

## APPENDIX 3.11-B: AIRPORT OBSTRUCTIONS



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Since publication of the Draft Environmental Impact Report/Environmental Impact Statement, the following substantive changes have been made to this appendix:

- Corrections were made to the description of runways at the Norman Y. Mineta San Jose International Airport.
- Text was added to summarize more recent forecasted aircraft operations at the Norman Y. Mineta San Jose International Airport.
- Revisions were implemented to more clearly differentiate between federal requirements governing airport obstructions under FAR Part 77 and state requirements for CLUPs governing airport-compatible land use planning.
- The San Carlos Airport code was corrected in Tables 1 and 2. Table 2 was also updated to reflect that in Redwood City, the radio tower would be co-located at Caltrain's Switching Station 1, Option 2.

### Introduction

Under the California Environmental Quality Act (CEQA) Guidelines, Appendix G (California Code of Regulations, tit. 14, Ch. 3, §§ 15000–15837) the following significance criterion applies to the California High-Speed Rail (HSR) System:

For a project located within an airport land use plan or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

Safety hazards can include the development of land uses that are incompatible with airport operations or result in the imposition of airspace obstacles that represent hazards to aviation, and subsequently to people on the ground in areas exposed to aircraft overflight. The purpose of this appendix is to evaluate whether the project alternatives of the San Francisco to San Jose Project Section (Project Section) would impinge on the Federal Aviation Regulation (FAR) Part 77 imaginary airspace surfaces or airport impact areas for any airports in the project vicinity, thus constituting a potential impact under CEQA.

Five airports and five heliports are located in the project vicinity. These airports and heliports are described in greater detail in the following sections. No privately operated airstrips were identified within 2 miles of the project alternatives (Federal Aviation Administration [FAA] 2017).

### San Francisco International Airport

San Francisco International Airport is located approximately 14 miles south of downtown San Francisco in San Mateo County. The airport is located along San Francisco Bay immediately east of U.S. Highway 101 (the Bayshore Freeway), adjacent to the cities of Burlingame, Millbrae, San Bruno, and South San Francisco. The airport is owned and operated by the City and County of San Francisco. The land use plan for San Francisco International Airport reflects the planned enhancements to the Runway Safety Areas for Runways 10L-28R, 10R-28L, 1R-19L, and 1L-19R (City/County Association of Governments of San Mateo County 2012).

### San Carlos Airport

San Carlos Airport is located on the San Francisco Bay Peninsula approximately 24 miles south of the city of San Francisco and 2 miles northeast of the city of San Carlos' central business district in San Mateo County. The 160-acre airport is located west of the San Francisco Bay at 5 feet above mean sea level. San Carlos Airport is owned and operated by San Mateo County Public Works, Airports Division. The airport accommodates almost 400 aircraft based at the airport and a variety of aviation-related businesses, including flight schools. Airside facilities at San Carlos Airport include one 2,600-foot-long runway (Runway 12-30), oriented northwest-southeast, taxiways, and navigational and approach lighting (City/County Association of Governments of San Mateo County 2015).

## Palo Alto Airport

Palo Alto Airport is located at the northwestern edge of Santa Clara County on the western shore of the southern portion of San Francisco Bay. The 103-acre airport is at an elevation of 4 feet above mean sea level. The airport is owned and operated by the City of Palo Alto but was managed until 2017 by the County of Santa Clara. Airside facilities consist of a single 2,443-foot-long runway (Runway 31-13), taxiways, and runway and navigation lights (County of Santa Clara 2016a).

## Moffett Federal Airfield

Moffett Federal Airfield is located in the north-central area of Santa Clara County at the southwest end of San Francisco Bay, adjacent to the cities of Mountain View and Sunnyvale. The 952-acre airfield is at an elevation of 32 feet above mean sea level. Moffett Field is a federally owned airport operated by the National Aeronautics and Space Administration (NASA). The California Air National Guard is based at Moffett Field. The remainder of operations at the Moffett Field include U.S. Coast Guard training flights, NASA test flights, and U.S. government personnel and air cargo flights. The existing airfield consists of two parallel runways Runway 32R-14L, which is 9,202 feet long by 200 feet wide, and Runway 32L-14R, which is 8,127 feet long by 200 feet wide), taxiways, and high-intensity runway lights (County of Santa Clara 2016b).

## Norman Y. Mineta San Jose International Airport

Norman Y. Mineta San Jose International Airport is an air carrier airport owned by the City of San Jose. The airport is located approximately 1.5 miles from downtown San Jose and approximately 0.3 mile from the project footprints at an elevation of 62 feet above mean sea level, and covers approximately 1,050 acres. The airport operates two parallel runways (Runway 30R-12L and Runway 30L-12R). Traffic at the airport was forecast to increase from a recorded 188,462 aircraft operations in 2006 to a projected 330,000 operations by 2017. The 2017 estimate of 330,000 operations was extended to 2027 in the November 2015 update to the *Airport Comprehensive Land Use Plan* (County of Santa Clara 2016c). The 2020 SJC Airport Master Plan Update extended the planning horizon to 2037 and changed the estimate of 330,000 operations in 2027 to 237,000 operations in 2037 (City of San Jose 2020).

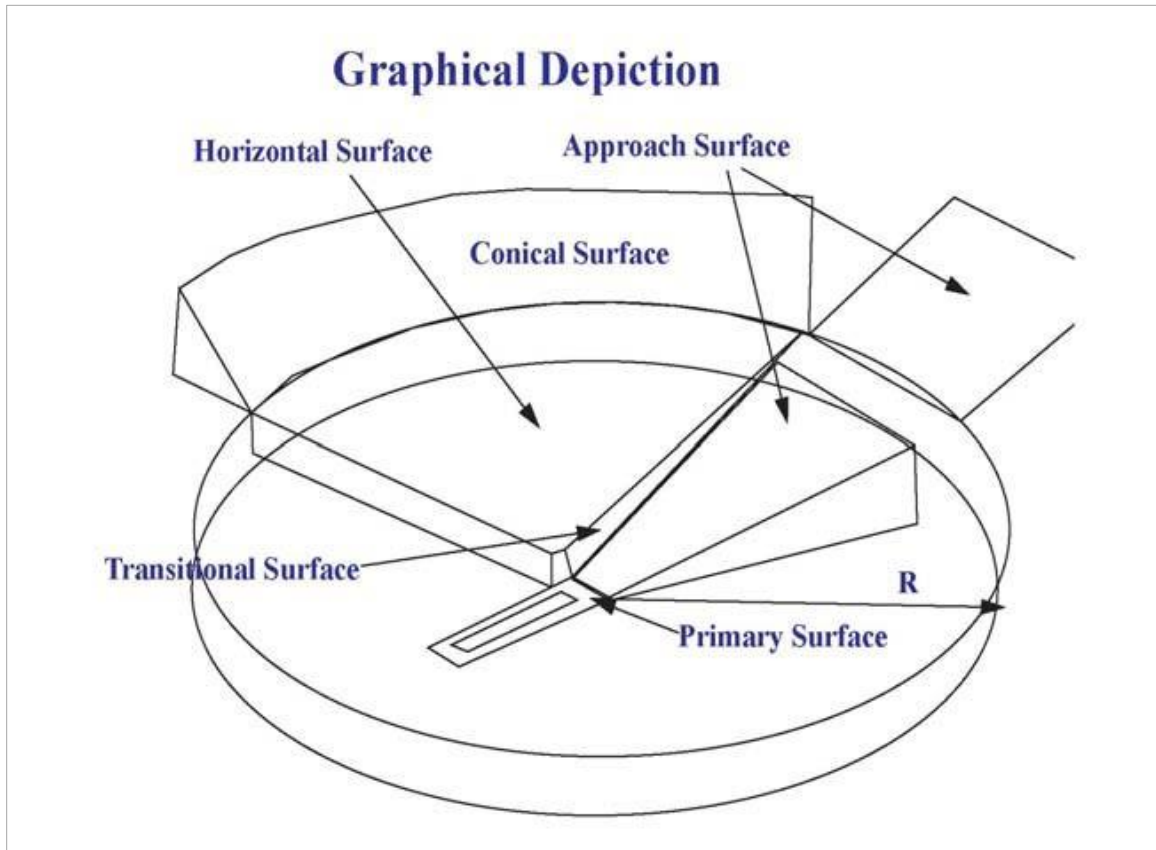
## Airport Influence Areas

San Francisco International Airport, San Carlos Airport, Palo Alto Airport, Moffett Field, and San Jose (Mineta) Airport are subject to airport comprehensive land use plans (CLUP) (County of Santa Clara 2016a, 2016b, 2016c; City/County Association of Governments of San Mateo County 2012, 2015). Each CLUP identifies the airport influence area (AIA)—the geographic boundary of the airport land use compatibility plan (ALUCP). Airport master plans and land use compatibility plans from county airport land use commissions regulate land use within airport safety zones to minimize airport hazards and risk of accidents. ALUCPs establish the AIA after a hearing and in consultation with the involved agencies, as required by California Public Utilities Code Section 21675(c). Proposed projects that encroach into an AIA defined in a CLUP are subject to review in accordance with procedures established in the CLUP.

## Imaginary Surfaces

Terminal instrument procedures (TERPS) are instrument approach and departure procedures for both civilian and military airports. TERPS define *imaginary surfaces* to help develop instrument procedures and conduct obstacle analysis for instrument operations. For purposes of identifying airspace obstacles for airports, the most commonly identified imaginary surfaces include those surfaces for civil aviation facilities defined under 14 Code of Federal Regulations (C.F.R.) Part 77 (Part 77) and TERPS. These imaginary surfaces for civil airports fall into five standard categories: primary, approach, transitional, horizontal, and conical. The size and shape of these surfaces can vary based on runway category and type of operating procedures available or planned for that runway. Examples of these surfaces are shown on Figure 1.

Under Part 77 regulations for determining obstructions to airspace, an existing object, including a mobile object, would be an obstruction to air navigation if it penetrates the surface of a takeoff and landing area of an airport or any imaginary surface established for the airport (14 C.F.R. § 77.24).



Source: Washington State Department of Transportation Aviation 2012

**Figure 1 Part 77 Airspace Surfaces**

Subpart B, Notice of Construction or Alteration, of the Part 77 regulations requires that the FAA be notified of any proposed construction or alteration of objects within 20,000 feet of a runway and having a height that would exceed a 100:1 imaginary surface (1 foot upward per 100 feet horizontally) beginning at the nearest point of the runway. This requirement applies to runways more than 3,200 feet in length (e.g., San Francisco International Airport and Norman Y. Mineta San Jose International Airport). For shorter runways, such as Runway 12-30 at San Carlos Airport, the notification surface has a 50:1 slope and extends 10,000 feet from the runway. Notification is required with regard to any public-use or military airport. Official determinations of the areas and elevations within which the federal notification requirements apply are subject to the authority of the FAA. The FAA may require filing of notices for proposed construction based on considerations other than the proposed height of the structure. For example, in some areas of complex airspace and high air traffic volumes, the FAA may be concerned about the potential for new construction of any height to interfere with electronic navigation aids. In these areas, FAA may also require notification of proposed construction projects (California Department of Transportation [Caltrans] 2011).

## Analysis

This analysis evaluates the project alternatives with respect to encroachment into the AIAs for each airport. For purposes of evaluating AIA encroachment, AIA plans for each of the airports were obtained from the latest versions of their respective ALUCPs (County of Santa Clara 2016a, 2016b, 2016c; City/County Association of Governments of San Mateo County 2012, 2015). The AIA airspace plans were georeferenced using ArcGIS 9.3 and overlaid with geographic information system (GIS) shape files representing the project alternatives for the purpose of identifying their location relative to each airport's AIA. The on-line FAR Part 77 Notice Criteria Tool (FAA 2018) was also used to assess FAR Part 77 notification requirements for proposed construction of the alternatives.

Table 1 shows the project alternatives' encroachment areas in relation to the airports' AIAs. For San Francisco International Airport and San Carlos Airport, there are two AIAs included in the airport land use plans; Area A includes the property area that is affected by FAR Part 77 height restrictions, and Area B includes the property area that is affected by aircraft noise impacts and FAR Part 77 height restrictions. Area B is a subset of Area A but as this relates to aircraft noise impacts as opposed to height restrictions this has been excluded from the AIA calculations in Table 1. For Alternative A, 130.1 acres of temporary construction area and 712.4 acres of permanent construction area are within the AIA for airports near the project alternatives. For Alternative B (Viaduct to Interstate (I-) 880), 180.9 acres of temporary construction area and 787.4 acres of permanent construction area are within the AIA for airports near the project alternatives. For Alternative B (Viaduct to Scott Boulevard), 222.4 acres of temporary construction area and 776.3 acres of permanent construction area are within the AIA for airports near the project alternatives.

**Table 1 Airport Influence Area Encroachment Area for Each Project Alternative**

| Airport  | Encroachment Area (acres) |              |                            |                    |
|--|---------------------------|--------------|----------------------------|--------------------|
|  | Alternative A             |              | Alternative B <sup>1</sup> |                    |
|  | Temporary                 | Permanent    | Temporary                  | Permanent          |
| San Francisco International Airport (SFO)—Area A     | 109.4                     | 450.6        | 87.2                       | 481.9              |
| San Francisco International Airport (SFO)—Area B     | 24.5                      | 146.0        | 24.5                       | 146.0              |
| Moffett Field Airport (KNUQ)                         | 0.8                       | 35.8         | 0.8                        | 35.8               |
| Palo Alto Airport (KPAO)                             | 0.0                       | 0.0          | 0.0                        | 0.0                |
| San Carlos Airport (SQL)—Area A                      | 4.7                       | 155.5        | 37.9                       | 172.2              |
| San Carlos Airport (SQL)—Area B                      | 1.5                       | 45.8         | 15.6                       | 56.3               |
| Norman Y Mineta San Jose International Airport (SJC) | 15.2                      | 70.5         | 55.0/96.5                  | 97.9/86.4          |
| <b>Total excluding SFO Area B and SQL Area B</b>     | <b>130.1</b>              | <b>712.4</b> | <b>180.9/222.4</b>         | <b>787.4/776.3</b> |

Sources: County of Santa Clara 2016a, 2016b, 2016c; City/County Association of Governments of San Mateo County 2012, 2015

I- = Interstate

<sup>1</sup>. Where applicable, values are presented for Alternative B (Viaduct to I-880) first, followed by Alternative B (Viaduct to Scott Boulevard). If only one value is presented, the affected area would be identical under both viaduct options.

The HSR system would require the installation of a radio-based communications network to maintain communications and share data between the trains and the operations control center. Communications radio towers would consist of an 8-foot by 10-foot communications equipment shelter and a 6- to 8-foot-diameter communications tower extending 100 feet above top-of-rail located at intervals of approximately 2.5 miles. Where possible, these facilities are co-located at an existing Caltrain traction power substation, switching station, paralleling station, or Caltrain station. Where communications towers cannot be co-located with other Caltrain facilities, the communications facilities would be sited near the HSR corridor in a fenced area approximately 20

by 15 feet. The locations of communication radio tower in relation to the Part 77 contours for each airport by Project Section are identified in Table 2 and shown in Figures 2 through 6.

**Table 2 Part 77 Notification for Project Alternatives**

| Airport                                   | City/Community      | Communication Tower <sup>2</sup>                                 | Height Exceedance (feet) |
|---|---------------------|--|--------------------------|
| San Francisco International Airport (SFO) | South San Francisco | Radio Tower Co-Located at Caltrain's TPS1 Option 4               | 6                        |
|   | San Bruno           | Stand-Alone Radio Tower #3                                       | 66                       |
|   | Burlingame          | Radio Tower Co-Located at Caltrain's PS3 Option 4                | 29                       |
| San Carlos Airport (SQL)                  | San Carlos          | Stand-Alone Radio Tower #6                                       | 26                       |
|   | Redwood City        | Radio Tower Co-Located at Caltrain's SWS1, Option 2 <sup>1</sup> | 15                       |
| Palo Alto Airport (KPAO)                  | Menlo Park          | Stand-Alone Radio Tower #7 <sup>1</sup>                          | 70                       |
|   | Palo Alto           | Stand-Alone Radio Tower #8 <sup>1</sup>                          | 50                       |
| Moffett Field Airport (KNUQ)              | Mountain View       | Stand-Alone Radio Tower #9                                       | 22                       |
|   | Sunnyvale           | Stand-Alone Radio Tower #10                                      | 91                       |
| Mineta/San Jose Airport (SJC)             | Santa Clara         | Stand-Alone Radio Tower #2                                       | 61                       |
|   |                     | Stand-Alone Radio Tower #1                                       | 53                       |

I = Interstate

PS = paralleling station

SWS1 = Caltrain's Switching Station 1, Option 2

TPS = traction power substation

<sup>1</sup> Exceeds an instrument approach area of the terminal instrument procedures.

<sup>2</sup> Radio towers apply to both project alternatives.

## Results

### San Francisco International Airport

The temporary and permanent construction areas for both project alternatives would encroach into the AIA for San Francisco International Airport. Encroachment areas are shown in Table 1. Both project alternatives include proposed communication tower locations in San Bruno (Stand-Alone Radio Tower #3) near the San Francisco International Airport. The communication tower locations in San Bruno for both project alternatives would be within the contour for FAR Part 77 Notification. According to the FAR Part 77 Notice Criteria Tool, the 100-foot height would exceed the FAR Part 77 notification contour for San Francisco International Airport by approximately 66 feet, including the 100-foot tower height and an additional 15 feet of terrain elevation (FAA 2018; City/County Association of Governments of San Mateo County 2012). The nearest runway to the proposed communication tower is SFO Runway 10R/28L. The FAR Part 77 Notice Criteria Tool indicates that FAR Part 77 notification would be required for approval of construction of the communication towers in San Bruno for both project alternatives.

Both project alternatives would locate communication towers in Burlingame (Radio Tower Co-Located at Caltrain's Paralleling Station #3 Option 4) and South San Francisco (Radio Tower Co-Located at Caltrain's Traction Power Substation #1 Option 4). According to the FAR Part 77 Notice Criteria Tool, the Burlingame tower would exceed the FAR Part 77 notification contour for San Francisco International Airport by 29 feet. The South San Francisco tower would exceed the FAR Part 77 notification contour by 6 feet, including the 100-foot tower height and an additional 16 feet of terrain elevation (FAA 2018; City/County Association of Governments of San Mateo



County 2012). The nearest runway to the proposed communication tower is San Francisco International Airport Runway 01R/19L. The FAR Part 77 Notice Criteria Tool indicates that FAR Part 77 notification would be required for approval of construction of the communication towers in Burlingame and South San Francisco for both project alternatives (Table 2).

### **San Carlos Airport**

The temporary and permanent construction areas for both project alternatives would encroach into the AIA for San Carlos Airport. Encroachment areas are shown in Table 1. Both project alternatives would locate communication towers in Belmont and San Carlos near San Carlos Airport. The communication tower locations in San Carlos for both project alternatives would be within the contour for FAR Part 77 Notification.

The communication radio tower in San Carlos (Stand-Alone Radio Tower #6) would exceed the FAR Part 77 notification contour by approximately 26 feet for both project alternatives, including the 100-foot tower height and an additional 15 feet of terrain elevation (FAA 2018; City/County Association of Governments of San Mateo County 2015). The nearest runway to the proposed communication tower is SQL Runway 12/30. The FAR Part 77 Notice Criteria Tool indicates that the proposed communication tower locations in San Carlos would exceed an instrument approach area by 110 feet, including the 100-foot tower height and 15 feet of additional terrain elevation. An aeronautical study would therefore be needed to determine if the structure would exceed a standard of subpart C of 14 C.F.R. Part 77. The FAR Part 77 Notice Criteria Tool indicates that FAR Part 77 notification would be required for approval of construction of the communication towers in San Carlos for both project alternatives (Table 2).

### **Palo Alto Airport**

The temporary and permanent construction areas for both project alternatives would not encroach into the AIA for Palo Alto Airport. Neither project alternative would fall within the FAR Part 77 defined horizontal surface zone for the airport (County of Santa Clara 2016a). However, the FAR Part 77 Notice Criteria Tool indicates that the proposed communication tower locations for both project alternatives in Menlo Park (Stand-Alone Radio Tower #7) would exceed an instrument approach area by 110 feet, including the 100-foot tower height and 75 feet of additional terrain elevation (FAA 2018). The proposed communication tower in Palo Alto (Stand-Alone Radio Tower Location #8) would exceed an instrumentation approach area by 50 feet based on a 100-foot tower height and 55 feet of additional terrain elevation. An aeronautical study would therefore be needed to determine if the structures would exceed a standard of subpart C of 14 C.F.R. Part 77. The FAR Part 77 Notice Criteria Tool indicates that FAR Part 77 notification would be required for the communication radio towers in Menlo Park and Palo Alto (Table 2).

### **Moffett Federal Airfield**

The temporary permanent construction areas for both project alternatives would encroach into the AIA for Moffett Federal Airfield. Encroachment Areas are shown in Table 1. Both project alternatives would locate communication towers in Mountain View (Stand-Alone Radio Tower #9) and Sunnyvale (Stand-Alone Radio Tower #10) near Moffett Federal Airfield. The communication towers in Mountain View and Sunnyvale for both project alternatives would be within the contour for FAR Part 77 Notification. According to the FAR Part 77 Notice Criteria Tool, the Mountain View communication towers would exceed the FAR Part 77 notification contour for Moffett Field by approximately 22 feet, including the 100-foot tower height and an additional 55 feet of terrain elevation. The Sunnyvale communication towers would exceed the FAR Part 77 notification contour for Moffett Field by approximately 91 feet, including the 100-foot tower height and an additional 100 feet of terrain elevation (FAA 2018; County of Santa Clara 2016b). The FAR Part 77 Notice Criteria Tool also indicates that the proposed communication tower locations in Sunnyvale would exceed an instrument approach area by approximately 95 feet, including the 100-foot tower height and 100 feet of additional terrain elevation. An aeronautical study would therefore be needed to determine if the structure would exceed a standard of subpart C of 14 C.F.R. Part 77. The nearest runway to the proposed communication tower locations is NUQ Runway 14R/32L. The FAR Part 77 Notice Criteria Tool indicates that FAR Part 77 notification



would be required for approval of construction of the communication towers in Sunnyvale and Mountain View for both project alternatives (Table 2).

### **Norman Y. Mineta San Jose International Airport**

All project alternatives encroach into the AIA of San Jose International Airport, as shown in Table 1. Alternative B (Viaduct to Scott Boulevard) and Alternative B (Viaduct to I-880) have communication towers located in Santa Clara (Radio Towers 1 and 2) that would exceed FAR Part 77 height restrictions near San Jose International Airport. The communication towers in Santa Clara would be within the contour for FAR Part 77 notification. According to the FAR Part 77 Notice Criteria Tool, in Santa Clara, Radio Tower 1 would exceed height restrictions by 53 feet, and Radio Tower 2, by 61 feet. Both of the towers are in proximity to a navigation facility associated with the airport and may affect the assurance of navigation signal reception. The nearest runway to the proposed communication towers is San Jose International Airport Runway 12R/30L. The FAR Part 77 Notice Criteria Tool indicates that FAR Part 77 notification would be required for approval of construction of the two communication towers in Santa Clara under Alternative B (Viaduct to Scott Boulevard) and Alternative B (Viaduct to I-880) (Table 2).

### **Heliports**

Five privately operated heliports in the City and County of San Francisco and the counties of San Mateo and Santa Clara are located within 2 miles of the project alternative footprints. These heliports are located at the University of California at San Francisco Medical Center Mission Bay building in San Francisco, Mills Peninsula Medical Center in Burlingame, Stanford Hospital in Palo Alto, Santa Clara Valley Medical Center in San Jose, and Santa Clara Towers in Santa Clara. The heliports are rooftop facilities associated with medical center and residential high-rise properties and would not be affected by construction and operation of the project.

### **Privately Operated Airstrips**

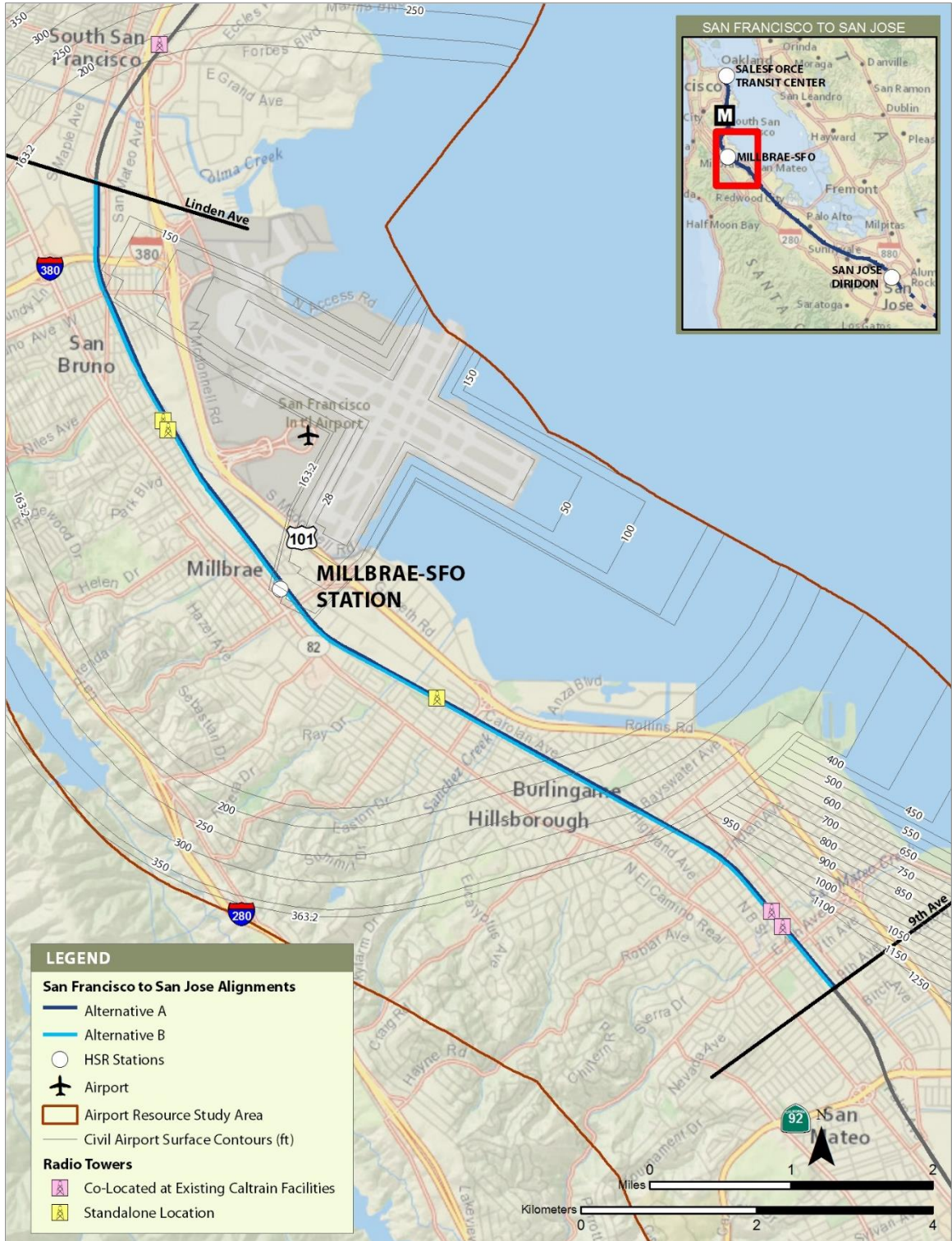
No privately operated airstrips were identified within 2 miles of either project alternative.



Sources: County of Santa Clara 2016a, 2016b, 2016c; City/County Association of Governments of San Mateo County 2012, 2015 MARCH 2020

**Figure 2 FAR Part 77 Contours and Tower Locations—San Francisco to South San Francisco Subsection**





Sources: County of Santa Clara 2016a, 2016b, 2016c; City/County Association of Governments of San Mateo County 2012, 2015 MARCH 2020

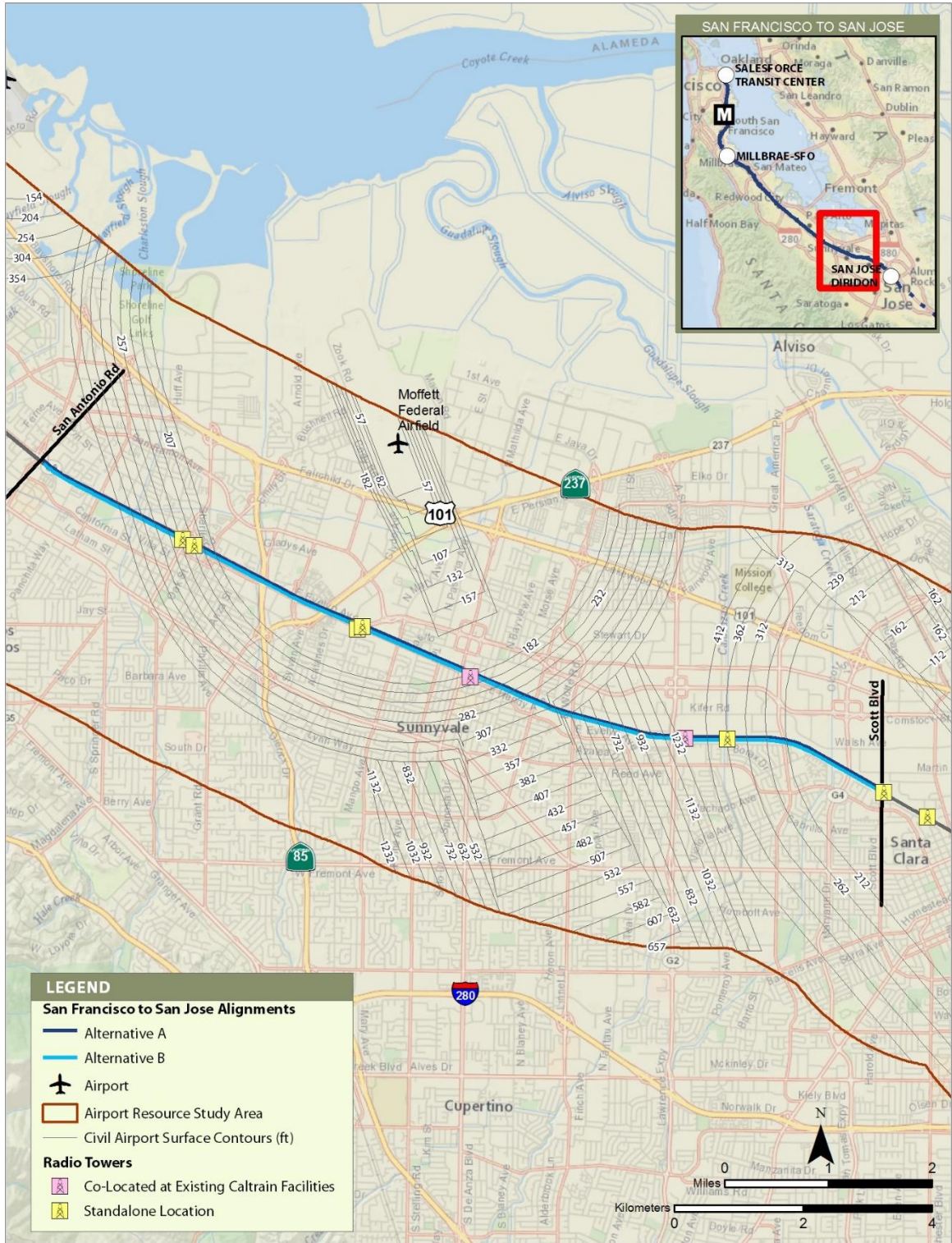
**Figure 3 FAR Part 77 Contours and Tower Locations—San Bruno to San Mateo Subsection**



Sources: County of Santa Clara 2016a, 2016b, 2016c; City/County Association of Governments of San Mateo County 2012, 2015 MARCH 2020

**Figure 4 FAR Part 77 Contours and Tower Locations—San Mateo to Palo Alto Subsection**





Sources: County of Santa Clara 2016a, 2016b, 2016c; City/County Association of Governments of San Mateo County 2012, 2015 MARCH 2020

**Figure 5 FAR Part 77 Contours and Tower Locations—Mountain View to Santa Clara Subsection**





Sources: County of Santa Clara 2016a, 2016b, 2016c; City/County Association of Governments of San Mateo County 2012, 2015 MARCH 2020

**Figure 6 FAR Part 77 Contours and Tower Locations—San Jose Diridon Station Approach Subsection**

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