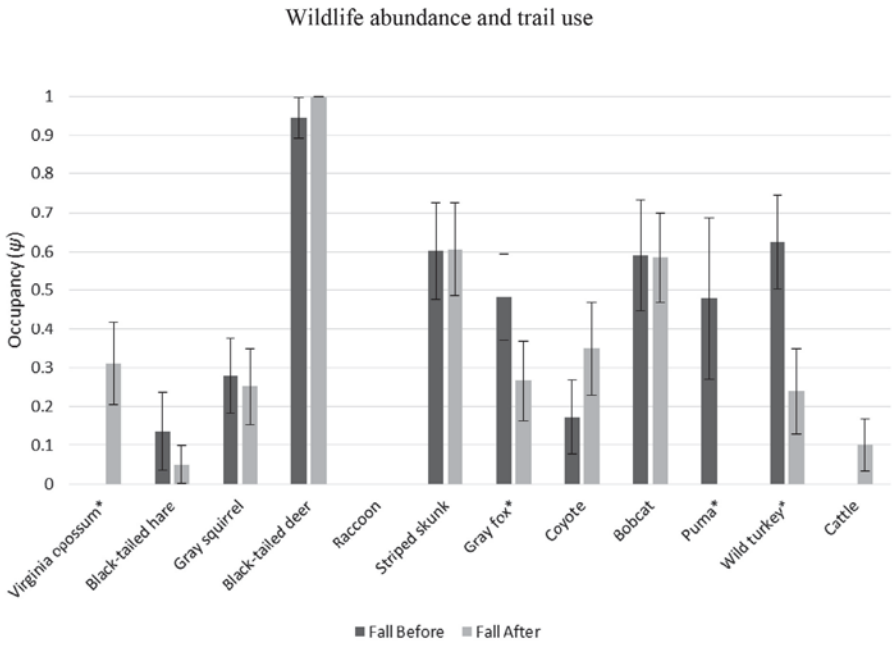

Figure 2c.

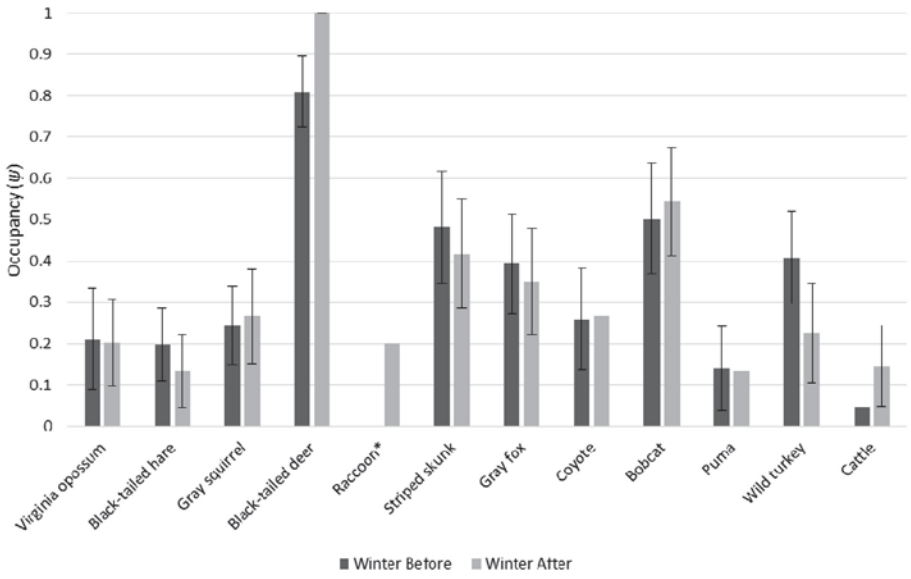

Figure 2d.

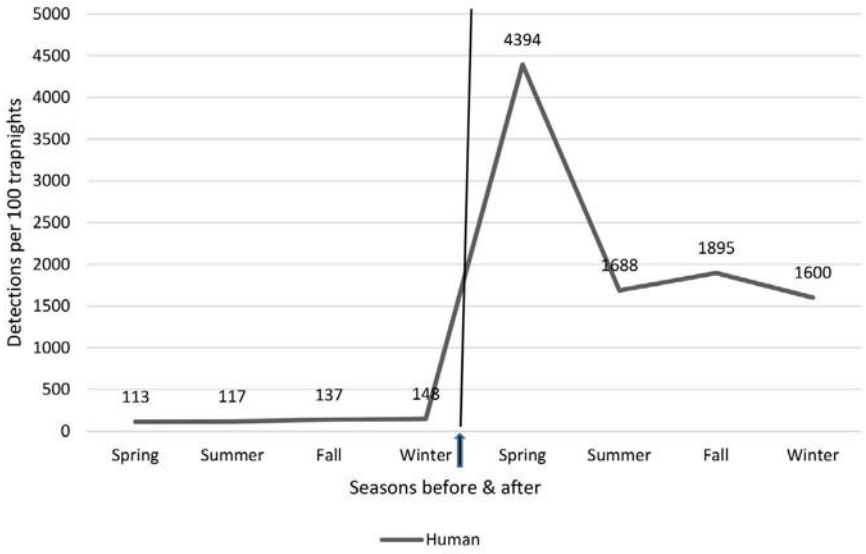

Figure 3a.

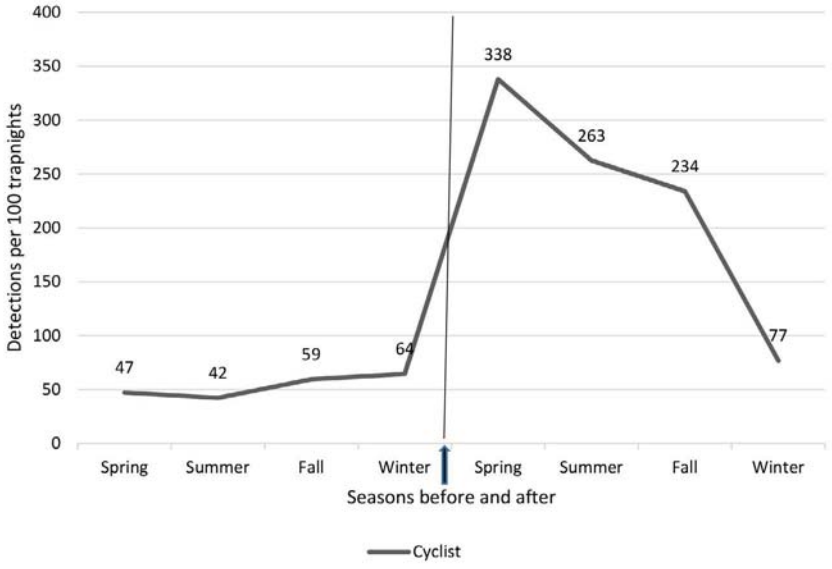

Figure 3b.

Figure 3a-d. Seasonal trail detections rates (detections per 100 trapnights) for before (spring 2014-winter 2015) and after (spring 2015-winter 2016) park opening (vertical line and arrow indicating 14 February 2015) for a) humans (non-cyclists), b) cyclists, c) domestic dog and livestock, and d) wildlife (linear = linear trend line) in North Sonoma Mountain Regional Park and Open Space Preserve, California, USA.

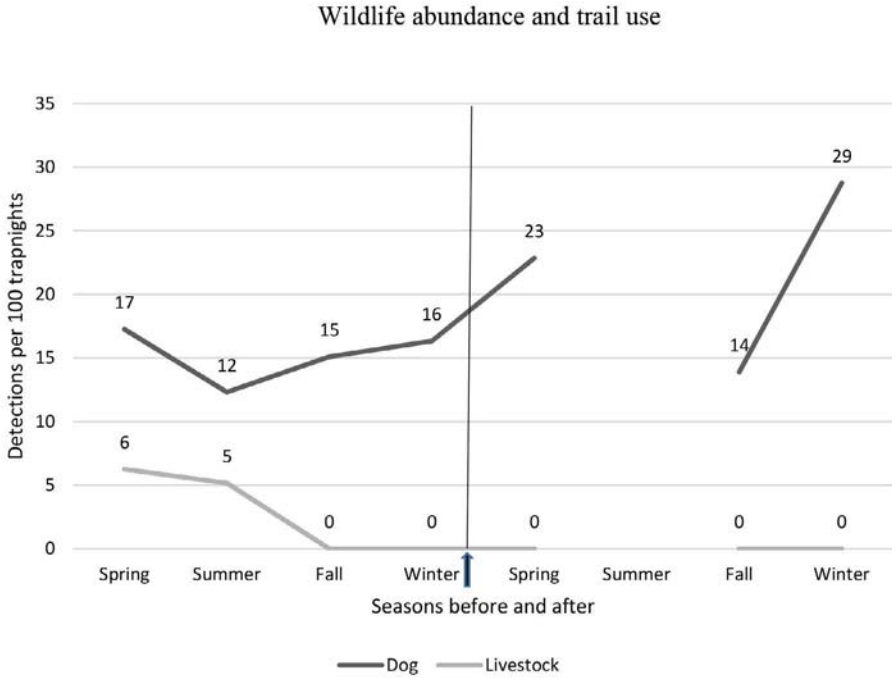

Figure 3c.

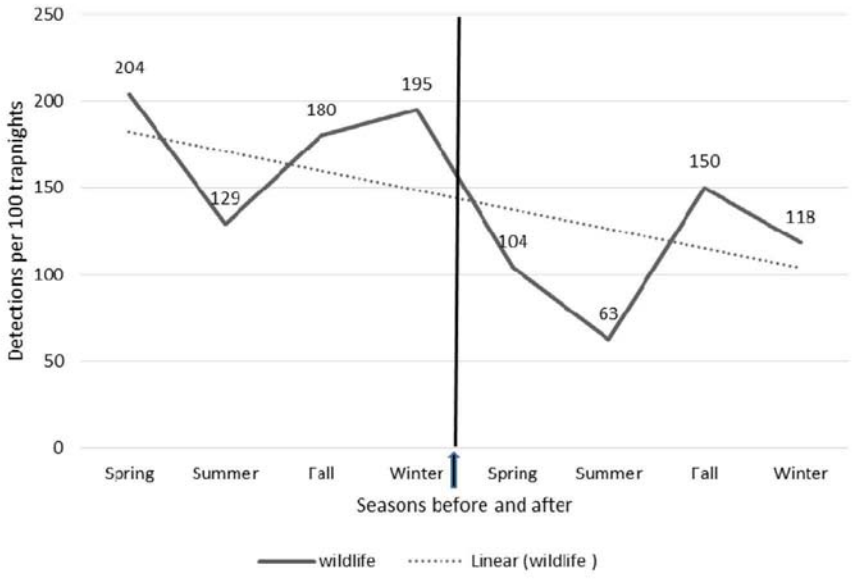

Figure 3d.

(Figure 5a). Striped skunk trail detection rates were the same post-opening for two seasons then increased to rates greater than pre-opening (Figure 5c).

Wild turkey.—Wild turkey increased in occupancy in the spring following Park/Preserve opening and decreased trail use (detection rates) post-opening (Figure 5b and 5d). Wild turkey had lower occupancy estimates and trail detection rates for post-opening summer, fall and winter.

Puma.— Puma occupancy fell to zero post-opening then increased after 3 seasons (ψ = 0.13, Figure 6a), potentially indicating some latency to recover. Puma decreased trail use post-opening (Figure 6c).

Bobcat.—Bobcat occupancy increased slightly in the Park/Preserve (Figure 6b) and decreased slightly in trail use (Figure 6d) post-opening.

Coyote.— Coyote occupancy decreased prior to the Park/Preserve opening and then remained relatively stable (Figure 7a). Trail use remained stable with a slight increase post-opening (Figure 7c); trail use was similar to patterns of occupancy.

Gray fox.— Gray fox occupancy was stable and similar to pre-opening occupancy (Figure 7b). Trail use was similar to patterns of occupancy (Figure 7d).

DISCUSSION

By our measures within this one study area, the wildlife that were the most affected by increased human trail use were puma and wild turkey, both decreasing in study area occupancy estimates, which we are using to detect changes in abundance and detection rates, which we are using as a measure of intensity of trail use. Additionally, the striped skunk notably increased trail use the third (fall) and fourth (winter) season after Park/Preserve opened. After two seasons post-opening, bobcat, gray fox, and coyote (three common mesocarnivores) appeared to be unaffected by public trail use both in abundance (as measured by occupancy estimates as an index of prevalence in the Park/Preserve) and trail use; these findings are consistent with a recent San Francisco Bay Area study (Reilly et al. 2016). The puma, which was present before the Park/Preserve opened, was then notably absent for three subsequent seasons post-opening. The majority of wildlife with the exception of the raccoon returned to previous occupancy levels the winter following opening (that is, after 9 months, Figure 2d).

Bobcat, coyote, and gray fox (mesocarnivores) showed little change in trail use, measured by camera detection rates on trail,and within the study area as indicated by by occupancy estimates from pre-opening measures, which support the null hypothesis, $H_{Ø}$ (Table 2); that is, that public trail use (at the rates we measured) did not appear to affect these species. Deer and gray squirrel showed decreased trail use despite no change in study area abundance post-opening, supporting H_1 that states that species change their trail use but not their overall use of the study area as measured by occupancy estimation. Puma and wild turkey decreased both trail use and abundance supporting H_2, which states that species will be affected by human trail use both on the trail and in the study area. Striped skunk increased trail use two seasons after opening and slightly decreased in abundance in the study area (see Table 2, Figures 5a and 5c). Deer may also have exhibited latency to habituation because their trail use resumed to pre-opening rates after two seasons (although it should be noted that human use declined; Figure 2a). Puma indicated latency to habituation for Park/Preserve abundance (Figure 6a).

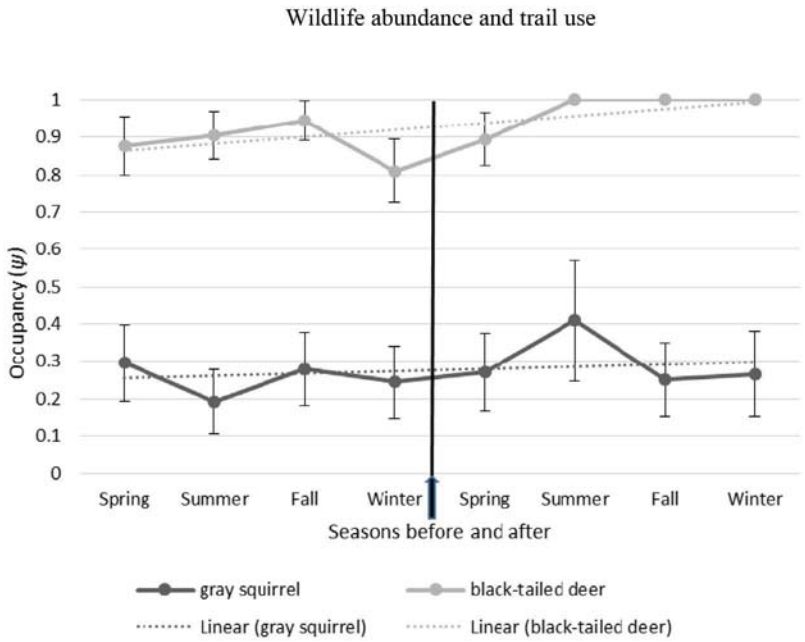

Figure 4a.

Figure 4a. Black-tailed deer and gray squirrel single-season occupancy estimates (ψ; error bar = ±SE, no error bar = no standard error) for seasons before (spring 2014–winter 2015) and after (spring 2015–winter 2016) opening (vertical line and arrow indicating 14 February 2015) in North Sonoma Mountain Regional Park and Open Space Preserve, California, USA.

In contrast to our findings, Reed and Merenlender (2008) conducted a study in the same region and found coyote and bobcat scat prevalence, as an indicator of animal presence, to be five times lower in protected areas that allowed recreation compared to sites that did not. Reilly et al. (2016), however, point out that carnivore scats are problematic as a surrogate for carnivore density because domestic dogs can consume these scats. Additionally, the human ability to visually detect scat is extremely low when compared to trained scat dogs for this purpose (i.e., humans detect only a very small fraction of scat that are present; Smith et al. 2005, Oliveira et al. 2012). Our findings were consistent with Reilly et al. (2016) that mesocarnivores appeared largely unaffected by public access and, additionally, that striped skunks increased trail use with recreational trail use.

The puma is the largest carnivore in the San Francisco Bay Area and is thought to play an important role in the ecosystem. Pumas are used as a surrogate to examine overall connectivity in the landscape due to its large body and home range size. Wang et al. (2015) examined puma behavioral responses to development and roads. According to their study, communication and denning required a four times larger buffer from human development. Findings from our study show a pattern of avoidance, at least, initially; pumas were detected very infrequently or not at all from the study area with commensurate lower trail use for three seasons post-opening; this finding was in contrast to puma adults and young consis-

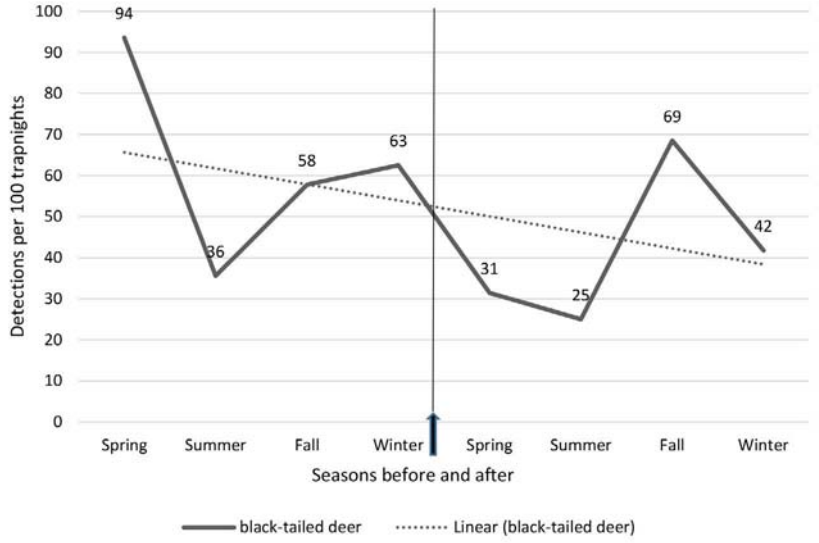

Figure 4b.

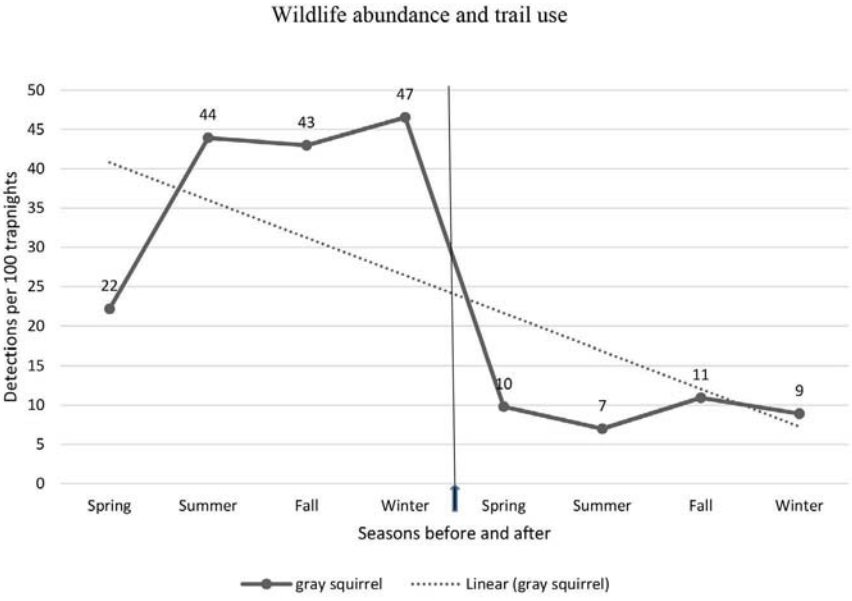

Figure 4c.

Figure 4b-c. Trail detection rates (detections per 100 trapnights) for b) black-tailed deer and c) gray squirrel for seasons before (spring 2014–winter 2015) and after (spring 2015–winter 2016) opening (vertical line and arrow indicating 14 February 2015) in North Sonoma Mountain Regional Park and Open Space Preserve, California, USA. Linear indicates linear trend line.

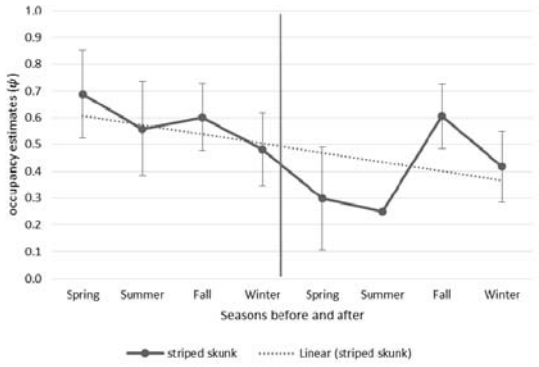

Figure 5a.

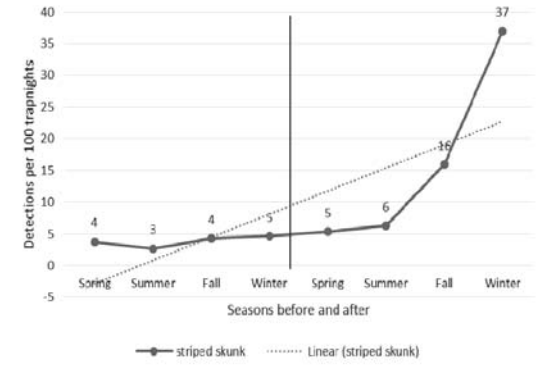

Figure 5c.

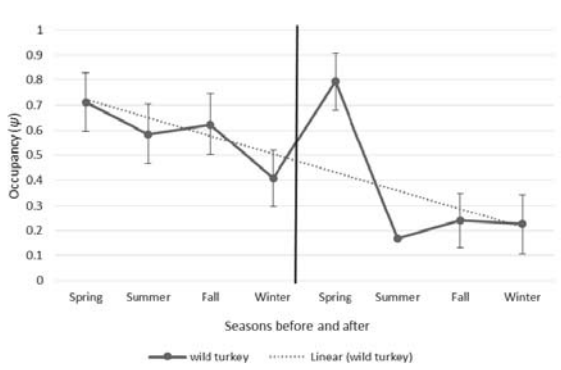

Figure 5b.

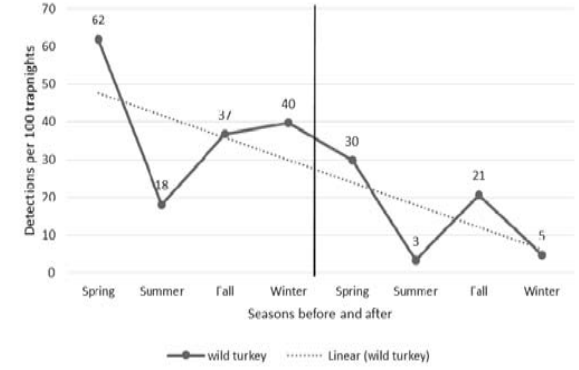

Figure 5d.

Figure 5a-b. Single-season occupancy estimates (ψ; error bar = ±SE, no error bar = observed occupancy) before (spring 2014–winter 2015) and after (spring 2015–winter 2016) opening (vertical line indicating 14 February 2015) for a) striped skunk and b) wild turkey in North Sonoma Mountain Regional Park and Open Space Preserve, California, USA. **Figure 5c-d.** Trail detection rates (detections per 100 trapnights) before (spring 2014–winter 2015) and after (spring 2015–winter 2016) opening (vertical line indicating 14 February 2015) for c) striped skunk and d) wild turkey in North Sonoma Mountain Regional Park and Open Space Preserve, California, USA. Linear indicates linear trend line.

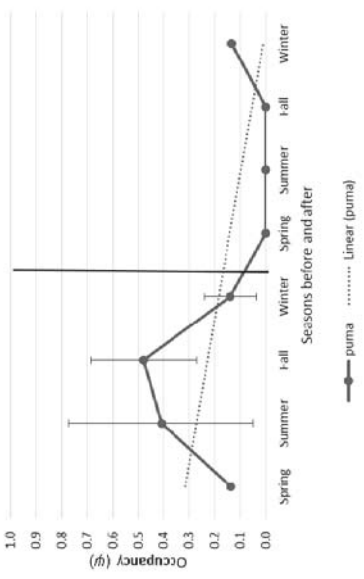

Figure 6a.

Figure 6b.

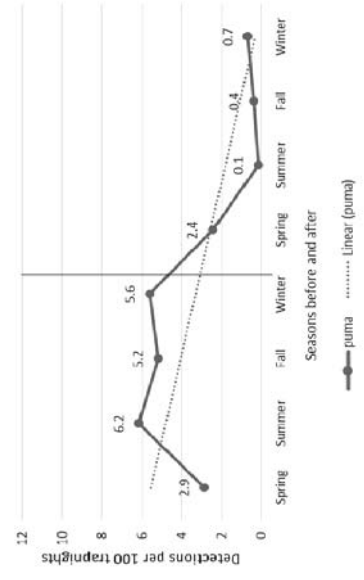

Figure 6c.

Figure 6d.

Figure 6a-b. Single-season occupancy estimates (ψ; error bar = ±SE, no error bar = observed occupancy) for seasons before (spring 2014–winter 2015) and after (spring 2015–winter 2016) opening (vertical line indicating 14 February 2015) for a) puma and b) bobcat in North Sonoma Mountain Regional Park and Open Space Preserve, California, USA. Figure 6c-d. Trail detection rates (detections per 100 trapnights) before (spring 2014–winter 2015) and after (spring 2015–winter 2016) opening (vertical line indicating 14 February 2015) for c) puma and d) bobcat in North Sonoma Mountain Regional Park and Open Space Preserve, California, USA. Linear indicates linear trend line.

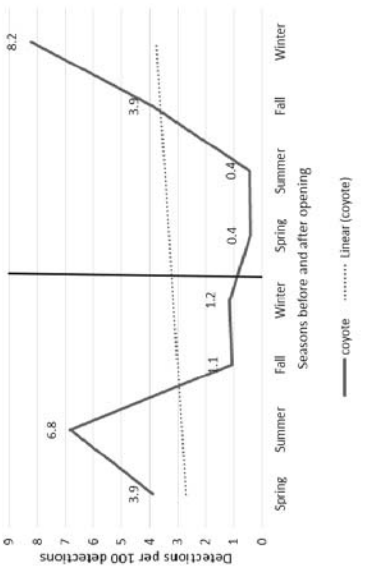

Figure 7a.

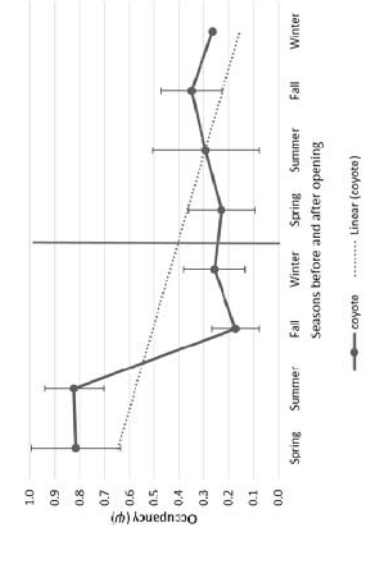

Figure 7b.

Figure 7c

Figure 7d.

Figure 7a-b. Single-season occupancy estimates (ψ; error bar = ±SE, no error bar = observed occupancy) before (spring 2014–winter 2015) and after (spring 2015–winter 2016) opening (vertical line indicating 14 February 2015) for a) coyote and b) gray fox in North Sonoma Mountain Regional Park and Open Space Preserve, California, USA. Figure 7c-d. Trail detection rates (detections per 100 trapnights) before (spring 2014–winter 2015) and after (spring 2015–winter 2016) opening (vertical line indicating 14 February 2015) for c) coyote and d) gray fox in North Sonoma Mountain Regional Park and Open Space Preserve, California, USA. Linear indicates linear trend line.

Table 2. Which hypotheses are supported for selected wildlife species [Column headings: No change = no difference in trail use or Park/Preserve occupancy, Trail only = differences observed in trail use but not in Park/Preserve occupancy, Trail/Grid = differences observed in trail use and Park/Preserve occupancy, and Latency = recovery to pre-opening trail use and/or Park/Preserve occupancy values]. Under "Trail/Grid," minus sign indicates a decline and a plus sign indicates an increase for each respective array. An "X" indicates findings support the hypothesis. North Sonoma Mountain Regional Park and Open Space Preserve, California, USA, 2014-2016.

	Hypotheses			
Common name	No change ($H_{ø}$)	Trail only (H_1)	Trail/Grid (H_2)	Latency (H_4)
Bobcat	X			
Coyote	X			
Gray fox	X			X?
Deer		X		X
Gray squirrel		X		
Puma			X-/-	X?
Striped skunk			X+/-	
Wild turkey			X-/-	

tently present in all seasons before the trail opened. Camera trap images of puma from the pre-opening year frequently had a mother with cubs or almost fully adult offspring.

Our study area represents an area with low to moderate human disturbance (both recreational and agricultural); therefore, the wildlife in our study have had exposure to humans, roads and other infrastructure. Naïve wildlife from more pristine areas (free from human influence) may behave differently to human presence on trails and may be affected for longer period of time and in a larger area; this factor (exposure to human influence) should be accounted for when planning trails and increasing recreational access. Undeveloped open space surrounding trails provides a buffer so wildlife can (initially) move away from novel human presence or disturbance even if they are able to habituate to human trail use over time. Certain species such as pumas may require large trail free "zones" near trails to habituate over time and to successfully fulfill the full suite of life history activities such as hunting, reproduction and raising young.

Finally, for this specific study area and trail, wildlife was documented using trails even with a marked increase in human use (pedestrians, cyclists and equestrians); wildlife trail use did not drop to zero with the exception of wild turkeys and puma (at least for 3 of the 4 seasons following opening). Additionally, the apparent habituation after a period of time indicated that much of the local wildlife community, but not all, may be resilient to an increased presence of humans on a trail given time to adjust; it also should be noted that the cyclist detection rates decreased to pre-opening levels of use by the 4th season after opening, so as an alternative explanation, wildlife trail use may be able to tolerate relatively high levels of human use (1600 detections per 100 trapnights) with lower levels of cyclists (77 detections per 100 trapnights compared to a high of 338 after opening)

Land acquisition and preservation can go a long way toward ensuring future open space for wildlife; however, without commensurate wildlife monitoring, particularly for things like trail building and increased human access, with concomitant changes occurring in the surrounding landscape (e.g., traffic intensity, climate change, development, fencing), the actual benefit of that land to wildlife over time will remain unknown. From a management perspective, this "unknown" is a lost opportunity. Identifying thresholds of human use beyond which wildlife or particular species are unable to adjust may differ with various disturbance regimes and for different life history needs (e.g., foraging and movement versus breeding). Determining these thresholds and for which species are important next steps in understanding the impacts of recreationalists on wildlife. Through studies that capture pre-impact conditions as well as a post-impact timeframe that is meaningful for wildlife, open space effectiveness as a conservation tool can be measured, evaluated and improved.

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Author Contributions
Conceived and designed the study: SET
Collected the data: SET, SH, MH
Performed the analysis of the data: SET
Authored the manuscript: SET
Provided critical revision of the manuscript: SH, MH, SH

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APPENDIX I. Human categories and wildlife species detected before and after park opening in each camera array for the North Sonoma Mountain Regional Park and Open Space Preserve, California, USA, 2014-2016.

Common name	Species	Grid before	Grid after	Trail before	Trail after
Human Cyclist			•	•	•
Domestic cat	*Felis sylvestris*		•		
Domestic dog	*Canis familiaris*	•	•	•	•
Equestrian		•		•	•
Hiker		•	•	•	•
Hikers with >2 dog				•	n/a
Human with dog				•	n/a
Staff				•	•
Vehicle		•	•	•	•
WPI crew		•	•	•	•
Ranger				•	n/a
Livestock					
Goats	(Goats)	•		•	•
Cattle	(Cattle)	•	•	•	
Wildlife					
Unknown	Unknown	•	•	•	•
Badger	*Taxidea taxus*		•		
Bird	(Bird)	•	•	•	•
Bat	(Bat)	•			
Black-tailed deer	*Odocoileus hemionus*	•	•	•	•
Black-tailed hare	*Lepus californicus*	•	•	•	•
Bobcat	*Lynx rufus*	•	•	•	•
Coyote	*Canis latrans*	•	•	•	•
Gray fox	*Urocyon cinereoargenteus*	•	•	•	•
Gray squirrel	*Sciurus griseus*	•	•	•	•
Opossum	*Didelphis virginiana*	•	•	•	•
Puma	*Puma concolor*	•	•	•	•
Raccoon	*Procyon lotor*	•	•	•	•
Striped skunk	*Mephitis mephitis*	•	•	•	•
Wild turkey	*Meleagris gallopavo*	•	•	•	•
Small rodent	(Small rodent)	•	•		•
Red fox	*Vulpes vulpes*			•	
Insect	(Insect)	•	•	•	
Lizard	(Lizard)	•			
Snake	(Snake)	•			

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A review of trail-related fragmentation, unauthorized trails, and other aspects of recreation ecology in protected areas

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Expanding levels of authorized and unauthorized non-consumptive recreation increasingly threaten sensitive biological resources in areas protected primarily or solely to conserve them. The majority of the documented effects on wildlife from non-consumptive recreation are negative. From a review of 84 papers in the recreation ecology literature about the effects of recreation on wildlife, the following topics emerged as warranting full consideration: trail-related internal fragmentation and expansion of the effect zone; the proliferation and use of unauthorized trails; disturbance thresholds; population-level effects; distinguishing facets of mountain biking; interpretation of observed behavioral responses by wildlife to recreation; magnitude and duration of responses; comparisons of effects among types of recreation and of results among studies; cumulative and synergistic effects; habituation; and the complexity of recreation ecology. Knowledge of these topics must inform efforts to cease the extant recreation-related exploitation of protected areas and to prevent it in the future. These efforts include: securing urgently needed perpetual monitoring, management, and enforcement commensurate with recreational pressure in dual-role protected areas to ensure the perpetuation of viable populations of focal sensitive species; preventing further use and proliferation of unauthorized trails; restoring areas damaged by inappropriate trails (i.e., unauthorized trails, unnecessarily redundant designated trails, and trails to be decommissioned); using science-based disturbance thresholds to develop management measures for recreation; using the best available science to guide all policy and decision-making about (1) the siting, design, and alignment of trails, and (2) the types, levels, and timing of recreation under consideration; and, planning separate protected areas and recreational areas in the future.

Key words: dual-role protected areas, effect zone, disturbance thresholds, internal fragmentation, mountain biking, non-consumptive recreation, perpetual monitoring/management/enforcement, recreation ecology, recreation-related disturbance to wildlife, unauthorized trails

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Conservation of habitats is a key strategy for conserving biodiversity worldwide (Pickering 2010a; Soulé and Noss 1998). The core function of many areas in California

protected for conservation is to ensure that the wildlife species living in them thrive in what is the nation's most biologically diverse state (CDFW 2015).[1] Areas protected for conservation (protected areas) include locally owned lands (e.g., county and city reserves), state-owned lands (e.g., ecological reserves, wildlife areas, state parks), federally owned lands (e.g., national wildlife refuges, wilderness areas), and privately owned lands (e.g., conservation easements, conservancy lands, mitigation banks and lands). Here, the focus is on protected areas conserved primarily or solely for the perpetuation of viable populations of sensitive species (i.e., species whose persistence is jeopardized).[2] These protected areas often serve a dual role of conserving biodiversity and providing nature-based recreational and educational opportunities for millions of people, despite the evidence that even non-consumptive recreation[3] may not be compatible with protected areas' core function (Reed and Merenlender 2008; Larson et al. 2016; Dertien et al. 2018; Reed et al. 2019).

Recreation ecology is the scientific study of the ecological effects of outdoor recreation and nature-based tourism activities and their effective management in natural or semi-natural environments (Monz et al. 2013; Gutzwiller et al. 2017).[4] Studies in recreation ecology have shown that the majority of documented responses of wildlife species to recreation are negative (Steven et al. 2011; Larson et al. 2016; Hennings 2017; Patten and Burger 2018). Recreation-related disturbance to wildlife is recognized as a threat to global biodiversity, and as having wide-ranging and, at times, profound implications for wildlife individuals, populations, and communities (Dertien et al. 2018). Documented negative effects include detrimental changes to behavior, reproduction, growth, immune system function, and levels of stress hormones, and ultimately the survival of individual animals and persistence of wildlife populations and communities.

In this review, several topics about recreation ecology became apparent as warranting full consideration.[5] These topics are (1) the major issues of trail-related fragmentation and

1 Wildlife means all wild animals: insects, fish, amphibians, reptiles, birds, and mammals.

2 These areas include areas protected pursuant to Natural Community Conservation Plans and/or Habitat Conservation Plans (NCCPs/HCPs). An NCCP is a comprehensive, single- or multi-jurisdictional plan that provides for regional habitat and species conservation at an ecosystem level while allowing local land use authorities to better manage growth and development. Upon issuing an NCCP Permit, the California Department of Fish and Wildlife (CDFW) can authorize take of certain state listed species and other species of concern, subject to the terms of coverage under the NCCP (CDFW 2015). An HCP is the federal counterpart to an NCCP; the U.S. Fish and Wildlife Service prepares HCPs and issues HCP permits. The terms and conditions under which an NCCP/HCP's protected areas are conserved establish the types and levels of public access that are permitted (Burger 2012). The types and levels of public access vary among the NCCP/HCP protected areas from no access to guided-only access to open access.

3 In contrast to consumptive recreation (e.g., hunting, fishing), non-consumptive recreation is generally assumed not to directly extract a resource; it includes nature and wildlife viewing, beach-going, kayaking, hiking, biking, horseback riding, and wildlife photography (Reed and Merenlender 2008; CDFW 2016; Gutzwiller at el. 2017). From here forward, "recreation" means non-consumptive recreation, unless otherwise stated.

4 From here forward, "management" includes monitoring, management, and enforcement. The level of enforcement necessary depends on the level of continual management implemented; generally, the more the management, the less enforcement is necessary. In addition, monitoring and management encompass both the natural resources and human users of the protected areas.

5 The author read 71 articles and 13 reports about the recreation-related effects on wildlife; this paper does not cite all of them. All the articles are published in peer-reviewed journals. Some of the reports were peer reviewed and all were written by or contributed to by professionals in the fields of biology or ecology, though none of the reports were published in peer-reviewed journals to this author's knowledge (e.g., Burger 2012; Hennings 2017; Dertien et al. 2018; Reed et al. 2019). And, the totals exclude documents that are not explicitly about recreation-related effects on wildlife (e.g., Taff et al. 2019) and all newspaper articles.

expansion of the effect zone, unauthorized trail creation and use,[6] disturbance thresholds, population-level effects, and distinguishing facets of mountain biking, and (2) the following aspects of recreation ecology: the interpretation of observed behavioral responses by wildlife to recreation, magnitude and duration of responses, comparisons of effects among types of recreation and of results among studies, cumulative and synergistic effects, habituation, and the complexity of recreation ecology.

This paper discusses the issues identified above to inform efforts to cease the extant recreation-related exploitation of protected areas and to prevent it in the future. These efforts include: securing urgently needed perpetual management of recreation commensurate with recreational pressure to ensure the perpetuation of viable populations of focal sensitive species[7] as intended upon establishment of the protected areas; preventing further use and proliferation of unauthorized trails; restoring areas damaged by inappropriate trails (i.e., unauthorized trails, unnecessarily redundant designated trails, and trails to be decommissioned); using science-based disturbance thresholds; using the best available science to guide all policy and decision-making about the siting, design, and alignment of trails, and about the types, levels, and timing of recreation under consideration; and, planning separate protected areas and recreational areas in the future. This paper discusses the above-listed aspects of recreation ecology for consideration in designing field studies and while reviewing recreation ecology literature.

Trail-related disturbance: fragmentation, edge effects, and expansion of the effect zone

External fragmentation.—There is much peer-reviewed literature on the ecological effects of fragmentation, a process by which once-contiguous areas of habitat are physically separated by human disturbance creating a network of isolated habitat patches (Soulé et al. 1988; Ballantyne et al. 2014; Vickers et al. 2015; Cheptou et al. 2017). Most fragmentation research worldwide has concentrated on progressive losses of natural habitat through removal of vegetation as a result of development, agriculture, and resource extraction. Physical fragmentation, in conjunction with other related factors (e.g., duration of isolation of habitat fragments, low vagility of species, loss of genetic diversity), causes the isolated areas of habitat to experience a decay of species diversity over time due to local extinctions (Soulé et al. 1988). Consequently, fragmentation is a major threat to biodiversity (Cheptou et al. 2017). This fragmentation is considered external to the protected areas within a landscape, though it influences the viability of protected areas with respect to wildlife conservation.

Internal fragmentation.—Recreational trails themselves can fragment habitat, thereby causing fragmentation that is internal to the areas they traverse (Pickering 2010a; Leung et al. 2011; Burgin and Hardiman 2012; Pickering and Norman 2017). Because of their linear nature, trails can have a greater negative effect than if the affected terrain were consolidated in a more compact form (Pickering 2010a). Complex networks of trails within protected areas

6 The literature refers to illegally created trails and constructed trail features variously as unauthorized, informal, social, unofficial, off-trail, visitor-created, user-created, and demand trails. "Unauthorized" is the term of choice here because it is the only term among these that clearly denotes the illegality of the creation and use of such trails and features.

7 Focal species are organisms whose requirements for survival represent factors important to maintaining ecologically healthy conditions; types of focal species include keystone species, umbrella species, flagship species, and indicator species. Focal species are identified for the purpose of guiding the planning and management of protected areas in a tractable way (Soulé and Noss 1998, Marcot and Flather 2007). Here, the term "focal species" is intended to include those species encompassed by the guild surrogate approach of conservation; this approach entails one member or a subset of members serving as a surrogate for other members of the guild (Marcot and Flather 2007).

can cumulatively affect nearly as much area as the above-mentioned external fragmentation (Ballantyne et al. 2014). Substantial evidence exists that trails may act as barriers to the movement of animals due to behavioral avoidance, the presence of a physical barrier, or development of a home range along the physical barrier (Burgin and Hardiman 2012). Trail density is a main factor influencing how wildlife respond to trail users and the ability of wildlife to disperse or reach seasonally important habitats such as breeding grounds (D'Acunto et al. 2018). Particularly when resulting from unauthorized trails or poorly sited and/or designed official trails, internal fragmentation can compound the negative effects of the external fragmentation in the surrounding landscape. The arterial spread of multiple cleared areas for trails within protected areas may cause losses of plant communities and ultimately result in long-term degradation of protected areas across large areas (Ballantyne et al. 2014).

Effects of trail presence on wildlife.—A likely consequence of internal fragmentation within protected areas is that the mere presence of trails, even in the absence of humans, can compromise protected areas' ability to sustain sensitive species (Pickering and Norman 2017; Baker and Leberg 2018). This is partly due to edge effects in the area of transition between two contrasting habitats, where resulting changes can occur in species abundance, community structure, and/or predation and parasitism (Zurita et al. 2012). Edge effects are major drivers of change in many fragmented landscapes (Laurance et al. 2007) and factor into the observations that internal fragmentation can restrict movement of some native animals and plants among habitat fragments and enhance the movement of invasive species along the trails (Barros and Pickering 2017). Baker and Leberg (2018) found that the presence alone of roads and trails, and not necessarily how often humans use them, had a significant negative effect on the occupancy of most of the 11 mammalian carnivore species they studied. Trails also potentially expose native animals to predators, including feral species such as the red fox (Vulpes vulpes), that penetrate natural areas by moving along the trails (Burgin and Hardiman 2012): a study on the effects of mountain biking on golden-cheeked warblers (Dendroica chrysoparia) found that the indirect effects from fragmentation and alteration of habitats from mountain biking trails may reduce the quality of the warblers' nesting habitat by increasing the vulnerability of warbler nests to predation by rat snakes (Elaphe obsoleta) and other edge-adapted predators (Davis et al. 2010). Edge effects associated with trails are known to affect other avian species similarly and to reduce the local abundance and nesting frequency of certain avian species, increase the incidence of nest parasitism by cowbirds, and affect avian vocalizations (Hennings 2017). The penetration of edge effects into the areas adjacent to trails is an aspect of internal fragmentation that underscores the ecological cost of unauthorized trails (Pickering and Norman 2017).

Trails expand the zone of effect.—Another notable consequence of trails is the expansion of the zone of effect of recreational disturbance to wildlife as habitats become more open, as occurs from the proliferation of unauthorized trails (Reed et al. 2019). In this context, "effect zones" are areas within which wildlife is disturbed by recreational activities on trails; effect zones encompass and extend beyond the area influenced by edge effects. The expanse of effect zones likely varies depending on the types and intensities of recreation and therefore may not be consistent across a trail network (Reed et al. 2019). Particularly in urbanized areas where protected areas are already highly confined in the surrounding urban matrix, the expansion of the effect zones further dissects and internally fragments what are already essentially habitat 'islands' (Balantyne et al. 2014; Pickering and Norman 2017).

The expansion of effect zones occurs in all protected areas with widespread trails irrespective of the sizes of the protected areas. For small protected areas (~300 ha) with dense trail networks, an effect zone of several hundred meters on either side of the trails can encompass a substantial proportion of the protected areas (Reed et al. 2019). In this way, effect zones reduce the proportion of a protected area that is suitable for various wildlife species (Reed et al. 2019), and can result in no contiguous areas across a protected area free from recreation-related disturbance to wildlife (Dertien et al. 2018).

The higher the level of recreation in protected areas, the greater the potential there is for the effects of trails and their use to extend beyond habitat loss and individual-level effects (behavioral and physiological) on wildlife into population- and community-level effects, including depletion of floral and faunal populations, alteration of trophic and community structures, and reduction of biodiversity (CDFW 2015). If habitat is available, wildlife may move to areas farther from trails, areas beyond the effect zone, to avoid recreation-related disturbance (Reed et al. 2019). However, the greater the proportion of a protected area occupied by effect zones, the fewer options there are for wildlife to move to areas outside the effect zones.

Unauthorized trails and technical trail features

General.—The implications to wildlife conservation of the disturbance to wildlife from trail-related fragmentation and expansion of effect zones are particularly grave with respect to unauthorized trails and recreational activities. The creation and use of unauthorized trails and technical trail features (TTFs) are commonplace and present concerns about the sustainability of biological resources in protected areas worldwide (Marion and Wimpey 2007; Newsome and Davies 2009; Ballantyne et al. 2014; Havlick et al. 2016; Barros and Pickering 2017).[8] Though most unauthorized trails and TTFs are readily visible and accessible, they are not officially planned or designed, approved for construction, managed, or part of a formally designated trail network (Davies and Newsome 2009; Leung et al. 2011; Hennings 2017). All user groups tend to create and use unauthorized trails, and there are several motivations for doing so, such as wanting access to trails closer to home or to engage in off-trail activities (Hennings 2017).

Though other recreationists venture off of designated trails, mountain bikers increasingly create unauthorized trails as they seek more challenging, wider-ranging, or free-riding opportunities (Havlick et al. 2016), or want a shortcut to reach specific destinations or to connect existing trails (Davies and Newsome 2009). If a trail is not sited in a place where bikers want to go, the off-trailing that results eventually forms trails (Davies and Newsome 2009).

Unauthorized trails expand the negative effects of human recreation on the flora and fauna of any protected area (Dertien et al. 2018). Similar to the above-discussed problems associated with internal fragmentation, unauthorized trails and recreational activities can negate the ecological benefits of both well-planned designated trails/trail networks and of prohibitions on access and activity (e.g., avoidance of breeding areas and seasonal access restrictions). The proliferation of unauthorized trails is often more responsible for trail-based fragmentation than formally designated trails (Ballantyne et al. 2014).

8 TTFs are created on mountain biking trails to increase the challenge of the ride. Examples of TTFs are jumps, ditches, mounds, bridges, ramps, ladders, drop offs, see saws, and 'skinnies' (i.e., narrow features that can be traversed) (Davies and Newsome 2009; Pickering et al. 2010c; Quinn and Chernoff 2010; Ballantyne et al. 2014; Havlick et al. 2016; Hennings 2017; Pickering and Norman 2017).

Even where unauthorized trails occupy a relatively small proportion of a landscape, they can be quite detrimental if in vital habitat; sensitive species whose territories or home ranges include the affected area(s) may be prevented via displacement or loss of habitat connectivity from accessing limited and essential resources (Gutzwiller et al. 2017). Wildlife can be more disturbed by off-trail than on-trail recreationists. For example, Taylor and Knight (2003) compared how mule deer (*Odocoileus hemionus*) respond to hikers and bikers using designated trails and one randomly chosen off-trail route. The deer exhibited a 70% probability of flushing from on-trail recreationists within 100 m from designated trails, whereas they exhibited a 96% probability of flushing within 100 m of recreationists located off trails, and their probability of flushing did not drop to 70% until the distance from the recreationists reached 390 m.

Examples.—Examples of protected areas affected by unauthorized trails include: 19 Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP; see footnote #2) protected areas in San Diego County, California where unauthorized trails comprise a mean of 45% (range: 8–85%) of the 1,206 km of trails mapped (Reed et al. 2014); an 829-ha area of the endangered Tall Open Blackbutt Forest in southeast Queensland, Australia, where 57% (26.5 km) of the 46.1 km of recreational trails was unauthorized when mapped in 2013 (Ballantyne et al. 2014); and, a 237-ha protected area in Argentina where 94% of the 19 km of trails found was unauthorized, resulting in landscape-level fragmentation and loss of vegetation (Barros and Pickering 2017). Another example of a protected area affected by unauthorized trails is the 191-ha Carlsbad Highlands Ecological Reserve in San Diego County. Though mountain biking is prohibited in this reserve, in addition to the 4 km of legal hiking trails in the reserve are also 27.4 km of unauthorized mountain biking trails and TTFs (E. Pert, South Coast Region, Regional Manager, California Department of Fish and Wildlife [CDFW], personal communication, 2019; Figure 1). This ecological reserve, so designated in 2000, comprises a critical component of an NCCP/HCP protected area and supports coastal sage scrub (a sensitive plant community), grasslands, thread-leaved brodiaea (*Brodiaea filifolia*, listed as threatened and endangered under the Federal and California endangered species acts, respectively), and several sensitive wildlife species: the federally threatened coastal California gnatcatcher (*Polioptila californica*), sharp-shinned hawk (*Accipiter striatus*), golden eagle (*Aquila chrysaetos*), white-tailed kite (*Elanus leucurus*), turkey vulture (*Cathartes aura*), and grasshopper sparrow (*Ammodramus savannarum*).[9]

Managing unauthorized trail creation and use.—Managing the rapid proliferation of unauthorized mountain biking trails and TTFs and their use is challenging. Even if only a small proportion of bikers is involved, the resulting vandalism can have serious ecological consequences as is well reflected in the statement, "[g]enerally when you ask people to stay out of the area no matter what the reason is, 80-90% obey you, [b]ut if you get 10% who don't obey you, you haven't done any good" (Bill Andree, retired district wildlife manager of Colorado Parks and Wildlife; Peterson 2019).

In the aforementioned Carlsbad Highlands Ecological Reserve, enforcement and education are necessary to substantially reduce the illegal riding, but the bikers monitor

9 Of CDFW's 136 ecological reserves (ER) statewide, biking is allowed on eight. About ERs, Title 14, California Code of Regulations §630(a) states, "All ecological reserves are maintained for the primary purpose of developing a statewide program for protection of rare, threatened, or endangered native plants, wildlife, aquatic organisms, and specialized terrestrial or aquatic habitat types. Visitor uses are dependent upon the provisions of applicable laws and upon a determination by the [Fish and Game] commission that opening an area to such visitor use is compatible with the purposes of the property."

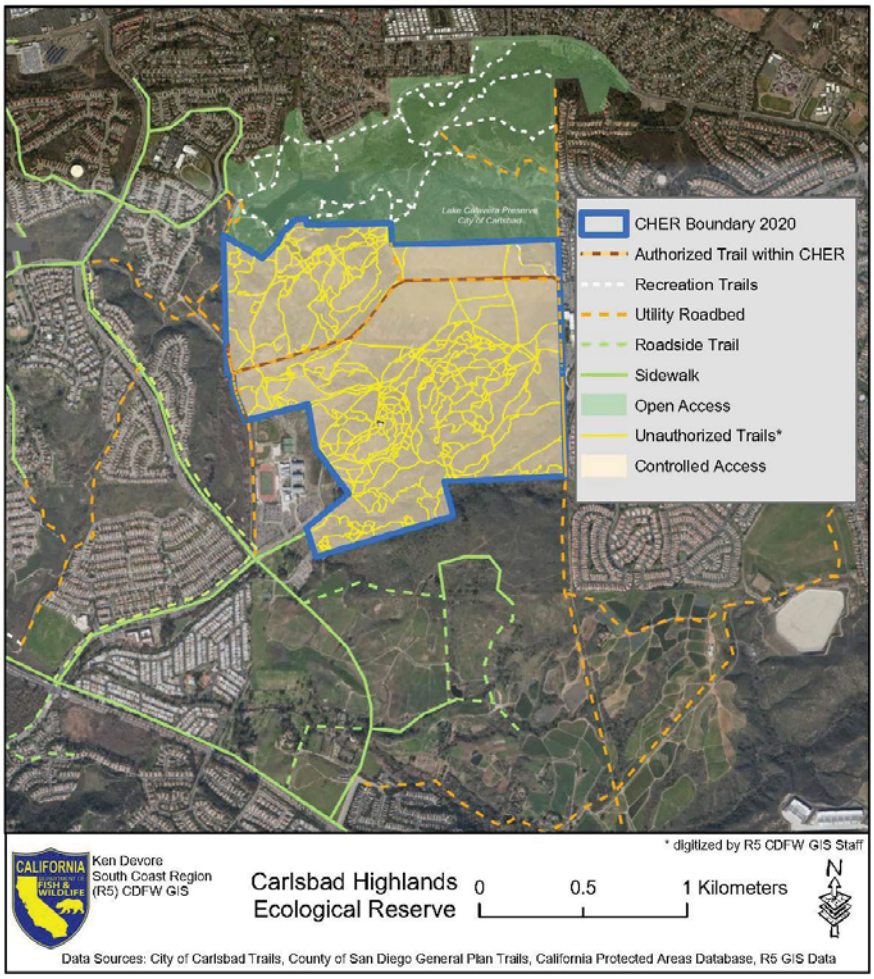

Figure 1. Carlsbad Highlands Ecological Reserve, Carlsbad, California. The yellow lines represent the unauthorized trails. Their associated effect zones occupy most, if not all of, the Ecological Reserve. (Credit: Ken Devore, South Coast Region (R5), GIS, CDFW 2017).

enforcement activity and recommence riding in the ecological reserve when enforcement officers leave (E. Pert, CDFW, personal communication, 2019). A similar protected area is the 350-ha Del Mar Mesa Preserve (Preserve) in the City of San Diego; the Preserve supports rare and endangered species such as Del Mar Manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia)*, Orcutt's brodiaea (*Brodiaea orcutti)*, San Diego button celery (*Eryngium aristulatum* var. *parishii)*, San Diego mesa mint (*Pogogyne abramsii*), San Diego fairy shrimp (*Branchinecta sandiegonensis)*, and the California gnatcatcher, and was the subject of a study the City conducted to determine whether enforcement by CDFW Wildlife Officers (wardens) is an effective method to curb unauthorized trail uses (SANDAG 2015; Greer et al. 2017). Of the 32.22 km mapped trails on a 257-ha portion of this Preserve, 21.98 km are considered unauthorized (Reed et al. 2014). Prior to the study, City Park Rangers had

conducted regular educational efforts in the field an average of 3–4 times monthly over a 17–month period. Despite the Rangers' efforts, non-compliance became the social norm as more users followed expanding numbers of unauthorized trails (Greer et al. 2017). The subsequent period of the CDFW Wildlife Officers' enforcement comprised 810 hours during a 12-week period with an unpredictable schedule. Prior to enforcement activities, the majority (78.7%) of the use within the study area was illegal, and over 85.5% of the illegal use was mountain biking. Illegal mountain biking decreased quickly during the enforcement period by 66.0% over the study period and stayed low during the 43-day post-enforcement period, while legal mountain biking remained the same. Other illegal use also decreased significantly, while other legal uses doubled (Greer et al. 2017). Greer et al. (2017) cite decades of research indicating that a combination of soft (i.e., education) and hard (e.g., warnings, citations, arrests, confiscation of bikes) enforcement is the most effective approach to promoting compliance. They assert that education becomes less effective in areas with chronic unauthorized trail creation and use.

Overall conclusions from Greer et al.'s (2017) study follow: (1) soft enforcement aimed at public education and redirecting social norms was not sufficient to curb unauthorized trail use in the Preserve; (2) open space enforcement by CDFW Wildlife Officers was determined to be effective in reducing unauthorized use in the Preserve; (3) the threat of sanctions (hard enforcement) has a more general utility and effectiveness in curbing non-compliant behavior than outreach to promote "awareness-of-consequence" of user actions (soft enforcement). The authors also concluded that social media has great potential to engage and educate the public on environmental issues, and that its use in combination with community policing can be a powerful tool to: redirect user attitude and subsequent behavior through peer-to-peer education about environmental impacts; answer questions regarding authorized uses; and, warn users of potential sanctions for non-compliance. They recommend the implementation of a social media component prior to and during enforcement efforts to help educate recreationists and reduce misinformation and recreationists' distrust of managers and enforcement personnel (Greer et al. 2017).

Paucity of information available.—Despite the global proliferation and use of unauthorized trails and TTFs and their far-reaching effects on wildlife in protected areas, there is a paucity of information of any depth available on such effects. The impacts of unauthorized trails and TTFs have been rarely documented (Marion and Wimpey 2007; Davies and Newsome 2009). A comprehensive literature search prior to 2010 produced only eight studies documenting the effects of unauthorized trails (Pickering et al. 2010c). Since then, additional studies have assessed the effects on vegetation from unauthorized trails, with little elucidation about their effects on wildlife. The proliferation, use, and wildlife-related effects of unauthorized trails remain understudied and insufficiently addressed. For protected areas where the creation and use of unauthorized trails and TTFs are prevalent, it is infeasible to fully assess the recreation-related effects on wildlife without including these activities and their effects. Yet, these effects have a great potential to impair the ability of protected areas to meet their conservation objectives.

Disturbance thresholds

Disturbance thresholds are predetermined levels of various measurable indicators above or below (depending on the indicator) which wildlife is disturbed (Hennings 2017).

These thresholds may be used to establish management measures such as minimum widths of spatial buffers between recreational trails and wildlife. Exceedance of a threshold may trigger the implementation of further management measures (Hennings 2017). Examples of disturbance thresholds are distance between people and wildlife or between trails and nesting sites (i.e., the distance within which wildlife species avoid people or trails), density of active trails above which wildlife alters its use of habitat, number of recreationists per day over which wildlife abundance decreases, duration of recreation, and number of recreational events per unit time (Hennings 2017; Dertien et al. 2018).

Thresholds should be set at levels equal to or more protective of predetermined levels of disturbance, and should be responsive to trends in changing conditions as identified by monitoring (Hennings 2017). Data from studies of recreational activities can be used to estimate quantitative thresholds of disturbance to wildlife (Dertien et al. 2018); however, determining these thresholds requires very specific empirical data (Rodríguez-Prieto et al. 2014).

While determining and using disturbance thresholds would be ideal for managers to optimize management decisions (Rodríguez-Prieto et al. 2014), they are difficult to determine for broad application. For example, thresholds established for distance to trail are not necessarily adequately protective of the focal species under all conditions in which they occur; a general rule of minimum thresholds for distance to trail cannot be established for some species, as individual variability within species can be high and can differ among populations, types of topography, and frequencies and types of human intrusion (González et al. 2006). As a result, the literature about recreation-related disturbance to wildlife provides limited information about quantitative thresholds for distance to trail (Dertien et al. 2018). Though their sample sizes (i.e., number of articles reviewed with such information) are accordingly small, Dertien et al. (2018) found the following examples of such thresholds: wading birds and passerines were generally affected at distances less than 100 m; larger-bodied species such as hawks and eagles had threshold effect distances greater than 400 m; small rodent species avoided areas within 50-100 m of trails or people; and some carnivores and ungulates had minimum effect distances up to 350-1000 m from trails and people.

As another example of a spatial buffer, Dertien et al. (2018) recommend a 200-m minimum buffer for ungulates; however, this would be insufficient for the circumstances of Taylor and Knight's (2003) study in which they found that mule deer showed a 96% probability of flushing within 100 m of recreationists located off trails, and the probability of their flushing did not drop to 70% until perpendicular distance reached 390 m. Two additional factors that influence the determination of spatial buffers are the density of the trail networks and the above-discussed effect zones. The smaller a protected area is and the denser its trail networks are, the greater the proportion of the protected area is occupied by effect zones, and the less likely it is that spatial buffers will protect the focal species from recreational disturbance (Wilcove et al. 1986; Ballantyne et al. 2014).

Land managers should consider both trail density and the level of human recreation before deciding on disturbance thresholds, since thresholds that work at lower levels of human activity may be ineffective when activity levels increase (D'Acunto et al. 2018). D'Acunto et al. (2018) simulated the success of trail closure strategies on reducing disturbance from Off Road Vehicles and pedestrians to nesting golden eagles during laying and incubation, focusing on eagle flushing behavior from the nest and alteration of foraging flight. They found that, for current levels of human recreation, the restrictive buffer (i.e. all trails closed

within the buffer) was best at reducing flushing of incubating eagles, while closing all but the popular trails was best for foraging eagles. When the simulated human recreation was increased, trail density was the main factor influencing eagle flushing frequency.

Hennings (2017) reports the following thresholds for levels of human recreation (i.e., number of users) from four studies: for guanacos (*Lama guanicoe*), about 250 visitors per day, above which the number of birds observed declined; for sanderlings (*Calidris alba*), 20 visitors per day; for songbirds, eight out of 13 species showed thresholds ranging from 8-37 visitors per ha; and, for Mexican spotted owls (*Strix occidentalis lucida*), around 50 hikers per day. Regardless of any threshold effects, the majority of the research indicates that more visitors will generally cause more wildlife effects (Hennings 2017). However, since recreational impacts vary nonlinearly with use in a variety of ecosystems, a small number of visitors can have a disproportionate impact on sensitive species (Reed and Merenlender 2008).

Other aspects of recreation ecology to consider

Interpretation of observed behavioral responses.—It is possible to misconstrue the reasons for and implications of observed responses by wildlife to recreational activity. Traditionally and intuitively, species or individuals showing strong negative responses (e.g., readily flee or avoid) to human disturbance are those assumed to most need protection from disturbance. However, species with little suitable habitat available nearby cannot show marked avoidance of disturbance even if the fitness costs of the disturbance are high (e.g., reduction of survival or reproductive success; Gill et al. 2001). Conversely, species with many nearby alternative sites to move to are likely to move away from disturbance even if the fitness costs of the disturbance are low (Gill et al. 2001). It should not be assumed that the most responsive animals are the most vulnerable (Beale and Monaghan 2004). For example, in a controlled study of the behavioral responses of a shorebird (ruddy turnstone, *Arenia interpres*) to human disturbance (an approaching observer), Beale and Monaghan (2004) found that birds in better condition (i.e., supplemented with food) had longer flight initiation distances (i.e., flushed sooner) from the disturbance and searched for predators more frequently than control birds (i.e., not supplemented with food).[10] That is, birds responding most were actually the least likely to suffer any fitness consequences associated with the human presence; this is opposite from the response generally expected when behavior is used as an index of disturbance effects. Birds that had the most to lose by flushing, or otherwise changing their behavior in a manner that reduced feeding time, showed the least behavioral response; this could be interpreted incorrectly as meaning that these birds were not disturbed. Gill et al. (2001) assert that the absence of an obvious behavioral response does not rule out a population-level effect. In the same vein, it may be that species occurring in protected areas that are remnant fragments within urban landscapes are forced to utilize all components of the fragments, irrespective of their land-use intensity and land cover. This may occur if animals have nowhere else to go, and may be an explanation for instances when total relative abundance of birds is greater in urban and suburban reserves than in exurban reserves (Markovchick-Nicholls et al. 2008).

In addition to the reasons Gill et al. (2001) provide for an absence of detected effects, other possible reasons for finding no recreation-related effects include that there

10 Flight initiation distance is the distance from an approaching threat (e.g., recreationist) at which an animal begins to move away to escape from the threat.

may be a negative effect but it is not detected due to methodological issues. For example, the response variable examined (e.g., behavior versus physiology) and/or the number of replicates used compared to the amount of variation in the traits measured may not reveal the actual response of the species studied or the associated longer-term population-level effects (Steven et al. 2011). Furthermore, some studies may not include sufficiently high levels of human activity to detect responses from species that can tolerate lower levels of disturbance (Reed et al. 2019).

Threatened, endangered, and sensitive species.—Current research of recreation-related effects on wildlife does not include many species of urgent conservation concern (Larson et al. 2016). As many rare and isolated species tend to be specialists, anthropogenic activities could have a greater detrimental effect on the distribution, breeding success, and survival of individuals of these species (Beale and Monaghan 2004b; Bennett et al. 2013) than found in studies involving less sensitive species. Studies do not always reveal the strongest effects because the most disturbance-sensitive species are naturally rare in number or are already gone from disturbed sites (Hennings 2017). While recreation may not be the primary reason for the sensitive status of such species, it is a threat worth understanding for types of recreation that occur in the protected areas designated to conserve them (Larson et al. 2016).

Magnitude and duration of wildlife responses to recreation.— It is known that the nature (e.g., behavioral, physiological), magnitude, and duration of recreation-related disturbance to wildlife depend on a variety of factors, including, but not limited to, frequency and type of recreation, distribution of recreational use, season(s) of use, and environmental conditions (Marzano and Dandy 2012). Evaluating the effectiveness of measures to manage recreation can be complicated by the intensity of recreational use of a protected area because levels of use influence the magnitude of recreation-related effects on wildlife (Reed and Merenlender 2011). But studies do not always quantify the levels of recreational uses. Likewise, research seldom provides insight to the duration of wildlife species' response (e.g., nest abandonment, interruption of foraging/hunting, breeding, fleeing) to human disturbance (Marzano and Dandy 2012; Burger 2012; Larsen et al. 2016) or degree of response (e.g., how far wildlife moves away from human disturbance at a greater energetic cost and resulting in less availability of habitat). The same is true for the spatial scale at which wildlife response occurs (Burger 2012).

Generalized comparisons of effects among types of recreation.—It is clear from the literature that recreation in protected areas, particularly in more urbanized areas, can negatively affect wildlife (Larsen et al. 2016). However, it is difficult to make defensible generalized comparisons of the effects on wildlife among different types of recreation, partly because of the diversity of recreational activities, study methodologies, and observed responses (Monz et al. 2013). A comparison of results among similar studies indicates that sweeping conclusions about the effects of urbanization and human activity on wildlife need to be made with caution and are likely to be species-specific (Markovchick-Nicholls et al. 2008). For example, applying this caution to one species, the U.S. Fish and Wildlife Service (2000) concludes that attempts to ascribe relative importance, distinguish among, or generalize the effects of different human activities on bighorn sheep (*Ovis canadensis*) behavior are not supportable, given the range of potential reactions reported in the literature and the different variables impinging on given situations. Therefore, generalized comparisons of the effects on wildlife among different types of recreation are ill advised. The differences among types of recreation in their effects on wildlife are less important than the negative association for wildlife of human presence, irrespective of type of recreation (Patten and Burger 2018).

Despite the difficulty of making well-founded comparisons of the effects on wildlife among different types of recreation, comparisons are made. Among the types of recreation examined in the literature, the ecological effects of hiking and biking are most often compared. For studies done in the United States, this reflects the 22% increase to 8.3 million from 2006 to 2015 in mountain bikers, and the 24% increase to 37.2 million hikers during the same time period (Hennings 2017). And, notwithstanding the foregoing caveat about generalized comparisons, Hennings (2017) underscores that photographers, people with small children, bird watchers, and people engaging in loud conversations may be especially detrimental to bird communities because they are unpredictable and generally alarming. Photographers and wildlife watchers tend to stop, look directly at wildlife, and even follow them around, triggering stronger antipredator responses than people who simply pass by; photographers also tend to seek out rare species and look for nests. Also, curious, excited children tend to run around and shout in an unpredictable fashion (Marzano and Dandy 2012; Hennings 2017).

An absence of differences among effects.—The absence of differences among recreational activities' effects on wildlife does not equate to no effects. There can be similar levels of both benign or significant effects. For instance, in a study of bison (*Bison bison*) and pronghorn (*Antilocapra americana*), the authors found little difference in wildlife response (i.e., alert distance, flight initiation distance, or distance moved)[11] to hikers versus mountain bikers, but both species exhibited a 70% probability of flushing when within 100 m from trails with recreationists present (Taylor and Knight 2003).

Cumulative and synergistic negative effects.— The negative effects of recreation on wildlife compound, and may also act synergistically with, those from other influences (Larson et al. 2016; Reed et al. 2019). The cumulative negative effects of all anthropogenic influences on wildlife complicate efforts to minimize the effects and assess their population-level consequences (Pirotta et al. 2018). However, recreation ecology studies typically do not factor in other anthropogenic influences to which wildlife in protected areas are exposed (Pickering et al. 2010c; Erb et al. 2012; Messenger et al. 2014; Reed et al. 2019). Other anthropogenic influences include climate change and its associated effects on natural disasters; fires and other natural or human-caused disasters; consumptive recreation; non-recreational human activity such as habitat loss or alteration, the associated lack of connectivity, and the resulting loss of genetic diversity; poor air and/or water quality; invasive species; roads; vehicles; artificial light; prey declines; reverse zoonoses; drones; and noise (e.g., from vehicles, planes, ships, and boats). Recreation-related cumulative effects may be important if, for instance, the densities of different types of recreationists influence predator use of sites more than does the density of any one type of recreationist alone (Gutzwiller et al. 2017).

Wildlife habituation to human activity.—Habituation is a form of tolerance in which, as the result of a lack of negative consequences, there is a waning of response to a repeated, neutral stimulus (Whittaker and Knight 1998; Pauli et al. 2017). Habituation allows wildlife to use their energy for normal fitness-enhancing behaviors such as resting, foraging, and mating instead of fleeing when confronted with human activities that result in neutral outcomes (Whittaker and Knight 1998; George and Crooks 2006; Reilly et al. 2017). Habituation is

11 Alert distance is the distance from a stimulus at which an animal initiates vigilance behavior (Guay et al. 2016 in Reed et al. 2019); more specifically in this context, it is the distance between a recreationist and an animal when the animal first becomes visibly alert to the recreationist. Distance moved is the distance an animal travels from its initial position until it stops (Taylor and Knight 2003).

an apt description for crows (*Corvus* spp.) ignoring a scarecrow, or a red fox ignoring the human activity in a suburban area (Whittaker and Knight 1998). Citing several authors' work, Martínez-Abraín et al. (2008) identify level and frequency of disturbance, species, location, size and diet of species, and age of individual animals as factors that affect the degree of wildlife habituation to human disturbance.

The ability to habituate to predictable and recurrent human use of recreational trails may be an important behavioral adaptation for wildlife (González et al. 2006; Martínez-Abraín et al. 2008). However, habituated urban wildlife might be less likely to avoid contact with humans, which may increase the probability of human-wildlife conflicts and of attraction to anthropogenic food sources; both circumstances are considered problematic in many urban areas (Whittaker and Knight 1998; George and Crooks 2006). Wildlife habituation to humans may also increase wildlife aggression toward humans, or render wildlife more vulnerable to predators, hunters, poaching, or roadkill (Whittaker and Knight 1998; George and Crooks 2006; Marzano and Dandy 2012). Habituation of adult individuals may be associated with negative consequences for their offspring since habituation of adult animals does not translate to immediate habituation of juveniles (Reilly et al. 2017).

True habituation is not easily measured, and what appears to be habituation is often not (Hennings 2017). Apparent habituation is not a true measure of whether people are disturbing wildlife (Hennings 2017). Wildlife can experience significant stress without fleeing, and when this is misconstrued as habituation, disturbance effects on wildlife are underestimated (Hennings 2017). Care must be taken to avoid attributing a lack of observable response by wildlife to human presence as habituation (Beale and Monaghan 2004). Wildlife that seem not to avoid recreational disturbance may experience stress or be unable to leave a site if, for example, there is no suitable habitat nearby (Gill et al. 2001; Beale and Monaghan 2004; Markovchick-Nicholls et al. 2008).

While habituation to human disturbance could result in development of tolerance within a population (Pauli et al. 2017), Bötsch et al. (2018) infer from their findings on the recreation-related disturbance to birds in forests where recreation has occurred for decades that habituation to humans has not outweighed the effects of the disturbance. A long-lived species with low recruitment, such as the golden eagle, may be unable to experience individual learning or population-level evolutionary adaptation at a rate sufficient to compensate for a rapidly shifting anthropogenic landscape (Pauli et al. 2017).[12]

In a study subjecting captive female elk to four types of recreational disturbances (all-terrain vehicles riding, mountain biking, hiking, and horseback riding) over a two-year period, the elk showed no evidence of habituation to mountain biking. Similarly, elk travel time in response to hiking was generally above that of control periods, suggesting elk also did not habituate to hiking disturbance (Naylor et al. 2009).

In a study of how bison, mule deer, and pronghorn responded to hikers and bikers on designated recreational trails, Taylor and Knight (2003) found little evidence of habituation to recreationists among the species at the time of the study (summers of two consecutive years). In fact, the pronghorn at the study site did not habituate to largely predictable recreational use over a three-year period following the opening of trails at the site, and used areas that were significantly farther from trails than they had prior to the start of recreational use.

12 Evolutionary adaptation is the hereditary alteration or adjustment in structure or habits, the process by which a species or individual improves its ability to survive and pass on its genes in relationship to the environment (Ha and Campion 2019); unlike habituation, evolutionary adaptation does not result from learning during an individual's lifetime.

Hennings (2017) asserts that wildlife do not appear to habituate to the presence of dogs; impacts potentially linger after dogs are gone because the scent of dogs repels wildlife. It may be too that wildlife do not habituate to dogs (particularly off-leash dogs) because wildlife perceive dogs as predators and because they are unpredictable (Hennings 2016). Dog-specific disturbance has been studied for birds, with no evidence of habituation even with leashed dogs and even where dog-walking was frequent; the disturbance was much weaker for people without dogs (Hennings 2016).

The challenge of research.—Recreation ecology, similar to other fields of ecology, faces challenges in conducting statistically valid research (Quinn and Chernoff 2010). The degree to which and how the biotic and abiotic resources present in any one location respond directly or indirectly to recreational activities depends on many variables, some of which may be confounding (Figure 2, Table 1). Measuring the effects of human activity on wildlife is difficult because of the variability in the underlying spatial, diurnal, seasonal, and even the type of, indices being measured (Burger 2012). Recreation-related effects on wildlife vary among species (Larson et al. 2016) as different wildlife species respond differentially to visual, auditory, olfactory, and tactile stimuli (Hennings 2017). Wildlife responses to recreationists are likely influenced by a suite of variables that may differ in each field setting (Steidl and Anthony 1996; Taylor and Knight 2003), including level of human presence/activity that evokes a response as well as feedbacks and interactions with other factors (e.g., edge effects, availability of cover, exposure to disturbance, or time since fire; Patten and Burger 2018). Study methodology (i.e., design, sampling, data collection, and data analysis) itself encompasses many variables that dictate how other variables will influence the study outcomes. Even if methodology is consistent between/among two or more studies, other variables can result in different study results (Taylor and Knight 2003). Methodological issues may limit the inferences that can be made from the results (Pickering et al. 2010c).

Study design and statistical analyses can utilize methods to control for the effects of confounding variables (e.g., by using covariates). Statistical analyses can be used to examine alternative use-impact or use-response relationships between recreational activity and wildlife responses to assess the effects of recreational activity relative to other known drivers (e.g., habitat fragmentation, invasive species) of species occupancy, distribution, physiology, reproduction and survival (Monz et al. 2013; Reed et al. 2014).

Differences among study results.—Differences among studies' results can be due more to differences in variables not accounted for (e.g., space, diet, competition; Markovchick-Nicholls et al. 2008), study design, and/or analytical methodologies than to actual differences among species' responses to recreational disturbance. As to methodology, for instance, some studies may not include sufficiently high levels of human activity to detect responses from species that can tolerate lower levels of disturbance (Reed et al. 2019).

Reilly et al.'s (2017) study using camera trap data to quantify how hiking, mountain biking, horseback riding, and dog-walking affect habitat use/occupancy and diel shifts in activity patterns of ten mammalian species is illustrative for this discussion because some of its results differ markedly from those of other studies. For example, the authors found no negative association between recreation and habitat use by bobcats (*Lynx rufus*) and coyotes (*Canis latrans*), whereas Reed and Merenlender (2008) documented (in the same study area as Reilly et al.) densities of these two species more than five times lower in protected areas that permitted recreation versus those that did not. Dertien et al. (2018) identify differences in the following aspects of the two studies: field study methods, statistical analyses,

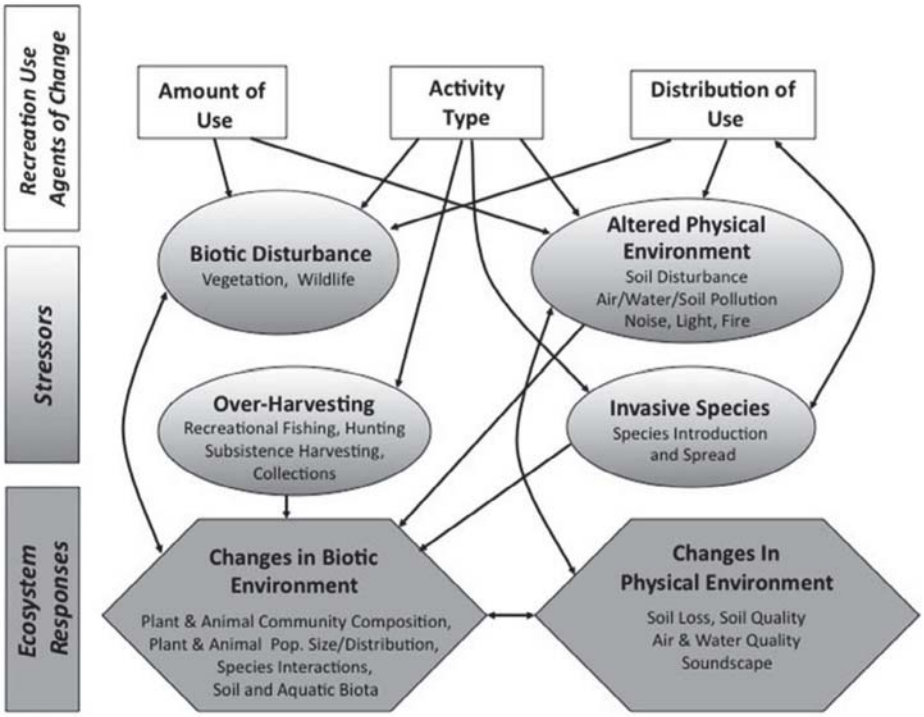

Figure 2. A conceptual model of ecological effects of outdoor recreation (Credit: Monz et al. 2010).

and research design – namely, types of study sites selected, treatment of data sources as replicates or independent of one another, and duration of data collection (one versus three years). These differences may have contributed to the greater variability observed in Reilly et al.'s (2017) study compared to Reed and Merenlender (2008).

Strong variability in other factors that are well known to influence mammalian distributions (e.g., habitat type, human development, or seasonal effects) make it difficult to conclude whether the potential effects of recreation on the target species were truly absent or simply undetected (Dertien et al. 2018). In addition, studies that use abundance, relative abundance, or species richness generally observe stronger effects of recreation than do studies such as Reilly et al.'s (2017) that use occupancy as a response variable (or occupancy interpreted as habitat use; Reed et al. 2019).

Reilly et al. (2017) acknowledge that: species vary widely in their responses to human activities; recreation-related effects on mammalian species that are rare or declining may be greater than on those that are more common or widely distributed; and birds, reptiles, amphibians, and small mammals may respond differently than the large and medium-sized mammals they studied. Finally, in contrasting their results with those of George and Crooks (2006), Reilly et al. do not acknowledge Gill et al.'s (2001) assertion that proximity to other suitable habitat influences how wildlife will respond to human disturbance; George and Crooks (2006) not only acknowledge but give credence to Gill et al.'s work.

Population-level effects

The foregoing discussion reveals many complexities of recreation ecology and provides a sense of why the population-level effects of human disturbance to wildlife are still poorly known (Burger 2012; Hennings 2017). Parameters used to measure population-level effects include population size, density, age structure, fecundity (birth rates), mortality (death rates), and sex ratio (Tarsi and Tuff 2012). Comprehensive assessments of the nonlethal effects on wildlife at the population level are rarely undertaken due to several constraints, including that robust assessment of these effects is challenging (Pirotta et al. 2018). Nonetheless, from a strictly conservation standpoint, human disturbance to wildlife is important only if

Table 1. Variables that influence the outcome of studies designed to assess the ecological effects of recreational activities. Each variable is mentioned in one or more of the cited articles (Taylor and Knight 2003; Beale and Monaghan 2004; Markovchick-Nicholls et al. 2007; Davis et al. 2010; Monz et al. 2010; Pickering 2010a; Quinn and Chernoff 2010; Burger 2012; D'Acunto 2018).

a. regional geophysical traits
b. size(s) of protected area(s) where research occurs
c. type(s) of vegetation present
d. area and density of vegetative cover
e. surrounding environment, including vegetation between the recreational activity and the target species
f. edaphic conditions (e.g., soil type, level of compaction, moisture, composition)
g. weather (temperature, precipitation, wind, shade, sun etc.)
h. timing (day / night / season)
i. time of day x location
j. design of trails (e.g., steepness of trails)
k. placement of trails (orientation to terrain - on flat, along a slope, across a slope)
l. direction of trails (ascending or descending)
m. spatial relationship between trails and target animals
n. trail density
o. wildlife present, target and non-target
p. total # of target wildlife individuals
q. spatial distribution of target wildlife
r. age classes and genders of target wildlife present (adult males/females, subadults, young of year)
s. reproductive status of target wildlife
t. fitness of target wildlife
u. predictability of recreational activity
v. degree of target animals' habituation to tested activities
w. duration of target animals' exposure
x. whether the target animals have the ability to retreat
y. type(s) of recreation
z. duration of recreational activity
aa. # of humans present (e.g., individuals or groups)
bb. # of human disturbances per day
cc. whether recreational activity is on or off an official trail
dd. recreationists' positions
ee. angle / trajectory of recreationists' approach to wildlife
ff. speed and style (e.g., 'aggressive') of recreationists' approach
gg. distance of recreational travel
hh. whether the recreationists apply best practices
ii. recreationists' behavior (e.g., talking or silent, continuous movement or stopping)
jj. encounter distance
kk. perpendicular distance
ll. encounter x perpendicular
mm. researcher bias
nn. study methodology (e.g., is recreationists' approach to wildlife direct or tangential, on or off trail; includes statistical analyses)

it affects survival or fecundity such that a population declines (Gill et al. 2001). Assessing and managing the nonlethal effects on wildlife populations has long been a goal of ecologists, land managers, and decision makers (Pirotta et al. 2018). The management of human activities that cause nonlethal effects on wildlife presents a fundamental ecological problem: how to understand the population-level consequences of changes in the behavior or physiology of individual animals that are caused by external stressors (Pirotta et al. 2018). Given the expansion of recreational activities that can disturb wildlife, quantitatively linking the effects of this disturbance to population dynamics is a major objective for modern conservation (Pirotta et al. 2018).

While behavioral responses, which are studied far more often than other types of responses (e.g., physiological; Larson et al. 2016), have the potential to affect survival or reproductive success, the actual fitness[13] costs of behavioral responses need to be quantified before the responses can be used as reliable estimates of population-level perturbations (Gill et al. 2001).

In most situations when statistical models are used to estimate or forecast the population-level effects of disturbance, selection of a model structure is likely to be driven by data availability (Pirotta et al. 2018). Collecting recreation data in conjunction with ongoing animal population monitoring efforts would be a valuable way to improve the understanding of the effects of human disturbance on demographic trends; and, studies that combine behavioral responses with physiological or demographic metrics would help calibrate the relationships between behavioral responses and population-level effects (Reed et al. 2019). Whichever models are used, uncertainty in the estimated population consequence can be reported as a distribution of potential outcomes, allowing the application of the precautionary principle if the results are used to make management decisions (Pirotta et al. 2018).[14] Application of the precautionary principle is warranted given that any simulation model simplifies reality (D'Acunto et al. 2018).

The dearth of conclusive evidence of recreation-related population-level effects in the literature does not mean that such effects are rare; logic dictates that, if the negative consequences of some observed behaviors or physiological changes in wildlife persist, negative population-level effects will eventually follow. For example, negative population-level effects on desert bighorn sheep (*Ovis canadensis nelsoni*) from recreational disturbance have been documented and are implicated in the bighorn sheep abandonment of habitat (and extirpation of the population) in the Pusch Ridge Wilderness in Arizona, USA (Longshore et al. 2013). And, recreation is one reason cited for the population of bighorn sheep in the Peninsular Ranges of California being listed in 1998 as endangered under the Federal Endangered Species Act (USFWS 2000).

The effects of hikers on elk (*Cervus elaphus*) provide another example of recreation-related population-level effects. Based on a two-year study of the response of female elk to the presence of back-country hikers during the calving season, Shively et al. (2005) recommended that some recreational closures be continued because, despite the evidence that elk reproduction can rebound from depressed levels when hikers are removed or reduced in

13 Fitness refers to reproductive success and reflects how well an organism is adapted to its environment (Hennings 2017).

14 The central tenet of the precautionary principle is that precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. Generally, the four central components of the principle are: taking preventive action in the face of uncertainty; shifting the burden of proof to the proponents of an activity; exploring a wide range of alternatives to possibly harmful actions; and increasing public participation in decision making (Kriebel et al. 2001).

number, they could not determine if there is a threshold level of reproductive depression from which elk cannot recover. In fact, a 2019 article in *The Guardian* reported that the number of elk in the same herd Shively et al. (2005) studied had dropped precipitously since the early 2010s with the steady increase in recreation; what was once a herd of 1,000 head of elk, had dropped to 53 at last count in February of 2019 (Peterson 2019). The article explains that, for Bill Alldredge, one of the authors of the study, there is no other explanation than the increased levels of trail users in the area that supports this elk herd (Peterson 2019).

In a study to assess the effects of recreational activities on Iberian frogs (*Rana iberica*), an endemic species in decline and listed as vulnerable in the Spanish Red Data Book, Rodríguez-Prieto and Fernández-Juricic (2005) concluded that (1) the decrease in Iberian frog abundance with the proximity to recreational areas suggests that direct human disturbance affects this species at the population level, and (2) overall, the results suggest that direct human disturbance needs to be considered as a potential factor affecting amphibian populations with low tolerance for disturbance.

From the peer-reviewed recreation ecology literature, Steven et al. (2011) compiled 69 journal articles that describe the results of original research examining the effects of non-motorized nature-based recreation on birds. Among the articles were 33 that examined population-level avian responses (i.e., reproductive success including number of nests, number eggs laid, and number of chicks that hatched or fledged). Negative effects were reported in 85% of these 33 articles.

Patten et al.'s (2017) 10-year study of mammalian populations across the County of Orange Central and Coastal NCCP/HCP protected areas coincided with a marked increase of human activity and provides insight to potential population-level effects. Though the authors did not discern a decline in the populations studied, they did discern temporal and spatial shifts by wildlife due to human presence, and they suggested that the associated losses in prey populations are unsustainable in light of additional stressors these populations face, which range from continued loss of habitat to human disturbance in the protected areas. Furthermore, given the avoidance behavior and temporal shifts of the various mammalian species, any further increase in human disturbance may yet drive mammalian populations downward (Patten et al. 2017).

With regard to population-level effects of anthropogenic fragmentation, evolutionary adaptation to such fragmentation has received some attention. Even when adaptation to fragmentation occurs, it may not be enough to fully compensate for the environmental effects from fragmentation, and in some cases may even exacerbate them (Cheptou et al. 2017).

Distinguishing facets of mountain biking

Together with the extent of the above-discussed creation and use of unauthorized trails and TTFs by mountain bikers, the mass-marketing of the sport, and the very large numbers of mountain bikers (Burgin and Hardiman 2012), at least four facets of mountain biking distinguish it from other recreational activities such that it may be of potentially greater concern with respect to its effects on wildlife than yet accounted for in the literature. These facets are distance traveled, speed of travel, biking in the dark, and political lobbying and advocacy.

Distance traveled.—Bikers traveling faster obviously travel farther than hikers per unit time and could therefore disturb more wildlife than hikers per unit time (Taylor and Knight 2003; Burgin and Hardiman 2012); the same applies to bikers and equestrians when bikers travel faster than equestrians. Larson et al. (2016) reasoned that, since motorized activities

often cover larger spatial extents than non-motorized activities, it is possible that the effects of motorized activities have been underestimated. The same logic applies to the distances traveled by bikers and hikers. For valid comparisons among recreation-related ecological effects, the comparisons must account for distances traveled and the associated levels of disturbance to wildlife along the entire route traveled.

Speed of travel.—While recreation-related effects on wildlife are generally assumed to be indirect (Dertien et al. 2018), the speed at which mountain bikers travel, combined with their relatively quiet mode of travel, can result in direct disturbance to wildlife. A relatively fast moving, quiet mountain bike may approach an animal undetected until well within the animal's normal flight response zone. The result may be a severe startle response by the animal with significant consequences to the animal and/or the mountain biker (Quinn and Chernoff 2010). The sudden encounter is the most common situation associated with grizzly bear (*Ursus arctos horribillis*) inflicted injury (Quinn and Chernoff 2010). Biking-caused wildlife fatalities likely resulting because of bikers' speed occur with amphibians and reptiles that may be attracted to trails for thermoregulation and are thus exposed to collision with bikes' wheels (Burgin and Hardiman 2012); photo-documentation provides evidence of three such fatalities in CDFW's Del Mar Mesa Ecological Reserve in San Diego where a San Diego horned lizard (*Phrynosoma coronatum blainvillii*, a species of concern under CDFW and the U.S. Fish and Wildlife Service), three western toads (*Anaxyrus boreas*), and two Baja California treefrogs (*Pseudacris hypochondriaca*) were killed by mountain bikes (J. Price, CDFW, personal communication, 2019). The treefrogs appear to have been mating when run over—the photo documentation shows eggs spilling out of the female. Biking is prohibited in this ecological reserve, and two of the run-overs occurred on unauthorized trails (J. Price, CDFW, personal communication, 2019).

Though there are methods (e.g., bells attached to bikes) for mountain bikers to give warning of their approach to other trail users, and these can be effective for this purpose, these methods themselves can introduce additional disturbance to wildlife. And, such warning sounds are ineffective for wildlife whose hearing range does not detect them or who do not hear them soon enough to avoid a collision. Moreover, when recreationists are visible on approach to wildlife, the more threatening (e.g., faster, more direct) the recreationists appear to wildlife (as potential predators), the greater the flight initiation distance from the recreationists (Stankowich 2008). Fleeing from a perceived predator represents potentially needless expenditure of valuable energy.

Biking in the dark.—Mountain biking in the dark (i.e., night riding), which is on the rise in protected areas, can disrupt the natural balance between diurnal and nocturnal wildlife. Consequently, night riding poses a dual threat to wildlife that exhibit diel shifts toward night: night riding can compound the pressure such wildlife experience from daytime recreational activities by increasing encounters with competitors and even further reducing the time available for foraging and breeding (Reilly et al. 2017). Night riding can also startle naturally nocturnal wildlife and wildlife that has become increasingly nocturnal to avoid daytime recreationists and other anthropogenic disturbances. Generally, temporal shifts by wildlife involve disruptions to both the shifting wildlife and to the wildlife naturally active during the time frame the shifting wildlife move into. In this way, such shifts set both groups of wildlife up for conflict and competition, disrupt predator/prey relationships, reduce feeding/hunting time and success, and disrupt breeding and other activities (Gaynor 2018). Temporal shifts can also result in spatial shifts and thus potentially cause further ecological

disruptions. Thus, temporal shifts are disruptive not only to individuals, but also to communities, and ultimately, populations (Gaynor 2018).

Political lobbying and advocacy.—In part due to the markedly different motivation driving mountain bikers compared to other recreationists in protected areas, especially in the more extreme forms of mountain biking (Burgin and Hardiman 2012), the mountain biking community has come to wield significant lobbying and advocacy pressure throughout the United States. Networking among members if the mountain biking community has resulted in changes in land managers' decisions (Bergin and Hardiman 2012). In California, a newly formed mountain biking nonprofit aims to gain a voice at the capital with lawmakers to put trail access and trail development front and center (Formosa 2019). And, the community has much experience in planning trail networks, experience that is necessary to negotiate areas appropriate for mountain biking. In San Diego County, the local mountain biking coalition and the United States Forest Service (USFS) work in partnership to build trail networks on national forest lands; because the USFS does not have a budget for recreation, the only way trails will be built on national forest lands within the County is if the coalition pays the USFS for the agency's staff time, studies and environmental review, and project-processing needed to approve the trail networks (SDMBA 2017). While the USFS-biking coalition partnership may be similar to the accepted practice of an applicant (e.g., utility) paying a lead/permitting agency to dedicate personnel to the applicant's project(s) or a certain body of work, conflicts of interest are usually inherent in such collaborations. In addition, much of the USFS-biking coalition partnership's planning process occurs outside of public view, prior to the public knowing anything about it. It is notable that, while not all USFS lands are considered protected areas in the meaning of this paper, the wilderness areas the USFS manages are.[15]

Recommendations and conclusions

Conservation of habitats is critical to the perpetuation of viable populations of sensitive species. California is home to several types of protected areas whose primary or sole purpose is conservation of sensitive species. After conserving these protected areas, the next crucial step in biological conservation is managing how, where, and when humans use the land. However, there is rarely adequate management to control the allowed types and levels of recreation such that they are compatible with conservation, much less prevent the illegal recreation. The following discussion provides recommendations related to the major issues of recreation ecology addressed above. The implementation of most of these recommendations is considered management as the term is used in this paper (footnote #4), and land managers are familiar with most, if not all, of them. Still, it is hoped that the recommendations provide some new insights and even useful guidance for practical application in the management of dual-role protected areas, the wildlife they support, and the recreationists they serve. For simplicity, clarity, and brevity, several of the recommendations are in imperative sentences. For some of the aspects about recreation ecology discussed

15 The USFS manages approximately 33% of the acreage within the National Wilderness Preservation System (https://wilderness.net/learn-about-wilderness/agencies.php) and describes wilderness areas as places where nature "still calls the shots… They are final holdout refuges for a long list of rare, threatened, and endangered species, forced to the edges by modern development… They are places where law mandates above all else that *wildness* be retained for our current generation, and those who will follow" (https://www.fs.usda.gov/managing-land/wilderness).

above, there are no discrete recommendations.

Continual management is imperative.—Continual management (footnote #4) of recreation is imperative for dual-role protected areas to meet their conservation objectives. The chronic insufficiency of management resources for protected areas is of obvious concern. It is urgent that action be taken to address the chronically underfunded management of protected areas by securing perpetual fiscal support that is sufficient for the management needs in perpetuity; the perpetual fiscal support to be secured includes all costs for personnel and all program costs. The level of management must be commensurate with expanding levels of authorized and unauthorized non-consumptive recreation. Given the upward trajectory of recreational activities in protected areas, garnering broad support for securing the perpetual fiscal support requires a societal course change to a collective perspective of respecting and tending to other species in need of protection. Management that is effective for the biological resources would also improve the often cited economic, educational, and health benefits of protected areas.

Prevent further use and proliferation of unauthorized trails.—Prevent the creation and use of unauthorized trails in the first place. This approach would be far preferable to having to contend with the damage to the ecological resources and cultural ecosystem services (discussed below) from the creation and use of unauthorized trails in protected areas. Here, prevention requires continual management. Consider the lessons learned from the work Greer et al. (2017) describe, as summarized above. Where feasible, gain the trail user community's support for and involvement in proactive efforts to prevent vandalism.

Restore habitat to reverse internal fragmentation.—It is reasonable to assume that the disturbance to wildlife from internal fragmentation associated with authorized trails and from legal recreation on them, occurs at least as much from fragmentation associated with unauthorized trails and recreation on them. The internal trail-related fragmentation and expansion of the effect zone most negatively affects those species for which the fitness costs of disturbance are high but have little or no excess habitat to move to; these species are thus constrained to stay in disturbed areas and to suffer the costs in terms of reduced survival or reproductive success (Gill 2001). For these species, restoring the habitat lost to inappropriate trails (i.e., unauthorized trails, unnecessarily redundant designated trails, and trails to be decommissioned) is critical from the standpoint of the negative recreation-related population-level effects. Using restoration to minimize the effects of recreation within fragmented protected areas in urban areas might enable the fragments to better support the focal species (Reed et al. 2019).

Therefore, though the effects on wildlife from unauthorized trails and recreation, per se, have received comparatively little formal study, the precautionary principle (Kriebel et al. 2001; footnote #14) dictates that there seems no need for further study to justify prioritizing restoration of habitat lost to inappropriate trails. So, for levels or habitat loss and the associated internal fragmentation that meet some yet-to-be-established criteria, the restoration should occur. If there is competition for resources (budget/funding, personnel) between (1) research on recreation-related disturbance to wildlife and (2) restoration of habitat lost to inappropriate trails to stop the disturbance, the latter should take priority to reverse internal fragmentation.

To assess the effects of the restoration on the wildlife communities within the protected area, conduct biological surveys within a year prior to the restoration and three to five years after the completion of the groundwork and planting. For this assessment, valid pre-disturbance wildlife survey data collected prior to the loss of habitat within the footprint

of the trails that will be restored and associated effect zone will help. But if there are no pre-disturbance data for the protected area or a nearby undisturbed control area, care must be taken in the interpretation of the results of the survey conducted a year prior to the restoration (i.e., the first survey). This is because the results of the first survey will likely represent wildlife communities altered from the pre-disturbed condition (Hennings 2017). It may be that the level of fragmentation, recreation, and many other factors, have caused conditions in which there are no or very few individuals of the focal species (Hennings 2017). These are reasons to be conservative in estimating the recreation-related effects on wildlife in disturbed protected areas without pre-disturbance data; if wildlife have already vacated the disturbed site before the first survey is done, the results will underestimate disturbance effects on wildlife (Hennings 2017). Here, the purpose of the survey data is to aid in determining how the restoration affects the occurrence and/or density of species (depending on the survey methodology), all other factors being equal. The assessment must account for whether the restoration involves the cessation of recreational activities on and/or in the vicinity of the trails to be restored, especially if no other recreational activities begin elsewhere within the species' effect zone throughout the restoration period. If there is funding available and a desire to monitor human activity and wildlife within the restoration areas, deploy camera traps within the areas; camera traps are the most cost-effective method currently available to monitor wildlife activity (Burger 2012).

Minimally, include the following tasks in the restoration: track the actual and in-kind costs (personnel, capital costs, volunteer hours, etc.) for the entire process; map the inappropriate trails and constructed trail features (some use of aerial imagery may work, but on-the-ground mapping validation is essential; Dertien et. al. 2018); prioritize the order of their restoration; determine the best approach for restoring each trail (e.g., passive, active, or a combination); do the restoration itself;[16] and, monitor for several years. Finally, publicize the costs of the restoration to inform the public (F. Landis, California Native Plant Society, personal communication, 2017); for this, compare the costs of the restoration with the costs of the management (footnote #4) that would have been necessary to prevent the damage requiring the restoration. Reasons for documenting the costs include being able to provide to local and state elected officials comparisons of the costs of reactive and proactive approaches to management, and to inform the public about the costs of repairing ecological vandalism.

If possible and logistically advantageous, it would be prudent and economically beneficial to collaborate with recreationists to volunteer with the restoration. For example, this would be an opportunity to mobilize well-organized volunteer contingents of the mountain biking community that are dedicated to building trails. In fact, in some areas, the mountain biking community provides well-organized volunteer assistance in the designing, building, and/or maintenance of officially designated trails in and outside of protected areas. Such volunteer dedication to the restoration of unauthorized trails is sorely needed.

In addition to the biological benefits, another motivation for this habitat restoration in protected areas is its potential to improve the human experience in protected areas open to public access. California's State Wildlife Action Plan (CDFW 2015) and much of the literature about recreation-related ecological effects point to the economic, educational, and recreational/health benefits (i.e., cultural ecosystem services) of protected areas and the species they support. Regarding the human health benefits, the visible recreation-related

16 Here, restoration encompasses decompacting the soil, building back and stabilizing the damaged or destroyed terrain and soil, and restoring the affected native plant communities.

damage to the terrain requires consideration beyond its ecological effects—it also affects the level of benefit people enjoy while being in nature, as illustrated by a study examining the relationship between recreational impacts in protected areas and human mental/emotional states (Taff et al. 2019). The study's results demonstrate that, as visible recreation-related ecological impacts increased, sense of wellbeing and mental state decreased, especially in response to settings with unauthorized trails. Collectively, the results show that managing tourism in protected areas in a manner that reduces such impacts is essential to optimizing beneficial cultural ecosystem services related to human health and wellbeing (Taff et al. 2019). Also diminishing the human experience is the risk of injury when using unauthorized trails and TTFs (Davies and Newsome 2009), a risk that restoration would remove. The benefits of the cultural ecosystem services from habitat restoration may increase the potential to obtain funding for such restoration.

Use science-based disturbance thresholds and the precautionary approach.—Establish and use science-based disturbance thresholds to guide management, recognizing and accounting for the notion that the imprecision of thresholds applies to all species, even those for which quantitative thresholds for known sources of disturbances under specific conditions have been identified; thresholds may not adequately protect the target focal species under all conditions in which they occur. The determination of disturbance thresholds must consider the influence of trail-related expansion of effect zones, especially with respect to reductions in the proportions of protected areas that are suitable for wildlife.

To compensate for the imprecision of thresholds when using them to guide management, (1) apply a precautionary approach that adopts maximum values of quantitative disturbance thresholds observed for the taxa of concern, while excluding the extreme values of the thresholds (Dertien et al.'s 2018),[17] (2) take into account that the default position should be a precautionary approach that assumes a priori that the functional value of species' abundance is high (Baker et al. 2018), (3) employ continual proactive and adaptive management to protect wildlife from recreational disturbance,[18] and (4) restrict access if the management fails. The need for the precautionary approach stems from the gaps in knowledge about quantitative disturbance thresholds of recreation.

In trail and trail network planning, use the best available science.—When planning new or modifying existing trails and trail networks in protected areas, the best available science ought to guide policy and decision-making about the siting, design, and alignment of the trails, and about the types, levels, and timing of recreation under consideration. To protect the sensitive species, the policy and decision-making should factor in the capacity to manage the existing and planned trails and recreation in perpetuity. No matter how high the pressure from recreationists for more recreational trails and opportunities, it must be recognized that the majority of recreation-related effects on wildlife are negative. The implications of this necessitate thorough consideration as to whether recreational accommodations that are being considered (in conjunction with all other anthropogenic effects) are compatible with

17 The precautionary approach and the precautionary principle (footnote #14) have subtle differences between them, but consideration of the differences is beyond the scope of this paper.

18 Based on section 13.5 of the California Fish and Game Code (FGC) and the Natural Community Conservation Planning Act (i.e., section 2805 of the FGC), adaptive management generally means (1) improving management of biological resources over time by using new information gathered through monitoring, evaluation, and other credible sources as they become available, and (2) adjusting management strategies and practices accordingly to assist in meeting conservation and management goals (e.g., conservation of covered or focal species). Under adaptive management, program actions are viewed as tools for learning and to inform future actions. Adaptive management is a cornerstone of large-scale multiple species conservation (CDFW 2014).

the protected areas' conservation objectives. The planning should incorporate protective disturbance thresholds, allowing for adaptive modifications as needed. In situations where recreation has been assumed to meet the conditions of compatibility (e.g., as negotiated in NCCPs/HCPs), great care is needed to ensure the veracity of this assumption. The outcome of the planning process should be ecologically soundly designed, sited, and aligned trails and trail networks, with science-based restrictions on types, levels, and timing of recreation. In conjunction with new trail/trail network construction, restore the habitat lost to inappropriate trails within the area of the construction.

For future protected areas, plan separate recreational areas.—Planning for future protected areas and associated trail networks and recreational areas holds the greatest potential for successful collaboration among landowners, agencies, recreationists, and other stakeholders that allows for truly protective conditions for sensitive species with respect to recreation. Perhaps it is not too late for California to redirect the trajectory of the recreational juggernaut toward an inspirational conservation success story, where stakeholders come together in the planning process, and apply the prevailing science regarding recreation-related disturbance to wildlife to ensure the perpetuation of viable populations of wildlife in the very protected areas set aside primarily or solely for that purpose. Representatives of the recreation community should sit at the table when planning future protected areas and associated trail networks and recreational areas (Burgin and Hardiman 2012); if the outcome is acceptable to them, it may prevent or minimize the creation of unauthorized trails. For example, without a strong strategic approach to mountain biking that includes community engagement, the outcome will be further degradation of protected areas and, at the least, loss of individuals of wildlife, if not major threats to wildlife populations; it's likely that there will also be on-going conflict between mountain bikers and other recreationists and residents (Burgin and Hardiman 2013).

The limited availability of resources for management suggests that it may be more effective to allocate recreational uses and conservation targets among different sites, which will require a diverse suite of land conservation strategies (Reed and Merenlender 2008). At least until such time that there is management of recreation in protected areas commensurate with recreational pressure, planning for future protected areas should heed what has been commonly known for at least 60 years: if conservation of land occurs without enforcing quotas on visitors, then separate areas need to be provided to accommodate recreational activities elsewhere so that the protected land will not bear the burden of those activities (Wilson 2019). This sentiment applies far more today, principally to protected areas preserved primarily or solely for the perpetuation of sensitive species. While this approach is infeasible for many established protected areas (most protected areas in urban areas), going forward, this ought to be the paradigm of habitat and species conservation in areas of high recreational pressure.

Figure 3 depicts an idealized vision of conservation planning using this approach. For protected areas established pursuant to NCCPs/HCPs negotiated in urban settings within an already fragmented landscape, there is often limited latitude for separate areas for recreation; furthermore, sensitive species are typically distributed more evenly across the urbanized landscape than depicted in Figure 3. Nevertheless, it represents the fundamental approach of separating conservation areas from recreational areas. Even in constrained areas, if planning for recreational access occurs at the regional level, planners and land managers could ensure that protected area networks include some areas that are closed to recreation, thus

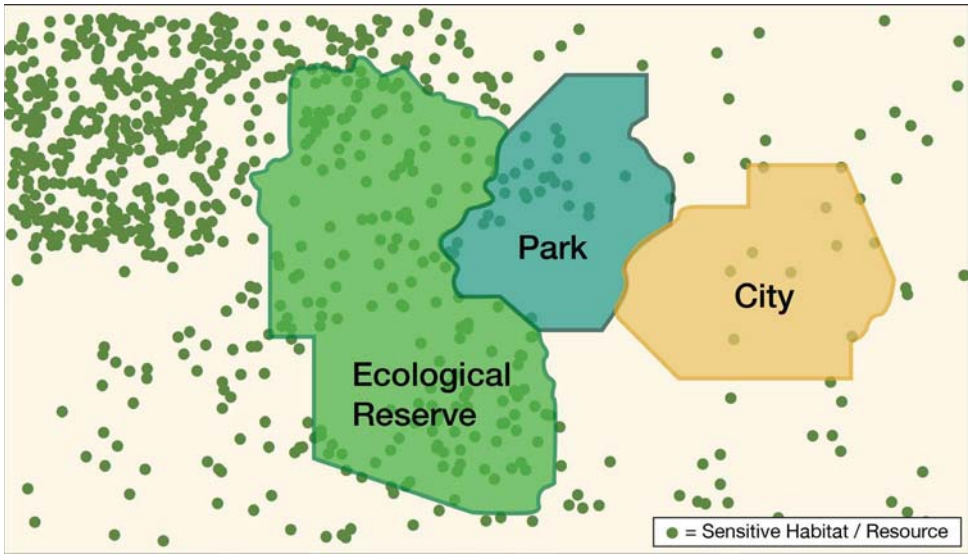

Figure 3. Effective planning for protected areas preserved primarily or solely for the perpetuation of viable populations of sensitive species: provide separate areas for conservation (e.g., ecological reserves) and recreational activities (i.e., parks). (Credit: Landscape Conservation Planning Program, CDFW 2020)

balancing the dual land uses of conservation and recreation at the scale of the protected area network instead of each individual protected area (Reed et al. 2019). Formally incorporating wildlife considerations into the trail planning process from the start is essential to reducing recreation-related disturbance to wildlife; if trail planning is well underway by the time wildlife is considered, it may be too late to gather sufficient wildlife information to inform the planning process (Hennings 2017).

A consideration often not made in conservation planning is the need to address the temporal aspect of human-wildlife interactions. For example, similar to seasonal restrictions, diurnal or nocturnal "temporal zoning" may be necessary to restrict certain human activities during times of the day when sensitive species are most active or when the likelihood of negative human-wildlife encounters is greatest (Gaynor 2018; Whittington 2019). The effectiveness of temporal closures likely depends on the amount and quality of habitat, and levels of human use and fragmentation, within the planned protected areas and in the surrounding landscape. Temporal closures may not benefit wildlife with diurnal activity patterns that differ from the timing of the temporal closures; so, full closures may be required to increase wildlife use in many situations (Whittington 2019). For situations when protected areas and recreational areas are separate but share a boundary, temporal zoning would also apply to the effect zone within the recreational area.

Conclusion.—The most sensible approach for species conservation may be to concentrate research and protection efforts on species whose populations are declining and for which human disturbance is implicated as a possible cause (Gill et al. 2001). The designation of ecological reserves and the conservation of habitat pursuant to NCCPs/HCPs are examples of processes that embody this approach. But, when recreation in such protected areas is not properly planned and adequately managed, their ecological viability and ability to meet their conservation objectives are jeopardized. Implementation of the recommendations provided

herein is necessary to ensure the focal species thrive.

Ultimately, for wildlife that avoids human activity, it is unlikely that dual-role protected areas are entirely sufficient or justifiable for meeting conservation objectives; limiting or prohibiting recreation in strategic circumstances and locations within protected areas is necessary to achieve conservation objectives (Bötsch et al. 2018; Dertien et al. 2018; Reed et al. 2019). Enforced closures of inappropriate trails in all protected areas and restoration of those trails would substantially decrease the trail-related disturbance to wildlife across the landscape; waiting until after wildlife detections or estimates of habitat use decrease is too late to implement these measures (Dertien et al. 2018). These approaches require perpetual management commensurate with expanding levels of authorized and unauthorized non-consumptive recreation in protected areas. Action is urgently needed to secure perpetual fiscal support for management sufficient to ensure the perpetuation of viable populations of sensitive species in protected areas.

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INFORMATION FOR AUTHORS

The California Fish and Wildlife Journal (CFWJ) is a peer-reviewed, scientific journal focused on the biology, ecology, and conservation of the flora and fauna of California and surrounding areas, and the northeastern Pacific Ocean.

Submissions guidelines (PDF) for the Journal have been updated (July 2019).

The California Fish and Wildlife Journal accepts manuscripts in the following categories:

- Original research papers
- Research notes
- Review papers
- Book reviews
- Commentaries and Essays

Manuscripts must be submitted by e-mail following directions provided in the link: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=171113&inline. The journal standard for style is consistent with the Council of Science Editors (CSE) Style Manual. Instructions in the CFWJ guidelines supersede the CSE Style Manual where differences exist between formats. Please follow these formatting guidelines carefully. Manuscripts that do not conform to the guidelines will be returned for revision.

Authors of manuscripts that are accepted for publication will be invoiced for charges at the rate of $50 per printed page shortly after page proofs are distributed.* Authors should state acceptance of printing charges in their cover letters. The corresponding author will receive a PDF file of the publication without additional fees and may distribute copies without restriction.

*Page charges may be waived for authors under in certain instances (e.g., for authors from developing countries or students without funding). If applicable, please request a waiver in your cover letter.

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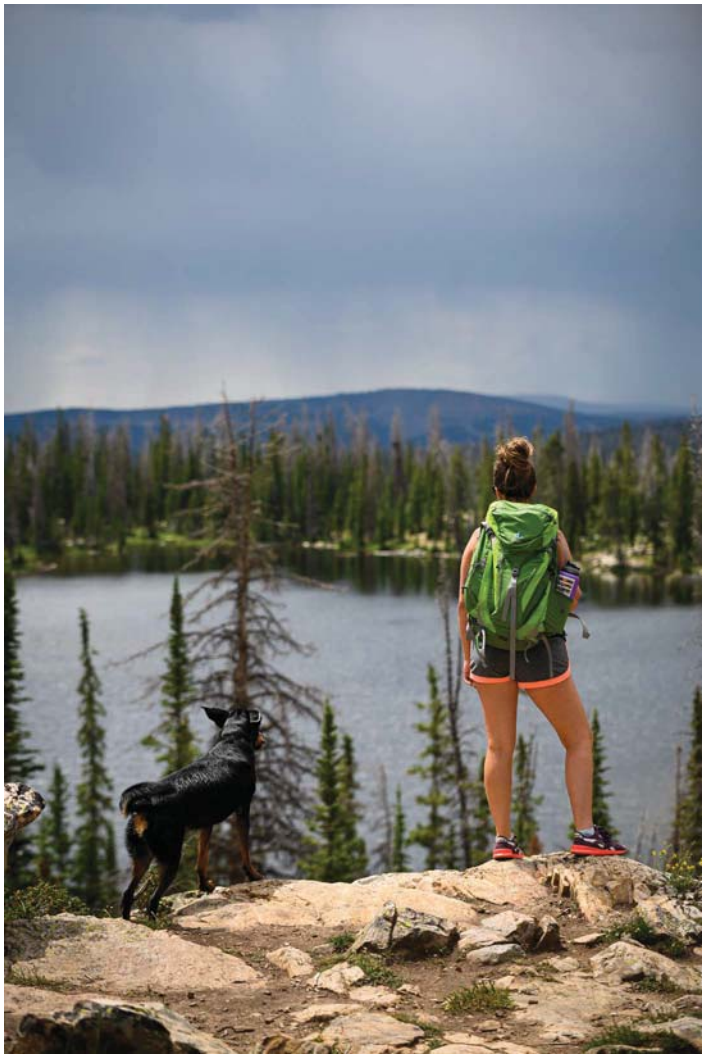

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ensuring scientific quality and visibility
SCIENCE Institute
California Department of Fish and Wildlife

www.wildlife.ca.gov/science

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Twenty-three Years of Experience, Observation, and Effort

Kira Od, 2019

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3. Grey Fox
4. River Otter
5. American Mink
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7. Long-Tailed Weasel
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9. Muskrat
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11. Salt Marsh Harvest Mouse
12. California Ground Squirrel
13. Virginia Opossum
14. Botta's Pocket Gopher
15. California Vole
16. Mexican Free-Tailed Bat
17. Black Tailed Jackrabbit
18. Raccoon
19. Bobcat
20. Mountain Lion (PRINTS ONLY)

REPTILES:

1. Western Pond Turtle
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3. Map Turtle
4. Gopher Snake
5. Western Racer
6. Western Fence Lizard

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1. Pacific Chorus Frog

FISH:

1. White Sturgeon
2. Leopard Shark
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5. Common Carp

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14. Barn Owl
15. Cooper's Hawk
16. Golden Eagle
17. Bald Eagle
18. Red Tailed Hawk
19. Northern Harrier
20. Black Shouldered Kite
21. Kestrel
22. Peregrine Falcon
23. Raven
24. Crow
25. White Pelican
26. Brown Pelican
27. Gulls*
28. Terns*
29. Phalaropes
30. Avocet
31. Black Necked Stilts
32. Willet
33. Marbled Godwit
34. Long Billed Curlew
35. Virginia Rail
36. Greater Yellowlegs
37. Snipe
38. Common Yellowthroat
39. Blackbirds*
40. California Towhee
41. Lesser Goldfinch
42. Mourning Dove
43. Pigeon
44. White Crowned Sparrow
45. Marsh Wren
46. Cliff Swallow
47. Violet Green Swallow
48. Dark-Eyed Junco
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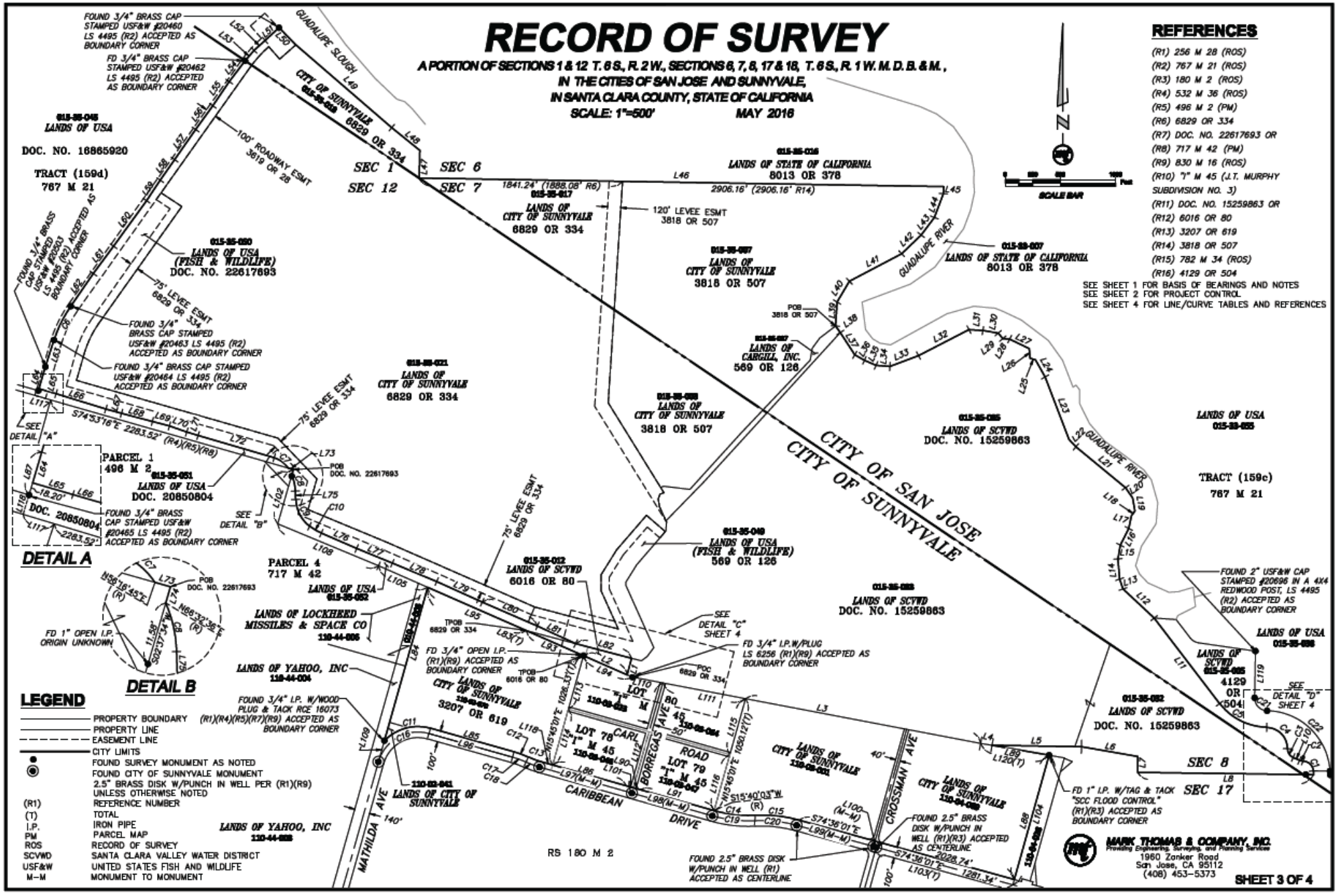
55. Ducks, Ducks, Ducks…*

*Denotes multiple species within a group.

RECORD OF SURVEY

A PORTION OF SECTIONS 1 & 12 T. 6 S., R. 2 W., SECTIONS 6, 7, 8, 17 & 18, T. 6 S., R. 1 W. M. D. B. & M.,
IN THE CITIES OF SAN JOSE AND SUNNYVALE,
IN SANTA CLARA COUNTY, STATE OF CALIFORNIA
SCALE: 1"=500' **MAY 2016**



REFERENCES

(R1) 256 M 28 (ROS)
(R2) 767 M 21 (ROS)
(R3) 180 M 2 (ROS)
(R4) 532 M 36 (ROS)
(R5) 496 M 2 (PM)
(R6) 6829 OR 334
(R7) DOC. NO. 22617693 OR
(R8) 717 M 42 (PM)
(R9) 830 M 16 (ROS)
(R10) "I" M 45 (J.T. MURPHY SUBDIVISION NO. 3)
(R11) DOC. NO. 15259863 OR
(R12) 6016 OR 80
(R13) 3207 OR 619
(R14) 3818 OR 507
(R15) 782 M 34 (ROS)
(R16) 4129 OR 504

SEE SHEET 1 FOR BASIS OF BEARINGS AND NOTES
SEE SHEET 2 FOR PROJECT CONTROL
SEE SHEET 4 FOR LINE/CURVE TABLES AND REFERENCES

LEGEND

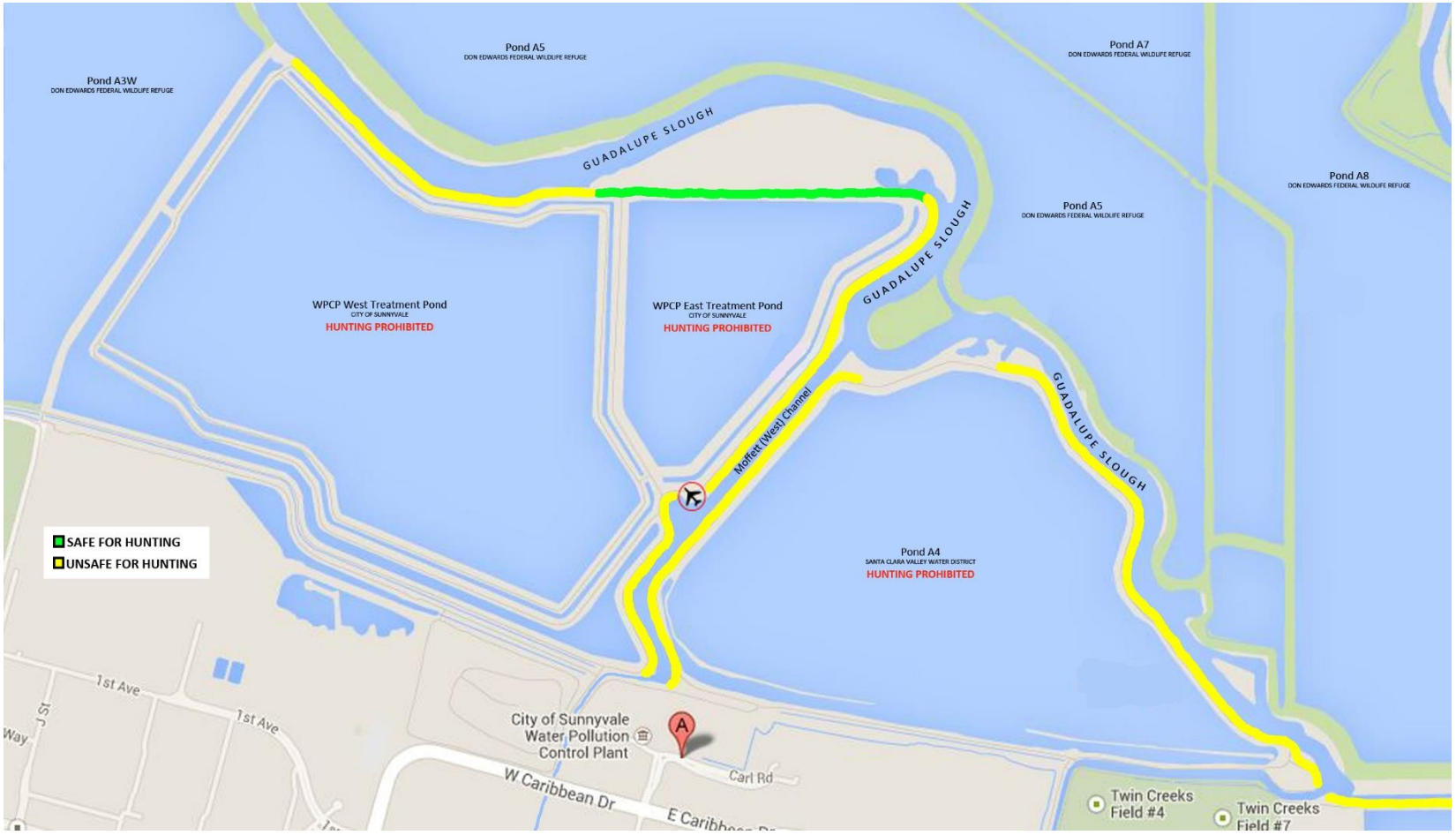
PROPERTY BOUNDARY	
PROPERTY LINE	
EASEMENT LINE	
CITY LIMITS	
●	FOUND SURVEY MONUMENT AS NOTED
◉	FOUND CITY OF SUNNYVALE MONUMENT
	2.5" BRASS DISK W/PUNCH IN WELL PER (R1)(R9) UNLESS OTHERWISE NOTED
(R1)	REFERENCE NUMBER
(T)	TOTAL
I.P.	IRON PIPE
PM	PARCEL MAP
ROS	RECORD OF SURVEY
SCVWD	SANTA CLARA VALLEY WATER DISTRICT
USF&W	UNITED STATES FISH AND WILDLIFE
M-M	MONUMENT TO MONUMENT

MARK THOMAS & COMPANY, INC.
Providing Engineering, Surveying, and Planning Services
1960 Zanker Road
San Jose, CA 95112
(408) 453-5373

AERIAL VIEW OF WPCP LEVEE ACCESS

WILDLIFE SHELTER AREA

MAP OF PONDS AND LEVEES ADJACENT TO SUNNYVALE WPCP

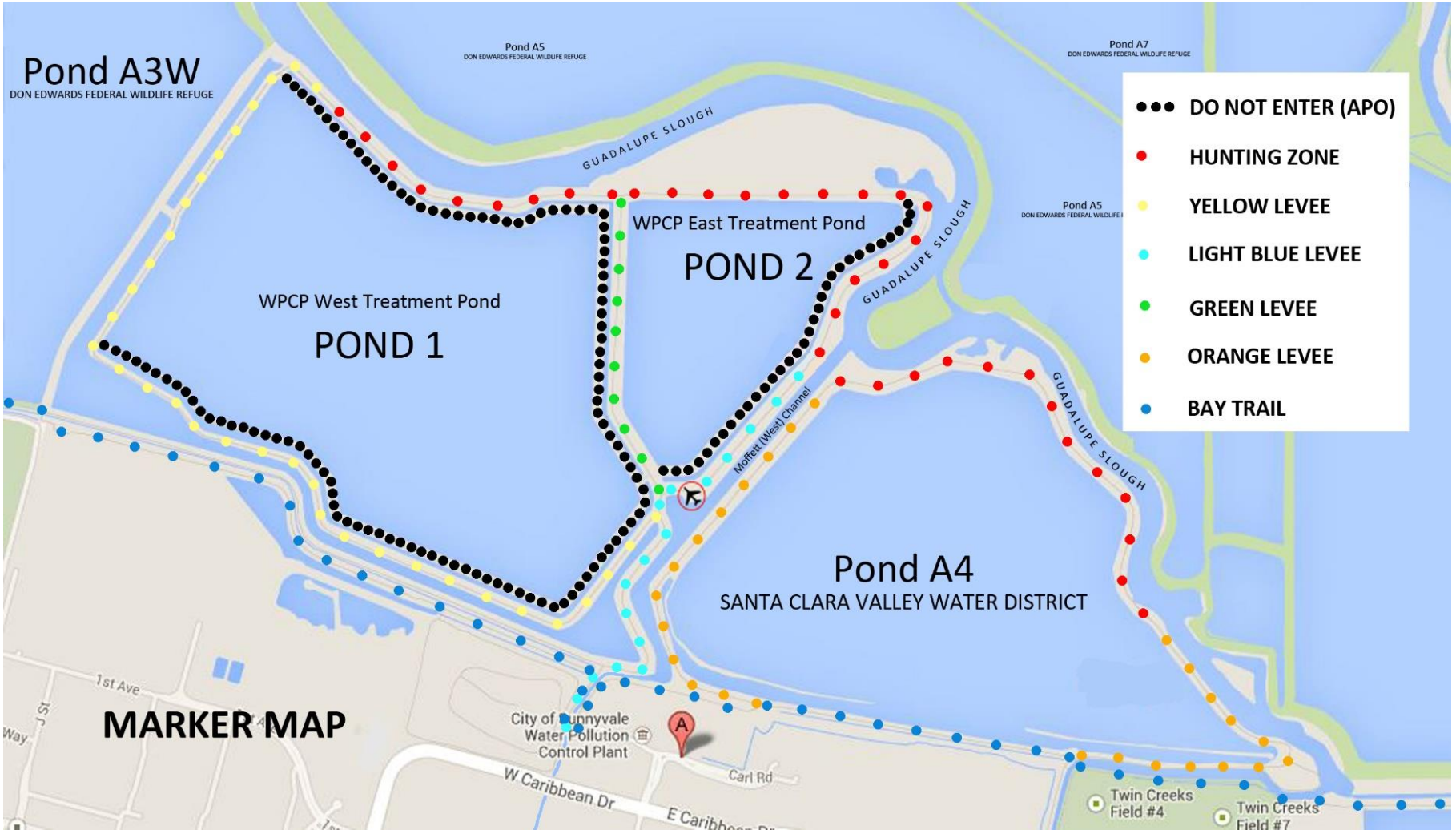


The **GREEN-marked** section of levee on the map is where almost all waterfowl hunting was practiced in Sunnyvale until perhaps 15 years ago. It is at least 450 feet from any opposing levees or traffic and can safely be hunted, as long as no shots are taken less than 90° to shore (the direction of the WPCP treatment ponds).

YELLOW-marked

The **YELLOW-marked** levees on the map are unsafe for hunting because they are less than 450 feet from opposing levees and/or from an occupied structure, such as the Radar Tower, which is frequently visited by FAA personnel, or the WPCP itself.

PROPOSED MARKER MAP



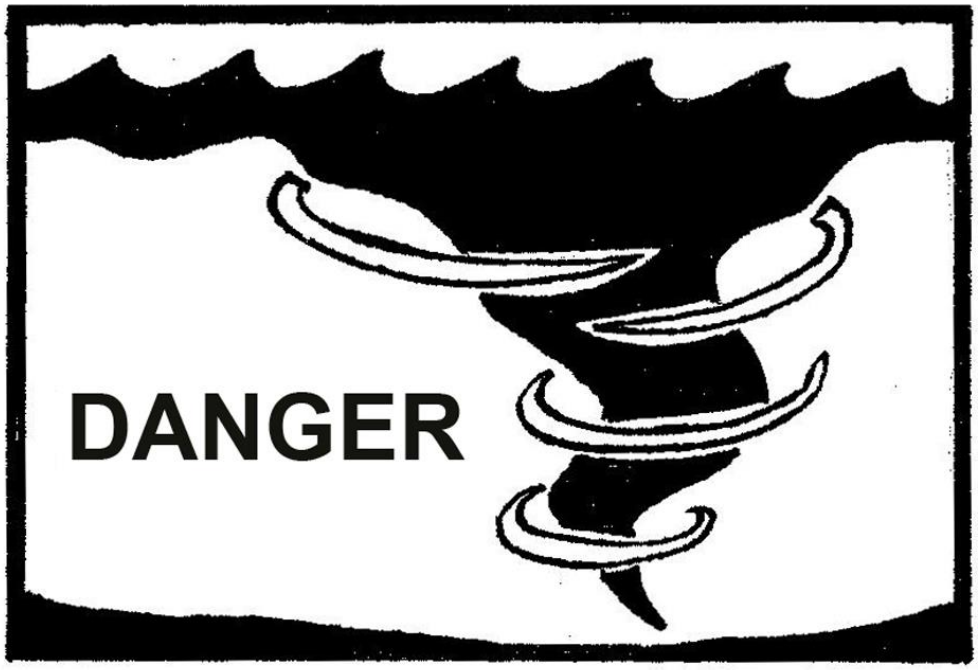
PROPOSED SEASONAL LEVEE CLOSURES

MISLEADING SIGNS ON MOFFETT "WEST" CHANNEL:

- Hunters shoot here from both banks AND from boats
- Banks are only ~250 feet apart
- Hunters were shooting here 12-31-13 in dense fog with only 75' visibility
- Hunters frequently fire when <450 feet from Radar Tower and/or pedestrians
- Hunters *do* fire from levee roads during high tides
- Hunters are *not* required to keep voice-controlled dogs on-leash
- Fish and Wildlife Regulations are nowhere to be seen
- The nearest map marking the Guadalupe Slough is by the parking lot
- NO HUNTING should be allowed in this channel, PERIOD

EXAMPLE OF POOR SIGNAGE

EXAMPLES OF CLEAR SIGNAGE



Muskrat

I AM A MAGIC SIGN. PLEASE TAKE MY PICTURE AND LEAVE ME HERE FOR OTHERS TO EXPLORE

EXPLORE

Ruddy Duck

I AM A MAGIC SIGN. PLEASE TAKE MY PICTURE AND LEAVE ME HERE FOR OTHERS TO EXPLORE

EXPLORE

White Tailed Kite

I AM A MAGIC SIGN. PLEASE TAKE MY PICTURE AND LEAVE ME HERE FOR OTHERS TO EXPLORE

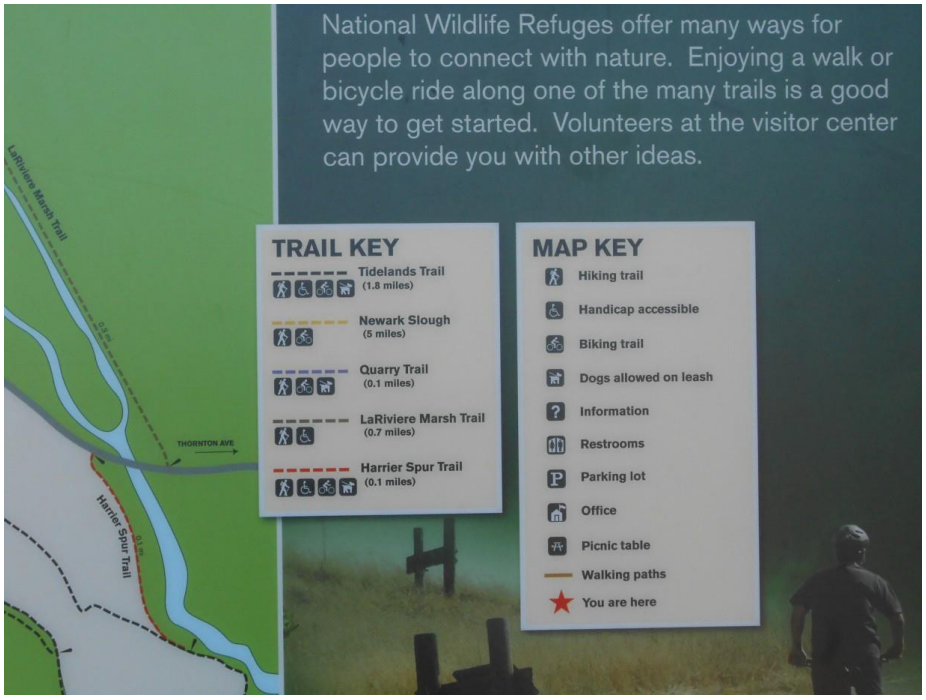
EXPLORE

Harbor Seal

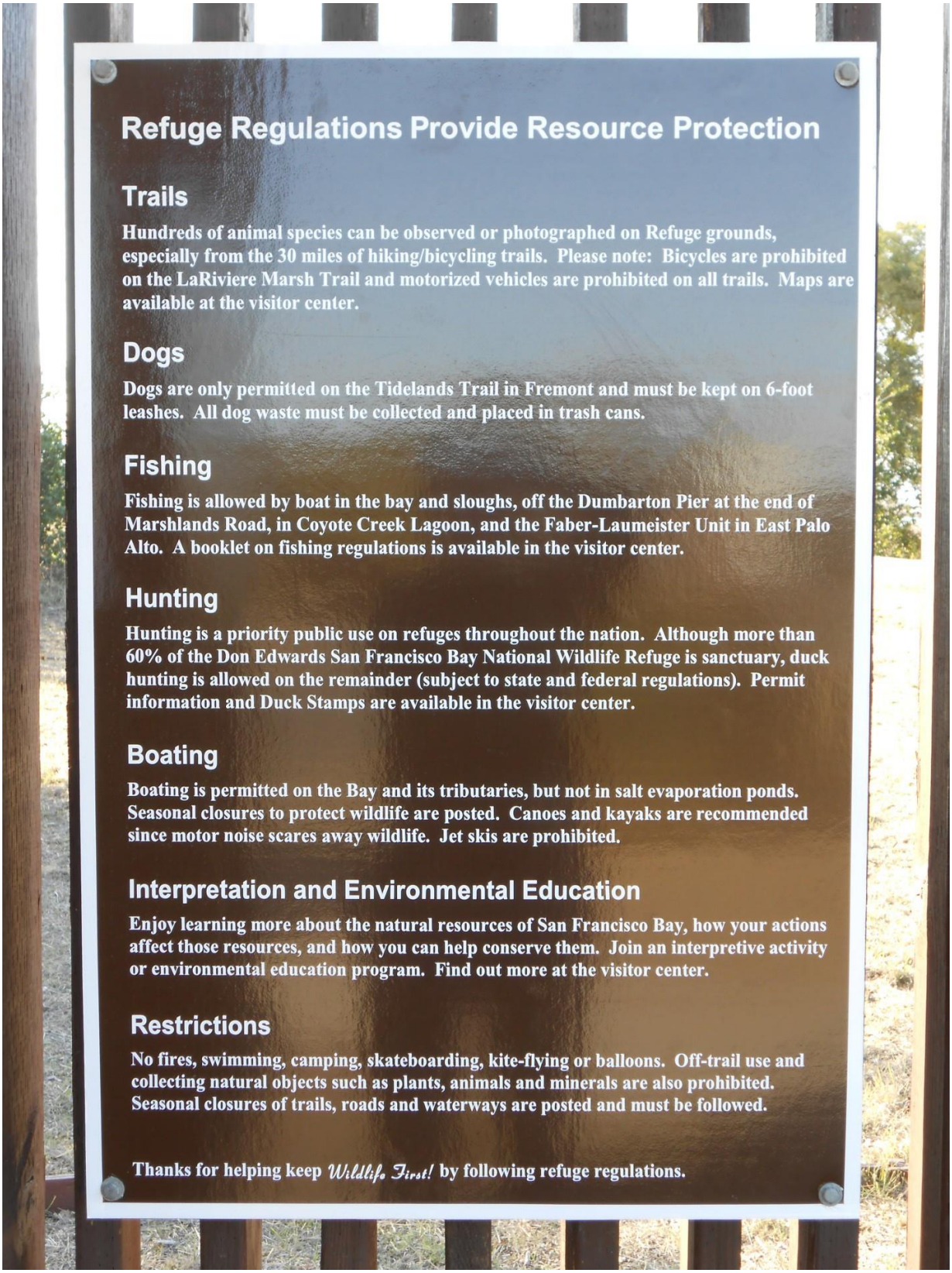
I AM A MAGIC SIGN. PLEASE TAKE MY PICTURE AND LEAVE ME HERE FOR OTHERS TO EXPLORE

EXPLORE

DON EDWARDS FEDERAL WILDLIFE REFUGE SIGNAGE




NATURE
Within Reach
U.S.
FISH & WILDLIFE
SERVICE
DEPARTMENT OF THE INTERIOR
Welcome to
Don Edwards San Francisco Bay
National Wildlife Refuge
The purposes of this refuge are to
Preserve and enhance wildlife habitat,
Protect migratory birds,
Protect threatened and endangered species, and
Provide opportunities for wildlife dependent recreation and study.
Like all national wildlife refuges, our motto is Wildlife First!
Refuge Regulations Provide Resource Protection
Trails
Hundreds of animal species can be observed or photographed on Refuge grounds, especially from the 30 miles of hiking/bicycling trails. Please note: Bicycles are prohibited on the Lakeview Marsh Trail and motorized vehicles are prohibited on all trails. Maps are available at the visitor center.
Dogs
Dogs are only permitted on the Tidelands Trail in Fremont and must be kept on 6-foot leashes. All dog waste must be collected and placed in trash cans.
Fishing
Fishing is allowed by boat in the bay and sloughs, off the Dumbarton Pier at the end of Marshlands Road, in Coyote Creek Lagoon, and the Faber-Laumeister Unit in East Palo Alto. A booklet on fishing regulations is available in the visitor center.
Hunting
Hunting is a priority public use on refuges throughout the nation. Although more than 60% of the Don Edwards San Francisco Bay National Wildlife Refuge is sanctuary, duck hunting is allowed on the remainder (subject to state and federal regulations). Permit information and Duck Stamps are available in the visitor center.
Boating
Boating is permitted on the Bay and its tributaries, but not in salt evaporation ponds. Seasonal closures to protect wildlife are posted. Canoes and kayaks are recommended since motor noise scares away wildlife. Jet skis are prohibited.
Interpretation and Environmental Education
Enjoy learning more about the natural resources of San Francisco Bay, how your actions affect these resources, and how you can help conserve them. Join an interpretive activity or environmental education program. Find out more at the visitor center.
Restrictions
No fires, swimming, camping, skateboarding, kite-flying or balloons. Off-trail use and collecting natural objects such as plants, animals and minerals are also prohibited. Seasonal closures of trails, roads and waterways are posted and must be followed.
Thanks for helping keep Wildlife First! by following refuge regulations.
Visitor Center
Open Tuesday - Sunday, 10 a.m. to 5 p.m.
Closed Federal Holidays.
Available at the Visitor Center: Maps, Duck Stamps, America the Beautiful Access Passes, Refuge Hunting Information, Books, Exhibits, Restrooms & Information.
Refuge Hours
The refuge is open from Sunrise to Sunset
Visitors must leave the refuge by Sunset.
The refuge is closed: January 1, Thanksgiving and December 25.
Emergency Phone Numbers
Call 911 for any life-threatening emergency.
Report all injuries and accidents to Refuge Headquarters: (510) 792-0222 or, when refuge headquarters is closed, to U.S. Park Police: (415) 561-5510
Public phones are located adjacent to the parking lot for the administrative offices and at the Dumbarton Pier.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Thanks for helping keep Wildlife First! by following refuge regulations.

RESOURCE CONTACTS

These people should all know me by name, or at least by description. (Try, *"the woman who rides a kid-sized BMX bike around the levees 5 - 6 days a week with her dog leashed to her waist."*) I have had e-mail and/or phone contact with all but Captain Donald Kelly, Jr.; many repeatedly.

Eric Mruz (replaced by Jared Underwood)
(Former Don Edwards San Francisco Bay National Wildlife Refuge Manager; now manages Oregon South Coast NWR Complex)
1 Marshlands Road
Fremont, CA 94555
Phone: (510)792-0222, x125
E-mail: Eric_Mruz@fws.gov
Hosted annual pre-hunt meeting for DESFWR at headquarters. Developed drive-out access to pond a3w blinds (via combo gate) to reduce conflicts between hunters and other recreational users at the WPCP

Melisa Amato
Wildlife Refuge Specialist
Don Edwards San Francisco Bay National Wildlife Refuge; now San Pablo Bay National Wildlife Refuge
1 Marshlands Road
Fremont, CA 94555
Phone: (707) 769-4200 (Ext 102)
E-mail: Melisa_Amato@fws.gov
Knows everything about hunting in the DESFWR, and still is the primary contact for hunting notifications there

Officer Ryan Rodriguez
Game Warden (as one of only 3 Wardens for ***all*** of Santa Clara County, he ***cannot*** respond to every reported hunting violation in a timely manner)
California Department of Fish and Wildlife
PO Box 391623
Mountain View, CA 94039
Phone: (408) 210-3882
E-mail: ryan.rodriguez@wildlife.ca.gov
Claims to have tried to get Sunnyvale to post regulations and close the Moffett ("West") Channel to hunting for 4 years, but will not put anything in writing. His supervisor is *Captain Donald J. Kelly, Jr.*

Captain Donald J. Kelly, Jr.
California Department of Fish and Wildlife
20 Lower Ragsdale Drive
Suite 100
Monterey, CA 93940
E-mail: dkelly@wildlife.ca.gov
Warden Ryan Rodriguez' supervisor at CDFW

Lt. James Boone
Sunnyvale Department of Public Safety
Phone: 408-730-7109
E-mail: JBoone@ci.sunnyvale.ca.us
Per e-mail to me and Eric Mruz: "*I am in agreement with here that NO hunting should be taking place along that section of slough (Moffett Channel) which leads out to the Guadalupe Slough and was surprised to hear that it was occurring. Please give me a call and let me know how we can work together to get this section closed."* (November 15, 2012)

Michelle Morgan, SR/CSO and **Melissa Murillo**
Animal Control Officers
Sunnyvale DPS
Phone: (408) 730-7172
E-mail: MMorgan@ci.sunnyvale.ca.us
E-mail: MMurillo@ci.sunnyvale.ca.us
Occasionally patrol levees near WPCP. Suggested color-coded zone signage for hunting, bikes, dogs, off-limit fragile areas, as well as wildlife info that "gives people ownership and pride for this wonderful place that is worth protecting." Officer Murillo and I worked together to stop a man who repeatedly let his off-leash dog chase wildlife on a daily basis, and who finally attacked someone else's dog in my presence.

Jackie Davison
Environmental
Outreach Coordinator
City of Sunnyvale
Phone: 408-730-7738
E-mail: jdavison@sunnyvale.ca.gov
For years Jackie was my main contact to report non-emergency safety issues, litter, or vandalism near the WPCP. She has since moved on to the Environmental Services Department.

Dan Hammons
Maintenance & Facilities Manager (Not sure if still in this position as of 2019)
Sunnyvale WPCP
Phone: (408)-730-7287
E-mail: dhammons@ci.sunnyvale.ca.us
Dan was my last contact for non-emergency safety issues, litter, or vandalism near the WPCP.

Cynthia Eaton
Senior Office Specialist (Not sure if still in this position as of 2019)
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3686
Phone (408) 265-2600
Determined that SVWD Pond A4, along with the levees that surround it, lies entirely within Sunnyvale city limits

Tom Flanagan and Ed Gelinas
Private citizens who have found themselves DIRECTLY in the line of fire in the last 2 years
(Ed passed away from lung cancer in 2013, and I have lost contact with Tom.)

Loren Summers, and Paul Allum
Hunters who have reported inexcusable hunting violations to me (and in one case to authorities) in recent weeks
(Both Loren and Paul moved out of state in or before 2018.)

Mike Meyers
Hunter who no longer hunts in Sunnyvale after a citizen reported him to 911 as a "sniper in the Guadalupe Slough" and he was surrounded by Sunnyvale SWAT. Regularly attends the annual Pre-Hunt Meeting at DESFWR.

FOR MORE INFORMATION PLEASE CONTACT ME:

Kira Od
Sculptor
475 Central Avenue
Sunnyvale, CA 94086
Phone: (408) 245-1294
E-mail: kiraod@kiraod.com
My offer to take Councilmembers out singly or in pairs for a bike tour of the area *still stands*. Please contact me to schedule a tour, or to ask any questions you may have.

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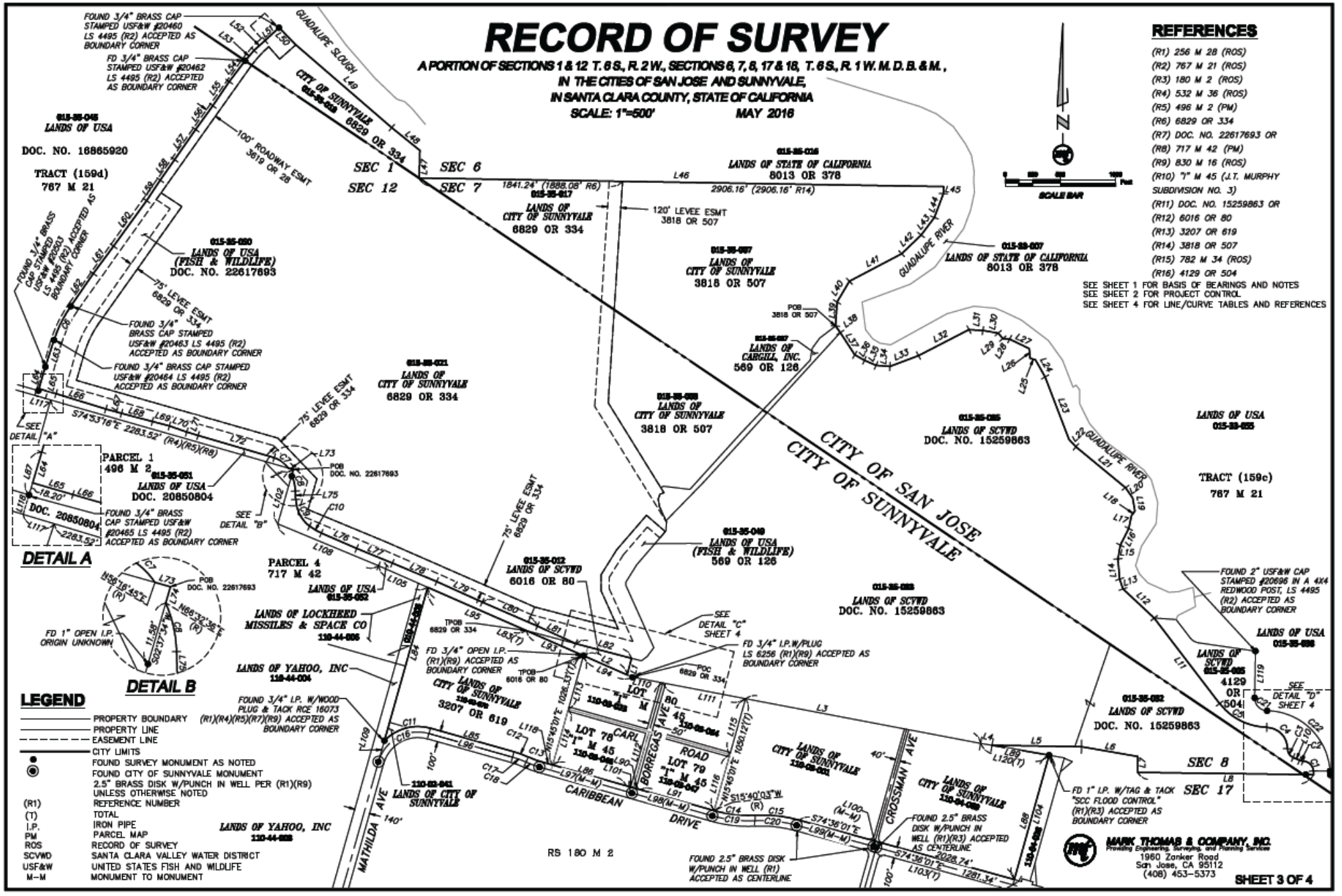

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(R7) DOC. NO. 22617693 OR
(R8) 717 M 42 (PM)
(R9) 830 M 16 (ROS)
(R10) "I" M 45 (J.T. MURPHY SUBDIVISION NO. 3)
(R11) DOC. NO. 15259863 OR
(R12) 6016 OR 80
(R13) 3207 OR 619
(R14) 3818 OR 507
(R15) 782 M 34 (ROS)
(R16) 4129 OR 504

SEE SHEET 1 FOR BASIS OF BEARINGS AND NOTES
SEE SHEET 2 FOR PROJECT CONTROL
SEE SHEET 4 FOR LINE/CURVE TABLES AND REFERENCES

LEGEND

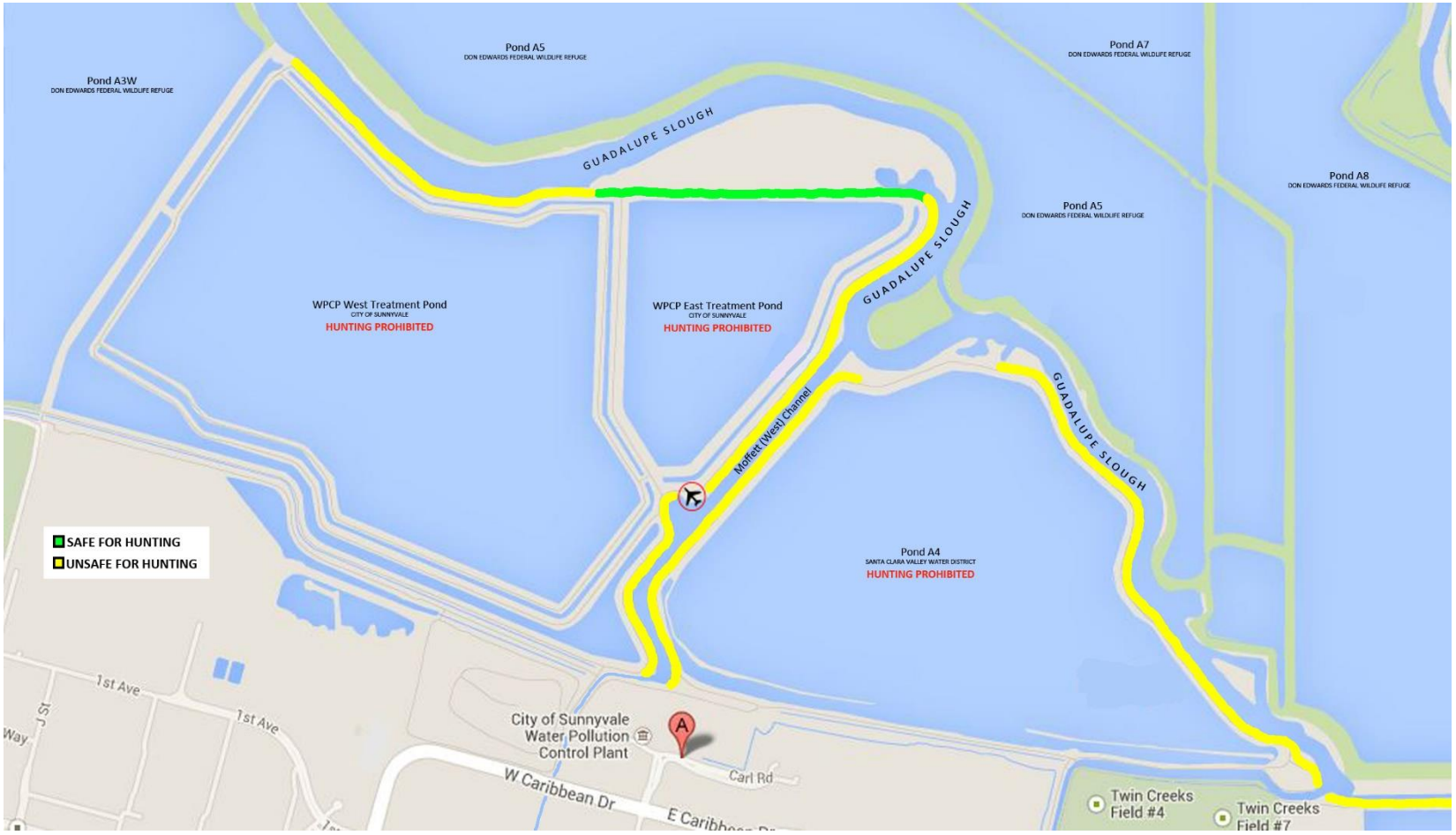
PROPERTY BOUNDARY	
PROPERTY LINE	
EASEMENT LINE	
CITY LIMITS	
●	FOUND SURVEY MONUMENT AS NOTED
◉	FOUND CITY OF SUNNYVALE MONUMENT
	2.5" BRASS DISK W/PUNCH IN WELL PER (R1)(R9) UNLESS OTHERWISE NOTED
(R1)	REFERENCE NUMBER
(T)	TOTAL
I.P.	IRON PIPE
PM	PARCEL MAP
ROS	RECORD OF SURVEY
SCVWD	SANTA CLARA VALLEY WATER DISTRICT
USF&W	UNITED STATES FISH AND WILDLIFE
M-M	MONUMENT TO MONUMENT

MARK THOMAS & COMPANY, INC.
Providing Engineering, Surveying, and Planning Services
1960 Zanker Road
San Jose, CA 95112
(408) 453-5373

AERIAL VIEW OF WPCP LEVEE ACCESS

WILDLIFE SHELTER AREA

MAP OF PONDS AND LEVEES ADJACENT TO SUNNYVALE WPCP

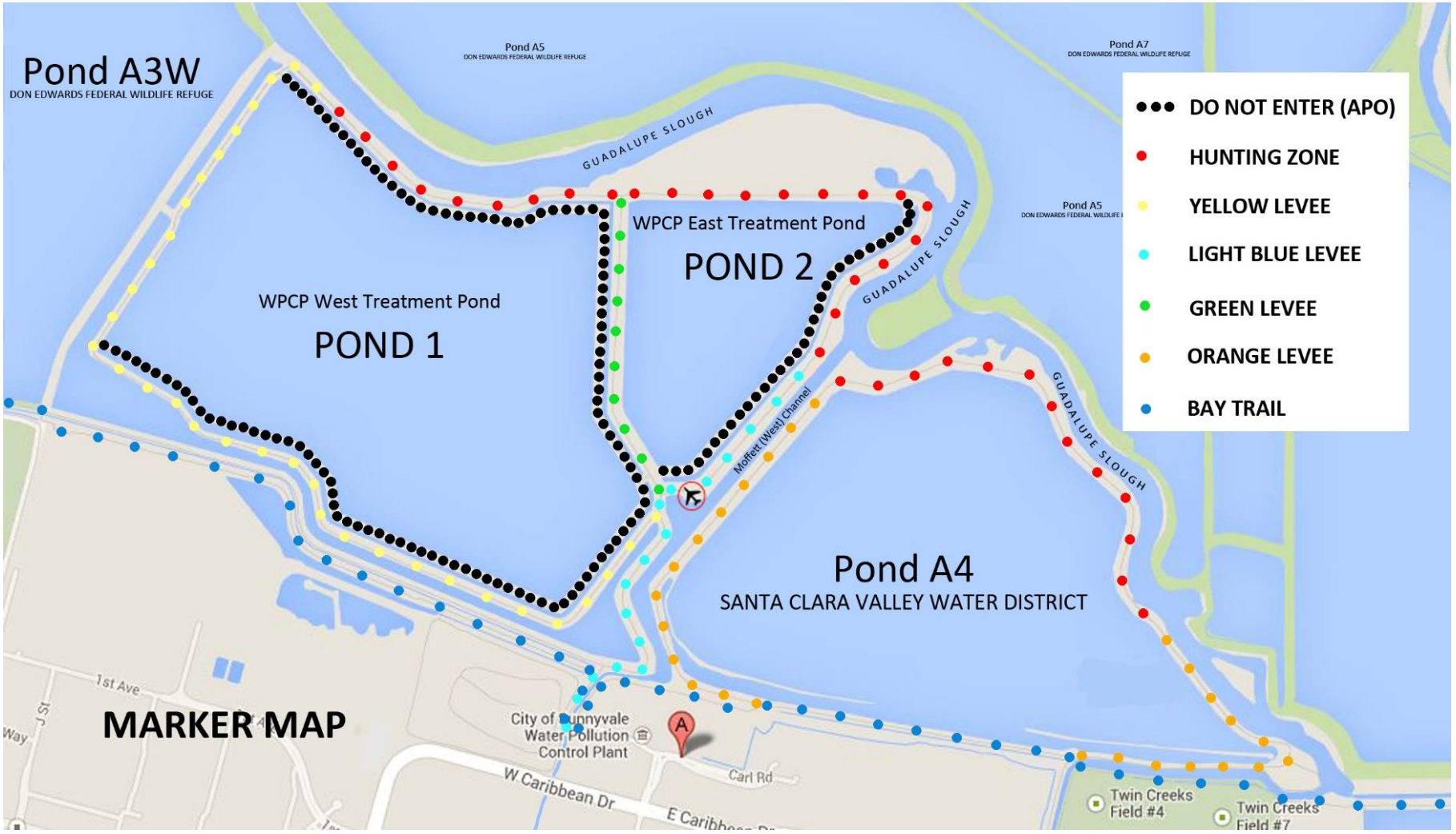


The **GREEN-marked** section of levee on the map is where almost all waterfowl hunting was practiced in Sunnyvale until perhaps 15 years ago. It is at least 450 feet from any opposing levees or traffic and can safely be hunted, as long as no shots are taken less than 90° to shore (the direction of the WPCP treatment ponds).

YELLOW-marked

The **YELLOW-marked** levees on the map are unsafe for hunting because they are less than 450 feet from opposing levees and/or from an occupied structure, such as the Radar Tower, which is frequently visited by FAA personnel, or the WPCP itself.

PROPOSED MARKER MAP



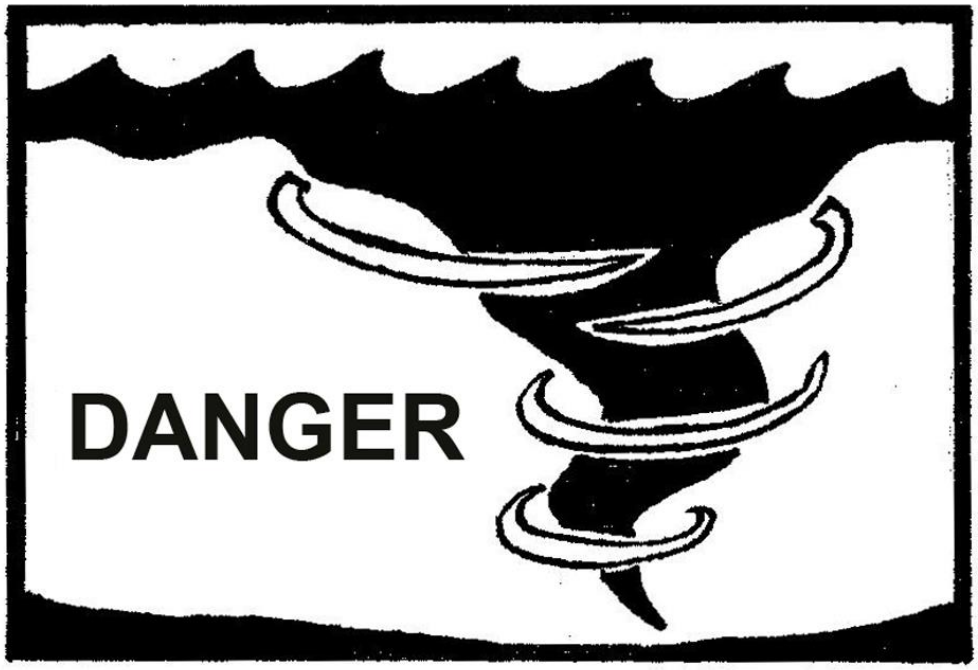
PROPOSED SEASONAL LEVEE CLOSURES

MISLEADING SIGNS ON MOFFETT "WEST" CHANNEL:

- Hunters shoot here from both banks AND from boats
- Banks are only ~250 feet apart
- Hunters were shooting here 12-31-13 in dense fog with only 75' visibility
- Hunters frequently fire when <450 feet from Radar Tower and/or pedestrians
- Hunters *do* fire from levee roads during high tides
- Hunters are *not* required to keep voice-controlled dogs on-leash
- Fish and Wildlife Regulations are nowhere to be seen
- The nearest map marking the Guadalupe Slough is by the parking lot
- NO HUNTING should be allowed in this channel, PERIOD

EXAMPLE OF POOR SIGNAGE

EXAMPLES OF CLEAR SIGNAGE



Muskrat

I AM A MAGIC SIGN. PLEASE TAKE MY PICTURE AND LEAVE ME HERE FOR OTHERS TO EXPLORE

EXPLORE

Ruddy Duck

I AM A MAGIC SIGN. PLEASE TAKE MY PICTURE AND LEAVE ME HERE FOR OTHERS TO EXPLORE

EXPLORE

White Tailed Kite

I AM A MAGIC SIGN. PLEASE TAKE MY PICTURE AND LEAVE ME HERE FOR OTHERS TO EXPLORE

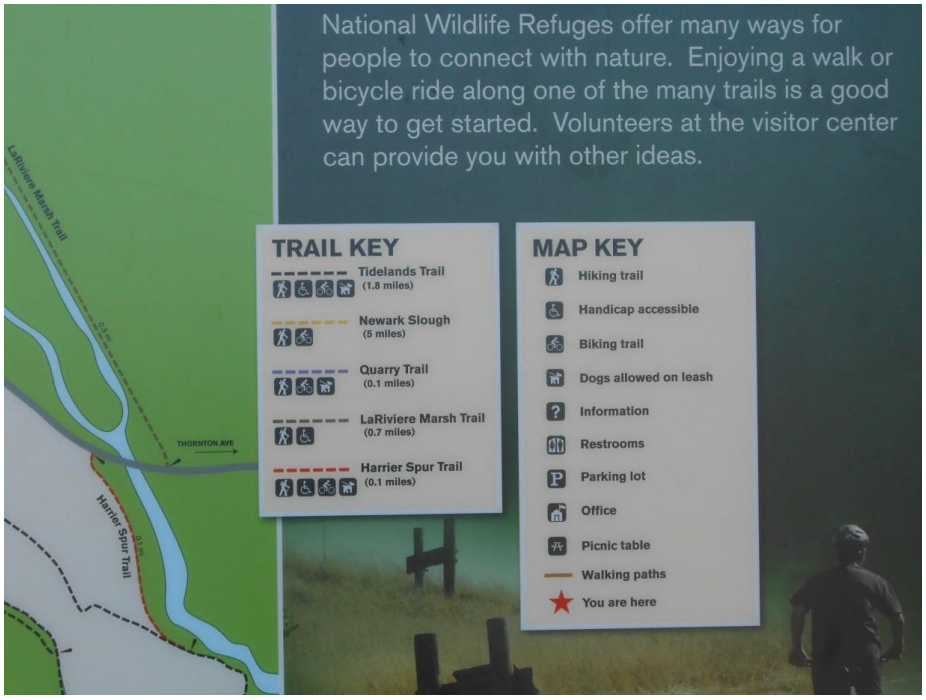
EXPLORE

Harbor Seal

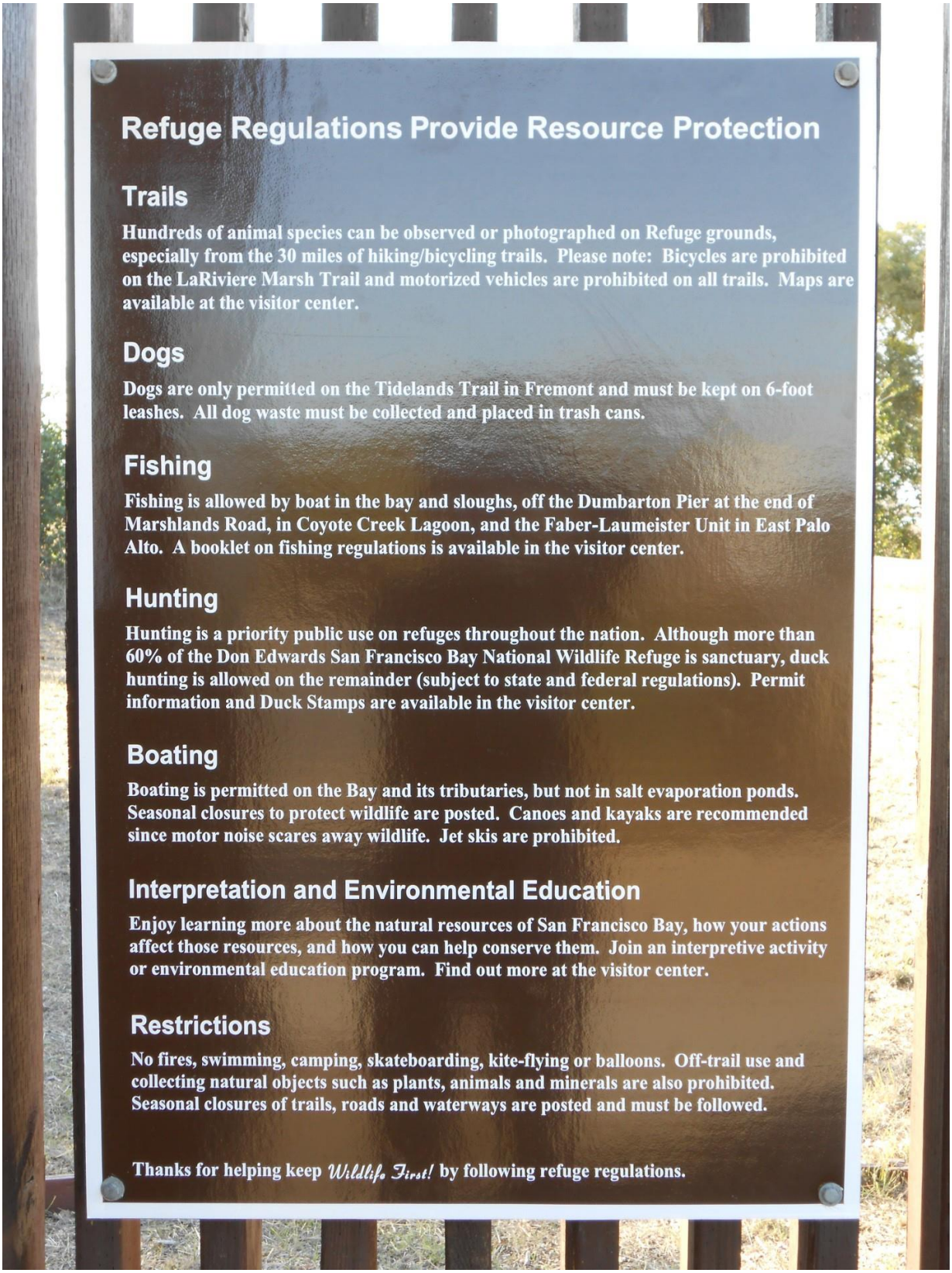
I AM A MAGIC SIGN. PLEASE TAKE MY PICTURE AND LEAVE ME HERE FOR OTHERS TO EXPLORE

EXPLORE

DON EDWARDS FEDERAL WILDLIFE REFUGE SIGNAGE




NATURE
Within Reach
U.S.
FISH & WILDLIFE
SERVICE
DEPARTMENT OF THE INTERIOR
Welcome to
Don Edwards San Francisco Bay
National Wildlife Refuge
The purposes of this refuge are to
Preserve and enhance wildlife habitat,
Protect migratory birds,
Protect threatened and endangered species, and
Provide opportunities for wildlife dependent recreation and study.
Like all national wildlife refuges, our motto is Wildlife First!
Refuge Regulations Provide Resource Protection
Trails
Hundreds of animal species can be observed or photographed on Refuge grounds, especially from the 30 miles of hiking/bicycling trails. Please note: Bicycles are prohibited on the Lakeview Marsh Trail and motorized vehicles are prohibited on all trails. Maps are available at the visitor center.
Dogs
Dogs are only permitted on the Tidelands Trail in Fremont and must be kept on 6-foot leashes. All dog waste must be collected and placed in trash cans.
Fishing
Fishing is allowed by boat in the bay and sloughs, off the Dumbarton Pier at the end of Marshlands Road, in Coyote Creek Lagoon, and the Faber-Laumeister Unit in East Palo Alto. A booklet on fishing regulations is available in the visitor center.
Hunting
Hunting is a priority public use on refuges throughout the nation. Although more than 60% of the Don Edwards San Francisco Bay National Wildlife Refuge is sanctuary, duck hunting is allowed on the remainder (subject to state and federal regulations). Permit information and Duck Stamps are available in the visitor center.
Boating
Boating is permitted on the Bay and its tributaries, but not in salt evaporation ponds. Seasonal closures to protect wildlife are posted. Canoes and kayaks are recommended since motor noise scares away wildlife. Jet skis are prohibited.
Interpretation and Environmental Education
Enjoy learning more about the natural resources of San Francisco Bay, how your actions affect these resources, and how you can help conserve them. Join an interpretive activity or environmental education program. Find out more at the visitor center.
Restrictions
No fires, swimming, camping, skateboarding, kite-flying or balloons. Off-trail use and collecting natural objects such as plants, animals and minerals are also prohibited. Seasonal closures of trails, roads and waterways are posted and must be followed.
Thanks for helping keep Wildlife First! by following refuge regulations.
Visitor Center
Open Tuesday - Sunday, 10 a.m. to 5 p.m.
Closed Federal Holidays.
Available at the Visitor Center: Maps, Duck Stamps, America the Beautiful Access Passes, Refuge Hunting Information, Books, Exhibits, Restrooms & Information.
Refuge Hours
The refuge is open from Sunrise to Sunset
Visitors must leave the refuge by Sunset.
The refuge is closed: January 1, Thanksgiving and December 25.
Emergency Phone Numbers
Call 911 for any life-threatening emergency.
Report all injuries and accidents to Refuge Headquarters: (510) 792-0222 or, when refuge headquarters is closed, to U.S. Park Police: (415) 561-5510
Public phones are located adjacent to the parking lot for the administrative offices and at the Dumbarton Pier.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Thanks for helping keep Wildlife First! by following refuge regulations.

RESOURCE CONTACTS

These people should all know me by name, or at least by description. (Try, *"the woman who rides a kid-sized BMX bike around the levees 5 - 6 days a week with her dog leashed to her waist."*) I have had e-mail and/or phone contact with all but Captain Donald Kelly, Jr.; many repeatedly.

Eric Mruz (replaced by Jared Underwood)
(Former Don Edwards San Francisco Bay National Wildlife Refuge Manager; now manages Oregon South Coast NWR Complex)
1 Marshlands Road
Fremont, CA 94555
Phone: (510)792-0222, x125
E-mail: Eric_Mruz@fws.gov
Hosted annual pre-hunt meeting for DESFWR at headquarters. Developed drive-out access to pond a3w blinds (via combo gate) to reduce conflicts between hunters and other recreational users at the WPCP

Melisa Amato
Wildlife Refuge Specialist
Don Edwards San Francisco Bay National Wildlife Refuge; now San Pablo Bay National Wildlife Refuge
1 Marshlands Road
Fremont, CA 94555
Phone: (707) 769-4200 (Ext 102)
E-mail: Melisa_Amato@fws.gov
Knows everything about hunting in the DESFWR, and still is the primary contact for hunting notifications there

Officer Ryan Rodriguez
Game Warden (as one of only 3 Wardens for ***all*** of Santa Clara County, he ***cannot*** respond to every reported hunting violation in a timely manner)
California Department of Fish and Wildlife
PO Box 391623
Mountain View, CA 94039
Phone: (408) 210-3882
E-mail: ryan.rodriguez@wildlife.ca.gov
Claims to have tried to get Sunnyvale to post regulations and close the Moffett ("West") Channel to hunting for 4 years, but will not put anything in writing. His supervisor is *Captain Donald J. Kelly, Jr.*

Captain Donald J. Kelly, Jr.
California Department of Fish and Wildlife
20 Lower Ragsdale Drive
Suite 100
Monterey, CA 93940
E-mail: dkelly@wildlife.ca.gov
Warden Ryan Rodriguez' supervisor at CDFW

Lt. James Boone
Sunnyvale Department of Public Safety
Phone: 408-730-7109
E-mail: JBoone@ci.sunnyvale.ca.us
Per e-mail to me and Eric Mruz: "*I am in agreement with here that NO hunting should be taking place along that section of slough (Moffett Channel) which leads out to the Guadalupe Slough and was surprised to hear that it was occurring. Please give me a call and let me know how we can work together to get this section closed."* (November 15, 2012)

Michelle Morgan, SR/CSO and **Melissa Murillo**
Animal Control Officers
Sunnyvale DPS
Phone: (408) 730-7172
E-mail: MMorgan@ci.sunnyvale.ca.us
E-mail: MMurillo@ci.sunnyvale.ca.us
Occasionally patrol levees near WPCP. Suggested color-coded zone signage for hunting, bikes, dogs, off-limit fragile areas, as well as wildlife info that "gives people ownership and pride for this wonderful place that is worth protecting." Officer Murillo and I worked together to stop a man who repeatedly let his off-leash dog chase wildlife on a daily basis, and who finally attacked someone else's dog in my presence.

Jackie Davison
Environmental
Outreach Coordinator
City of Sunnyvale
Phone: 408-730-7738
E-mail: jdavison@sunnyvale.ca.gov
For years Jackie was my main contact to report non-emergency safety issues, litter, or vandalism near the WPCP. She has since moved on to the Environmental Services Department.

Dan Hammons
Maintenance & Facilities Manager (Not sure if still in this position as of 2019)
Sunnyvale WPCP
Phone: (408)-730-7287
E-mail: dhammons@ci.sunnyvale.ca.us
Dan was my last contact for non-emergency safety issues, litter, or vandalism near the WPCP.

Cynthia Eaton
Senior Office Specialist (Not sure if still in this position as of 2019)
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3686
Phone (408) 265-2600
Determined that SVWD Pond A4, along with the levees that surround it, lies entirely within Sunnyvale city limits

Tom Flanagan and Ed Gelinas
Private citizens who have found themselves DIRECTLY in the line of fire in the last 2 years
(Ed passed away from lung cancer in 2013, and I have lost contact with Tom.)

Loren Summers, and Paul Allum
Hunters who have reported inexcusable hunting violations to me (and in one case to authorities) in recent weeks
(Both Loren and Paul moved out of state in or before 2018.)

Mike Meyers
Hunter who no longer hunts in Sunnyvale after a citizen reported him to 911 as a "sniper in the Guadalupe Slough" and he was surrounded by Sunnyvale SWAT. Regularly attends the annual Pre-Hunt Meeting at DESFWR.

FOR MORE INFORMATION PLEASE CONTACT ME:

Kira Od
Sculptor
475 Central Avenue
Sunnyvale, CA 94086
Phone: (408) 245-1294
E-mail: kiraod@kiraod.com
My offer to take Councilmembers out singly or in pairs for a bike tour of the area *still stands*. Please contact me to schedule a tour, or to ask any questions you may have.

TRANSMITTED VIA EMAIL

February 10, 2023

Michelle King, Principal Planner
City of Sunnyvale, Community Development Department
456 W. Olive Avenue
Sunnyvale, CA 94086

Re: Draft Moffett Park Specific Plan, Coalition Letter

Dear Michelle King,

We write to you today regarding the Draft Moffett Park Specific Plan (MPSP). As organizations that have been actively engaged in this multi-year process, we commend City Staff for their impassioned and diligent work. This plan has come a very long way and we appreciate the City's continued dedication to community input and building consensus around a vision for an accessible, equitable, and inclusive Eco-Innovation District.

The MPSP (the Plan) lays out an innovative blueprint to cultivate new and complete neighborhoods, new housing, new jobs, and new opportunities for dynamic urbanism that leverages transit resources and commits to environmental stewardship, sustainability, and climate resilience. The Plan recognizes that success will be measured in part by the opportunities it promises to current and future residents of Sunnyvale across all incomes — a vibrant and inclusive community where all people can thrive.

Our organizations, representing expertise in topics ranging from housing to environmental issues and economic development to transit and community participation, all recognize that realizing this vision will be transformational for Sunnyvale and the Silicon Valley. The recommendations below are intended to support this shared vision by providing additional tools we believe will help ensure it is manifested.

Affordable Housing

- Because the City's Inclusionary Housing Program does not guarantee that affordable units will be built on site or within Moffett Park, include an explicit requirement that a minimum of 15 percent of the residential units in the plan area be income-restricted housing affordable to moderate, low, very-low and extremely-low income households, with a 20 percent goal.
- Include explicit language acknowledging that expanding access to people of all incomes will require deed-restricted units integrated into both market-rate development and stand-alone 100 percent affordable developments. This will require additional public and private resources to achieve deeper levels of affordability.
- Consider other tools that would generate additonal resources, reduce costs, and incentivize affordable housing development.
- One potential tool to consider could be to allow all or some of the Housing Mitigation Fees collected from commercial development within Moffett Park be dedicated to affordable housing development within each master plan area. Another tool could be to reduce city development fees for affordable housing within the plan area.
- Incorporate concrete language in the Community Benefits Program that affordable housing be prioritized to expand opportunities for very-low and extremely-low income households.
- Include details in the Community Benefits Program on how affordable housing is valued, relative to other benefits.

Environmental Resilience and Equitable Open Space

- Pursue more extensive efforts to stave off urban heat island effects and predicted flooding issues by specifying and incorporating additional nature based solutions and green infrastructure (bioswales, wetland restoration and creation, urban greening requirements, etc.) into the MPSP.
- Ensure spatial equity by committing to going above and beyond the minimum 44 acres of high habitat value eco patches recommended in the San Francisco Estuary Institute Technical Report, with emphasis in areas and neighborhoods slated for affordable housing development.
- Consider the establishment of a climate resilience task force focused on guidance of longer term resilience planning efforts.

Shared Economic Opportunity

- The establishment of a small business advocate office that serves as a single point of contact for existing Sunnyvale small business owners and non-profits, or through a small business alliance, to support the proposed retention/expansion policy currently included in the Community Benefits Program list.

Equitable Transit Commitments

- Require increased investment in Transportation Demand Management measures that seek to attain the goals before assessing penalties for non-attainment.
- Include an explicit commitment to engage in regional transit integration plans to expand equitable access to Moffett Park including: Metropolitan Transportation Commission (MTC) Connected Network Plan, Valley Transportation Authority's Visionary Network, and an MTC-convened regional initiative laying the groundwork for a regional funding measures for public transportation.
- Adjust the MPSP to be consistent with MTC's recently adopted Transit Oriented Communities Policy, wherever relevant.

Community Participation

- Include public participation in developing and implementing the administrative guidelines and expected value of contributions for the Community Benefits Program.
- Provide the Sunnyvale community an ongoing role as equity stakeholders in the Collaborative Entity for Infrastructure, the Transportation Management Authority, and the Community Benefits Program's community benefits guidelines and contributions.

We are excited to reach the end-stage of the planning process and are hopeful that these recommendations will be seen as supporting the vision of an inclusive Moffett Park, and ensure that all Sunnyvale residents have the opportunity to live, prosper, and move freely in the Eco-Innovation District. This is going to be a great place that will serve as a regional model and the details in this plan will determine who will be able to be a part of it.

Please do not hesitate to contact us for any questions you may have.

Sincerely,

Regina Celestin Williams
Executive Director
SV@Home

Jordan Grimes
Resilience Manager
Greenbelt Alliance

Corey Smith
Executive Director
Housing Action Coalition

Adina Levin
Executive Director
Friends of Caltrain

Ian Griffiths
Policy Director
Seamless Bay Area

Erika Pinto
Planning Policy Manager
SPUR

Louis Mirante
Vice President of Public Policy, Housing
Bay Area Council

Amy Thompson
Policy and Programs Manager
TransForm

From: Kristel [redacted]
Sent: Friday, February 10, 2023 4:55 PM
To: Michelle King <MKing@sunnyvale.ca.gov>
Subject: Moffett Park SP & DEIR

ATTN: Email is from an external source; Stop, Look, and Think before opening attachments or links.

Michelle,
Two suggested items:
1) add something to the plan that would somewhat synchronize the building of housing with other uses like office. Since the plan will cover multiple decades the office space could get built much faster than housing without safeguards.
2) with significant and unavoidable GHG impacts and construction over decades it would be good to address/encourage low carbon construction materials and use of zero emission construction equipment. Although these are not yet mandated, the requirement for 85% GHG reduction by 2045 will necessitate many changes such as these. Meanwhile, cost and availability of these materials and methods will continue to improve.

Kristel Wickham
Sunnyvale Resident since 2004