

## 5 Environmental Consequences

This chapter discusses the potential environmental impacts that could result from implementation of the Proposed Action and the No Action Alternative. Specifically, this EA considers effects on the environmental resource categories identified in Appendix A of FAA Order 1050.1E. Both the Proposed Action and the No Action Alternative were evaluated under forecasted 2014 conditions, the first year of implementation for the Proposed Action, and under forecasted 2019 conditions, five years after implementation of the Proposed Action. This evaluation includes consideration of the direct, indirect, and cumulative effects associated with the Proposed Action and No Action Alternative, as required under FAA Order 1050.1E.

Potential environmental impacts are identified for the environmental resource categories described in Section 4.3. Neither the Proposed Action nor the No Action Alternative would involve land acquisition; physical changes to the environment resulting from ground disturbance or construction activities; changes in patterns of population movement or growth, increases in public service demands, or business and economic activity; or generation, disturbance, transportation, or treatment of hazardous materials. Therefore, neither alternative is expected to result in impacts to certain environmental resource categories (please see Section 4.2 for a list of excluded categories). The excluded environmental resource categories are not further discussed in this chapter.

**Table 5-1** identifies the environmental impact categories with potential to be affected by the Proposed Action, the thresholds of significance used to determine the potential for impacts, and a side-by-side comparative summary of the potential for environmental impacts resulting from implementation of the Proposed Action under 2014 and 2019 forecast conditions.

**Table 5-1 Summary of Potential Environmental Impacts (1 of 2)**

<b>Environmental Impact Category</b>	<b>Threshold of Significance</b>	<b>Impact?</b>	
		<b>2014</b>	<b>2019</b>
Noise	A significant noise impact would occur if analysis shows that the proposed action will cause noise sensitive areas to experience an increase in noise of DNL 1.5 dB or more at or above DNL 65 dB noise exposure when compared to the no action alternative for the same timeframe.	No	No
Compatible Land Use	A significant noise impact would occur if analysis shows that the proposed action will cause noise sensitive areas to experience an increase in noise of DNL 1.5 dB or more at or above DNL 65 dB noise exposure when compared to the no action alternative for the same timeframe.	No	No

**Table 5-1 Summary of Potential Environmental Impacts (2 of 2)**

<b>Environmental Impact Category</b>	<b>Threshold of Significance</b>	<b>2014</b>	<b>2019</b>
Department of Transportation Act, Section 4(f) Resources	A significant impact would occur pursuant to NEPA when a proposed action either involves more than a minimal physical use of a section 4(f) property or is deemed a "constructive use" substantially impairing the 4(f) property, and mitigation measures do not eliminate or reduce the effects of the use below the threshold of significance (e.g., by replacement in kind of a neighborhood park). Substantial impairment would occur when impacts to section 4(f) lands are sufficiently serious that the value of the site in terms of its prior significance and enjoyment are substantially reduced or lost.	No	No
Historic and Cultural Resources	A significant impact would occur when an action adversely affects a protected property and the responsible FAA official determines that the information from the State and/or Tribal Historic Preservation Officer addressing alternatives to avoid adverse effects and mitigation warrant further study	No	No
Wildlife (Avian and Bat Species)	A significant impact to federally-listed threatened and endangered species would occur when the FWS or NMFS determines that the proposed action would be likely to jeopardize the continued existence of the species in question, or would result in the destruction or adverse modification of Federally-designated critical habitat in the affected area. An action need not involve a threat of extinction to federally listed species to meet the NEPA standard of significance. Lesser impacts including impacts on non-listed species could also constitute a significant impact.	No	No
Environmental Justice	A significant impact would occur if there were disproportionately high and adverse human health or environmental effects on minority and low-income populations.	No	No
Energy Supply (Aircraft Fuel)	A significant impact would occur when an action's construction, operation or maintenance would cause demands that would exceed available or future (project year) natural resources or energy supplies and the responsible FAA official determines that additional analysis in an EIS is necessary	No	No
Air Quality	Potentially significant air quality impacts associated with an FAA project or action would be demonstrated by the project or action exceeding one or more of the NAAQS for any of the time periods analyzed.	No	No
Climate	No significance thresholds have been established.	No	No

Source: FAA Order 1050.1E, Chg 1, Appendix A; ATAC Corporation, December 2013.  
Prepared By: ATAC Corporation, January 2014.

The following sections describe the impact findings for each environmental resource category, followed by a discussion of potential cumulative impacts. In summary, no significant impacts to any environmental resource category have been identified.

## 5.1 Noise

This section discusses the analysis of aircraft noise exposure under the Proposed Action and the No Action Alternative under both 2014 and 2019 forecast conditions. This discussion includes identification of the differences in noise exposure between the Proposed Action and the No Action Alternative. This comparison is used to determine if implementation of the Proposed Action would result in significant noise impacts. Additional information on noise metrics and the basics of noise can be found in **Appendix E**. Detailed information on the noise analysis prepared for the NorCal OAPM Project is included in the *NorCal OAPM Noise Technical Report*, available on the project website (<http://www.oapmenvironmental.com>).

### 5.1.1 Summary of Impacts

Aircraft noise exposure was modeled for both the Proposed Action and the No Action Alternative under 2014 and 2019 forecast conditions. The noise analysis demonstrates that noise exposure resulting from implementation of the Proposed Action would not result in a day-night average sound level (DNL) increase of 1.5 dBA or higher in noise sensitive areas exposed to DNL 65 dB or higher. Therefore, the Proposed Action would not result in a significant noise impact.

### 5.1.2 Methodology

The noise analysis evaluated noise exposure to communities within the General Study Area generated by aircraft forecasted to be operating under Instrument Flight Rules (IFR) -filed flight plans, at altitudes between the surface (i.e., ground level) and up to 10,000 feet above ground level (AGL). IFR-filed aircraft activity was forecasted for the years 2014 and 2019 and used to model conditions under both the Proposed Action and the No Action Alternative. Noise modeling was conducted using Noise Integrated Routing System (NIRS) Version 6.1, the FAA-required noise model for projects involving air traffic changes over large areas and altitudes over 3,000 feet AGL.

If the Proposed Action is approved, the FAA expects to begin and complete implementation in 2014; therefore, aircraft noise modeling was completed for 2014 and five years later (2019), as required by FAA Order 1050.1E. Future year noise exposure levels modeled for the Proposed Action and the No Action Alternative were compared to determine whether there is a potential for noise impacts.

In both the 2014 and 2019 forecast scenarios, the Proposed Action and the No Action Alternative were modeled using the same number and type of aircraft operations. The Proposed Action does not include development or construction of facilities, such as runways or terminal expansions that would be necessary to accommodate an increase in aviation activity; therefore, no additional growth in operations is anticipated. The noise analysis reflects the change in noise exposure resulting from the proposed changes in aircraft routes (i.e., flight tracks) under the Proposed Action compared to the No Action Alternative.

Detailed information on IFR-filed aircraft operations within the General Study Area was assembled for input into NIRS, including the following data:

**Average Annual Day IFR-Filed Aircraft Flight Schedules:** The IFR-filed aircraft flight schedules identify arrival and departure times, aircraft types, and origin/destination information for an average annual day (AAD) in 2014 and in 2019. The AAD represents all

the aircraft operations for every day in a study year divided by 365, the number of days in a year. The AAD does not reflect a particular day, but is meant to represent a typical day over a period of a year. The forecast was based on the FAA's 2012 Terminal Area Forecast (TAF),<sup>31</sup> modified for 2014 and 2019 with additional details using previously identified arrival/departure times, aircraft types, and origin/destination information. For 2014, a total of 826,187 IFR operations (2,263 IFR operations for an average annual day) were modeled for all Study Airports. For 2019, a total of 900,324 IFR operations (2,467 IFR operations for an average annual day) were modeled for all Study Airports.

**Flight Tracks:** The flight tracks used in modeling were based on radar data collected for the existing conditions (2011) noise analysis and information provided by FAA Air Traffic Control (ATC) personnel. Aircraft routings under both the No Action Alternative and Proposed Action are depicted on **Exhibits 3-6** through **3-9** in Chapter 3, *Alternatives*. For the Proposed Action, flight tracks were developed from the aircraft procedures created by the NorCal OAPM Design & Implementation (D&I) Team using the Terminal Area Route Generation, Evaluation, Traffic and Simulation (TARGETS) program. The majority of the No Action Alternative modeled flight tracks are based on the existing conditions noise analysis. The flight tracks for amended or new procedures that are part of the No Action Alternative were modeled based on input from the ATC subject matter experts who developed the procedures.

**Runway Use:** Runway use percentages were identified for all runways at the Study Airports. Forecasted aircraft operations were assigned to particular runways representing operating conditions at the Study Airports under Proposed Action and No Action Alternative conditions. The Proposed Action Alternative was not expected to change runway use patterns at the Study Airports compared to the No Action Alternative.

More detail related to the development of the NIRS model input files is provided in the *NorCal OAPM Noise Technical Report*, available on the project website (<http://www.oapmenvironmental.com>).

As discussed in Section 4.3.1.1, the NIRS model was used to compute DNL values for 2014 and 2019 Proposed Action and No Action Alternative conditions at three sets of data points throughout the General Study Area:

1. 53,141 2010 Census block centroids;
2. 94,046 uniform grid points at 0.5-nautical mile (nm) intervals on a uniform grid covering the General Study Area, which were also used to calculate DNL values at potential Department of Transportation Act (DOT), Section 4(f) resources and historic sites; and,
3. 12,215 unique points representing Section 4(f) resources too small to be captured in the uniform grid, including 8,892 unique points representing National Register listed historic sites.

As discussed in Section 4.3.1.1, Section 14, paragraph 14.5e of Appendix A to FAA Order 1050.1E, requires analysis of aircraft noise using the DNL metric. **Table 5-2** provides the criteria used to assess the changes in aircraft noise exposure attributable to the Proposed

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<sup>31</sup> U.S. Department of Transportation, Federal Aviation Administration, Terminal Area Forecast, 2012 (<https://aspm.faa.gov/main/taf.asp>; accessed March 2013).

Action compared with the No Action Alternative. FAA Order 1050.1E defines a significant impact as an increase of DNL 1.5 dB at noise-sensitive land use locations (e.g., residences, schools, etc.) exposed to aircraft noise of DNL 65 dB or higher under the Proposed Action. For example, an increase from 63.5 dB to 65 dB is considered a significant impact.

In addition, in response to a recommendation made in 1992 by the Federal Interagency Committee on Noise (FICON), FAA Order 1050.1E also recommends that in instances where there are DNL increases of 1.5 dB or more at noise sensitive locations in areas exposed to aircraft noise of DNL 65 dB and higher, DNL increases of 3 dB or more in areas exposed to aircraft noise between DNL 60 dB and 65 dB should also be evaluated and disclosed. It is important to note that DNL increases of 3 dB in areas exposed to aircraft noise below DNL 65 dB are not considered “significant impacts” but are to be considered in the environmental evaluation of a proposed project.

FAA Order 1050.1E also stipulates that changes in exposure of DNL 5 dB or greater in areas exposed to aircraft noise between DNL 45 dB and 60 dB should be considered for airspace actions, such as changes to air traffic routes. This threshold was established in 1990, following issuance of an FAA noise screening procedure to evaluate whether certain airspace actions above 3,000 feet AGL might increase DNL levels by 5 dB or more. The noise screening procedure was prepared as a result of FAA experience that indicates that DNL increases 5 dB or more at cumulative levels well below DNL 65 dB could be disturbing to people and become a source of public concern.

**Table 5-2 Criteria for Determining Impact of Changes in Aircraft Noise**

DNL Noise Exposure Level	Increase in DNL with Proposed Action	Aircraft Noise Exposure Change Consideration
DNL 65 and higher	DNL 1.5 dB or more <sup>1/</sup>	Exceeds Threshold of Significance
DNL 60 to 65	DNL 3.0 dB or more <sup>2/</sup>	Reportable Noise Increase (Considered When Evaluating Air Traffic Actions)
DNL 45 to 60	DNL 5.0 dB or more <sup>3/</sup>	Reportable Noise Increase (Information Disclosed When Evaluating Air Traffic Actions)

Notes:

1/ Source FAA, Order 1050.1E, Appendix A, Paragraph 14.3; Title 14 C.F.R. Part 150.21 (2) (d); and Federal Interagency Committee on Noise, Federal Agency Review of Selected Airport Noise Issues, August 1992.

2/ Source FAA Order 1050.1E, Appendix A, Paragraphs 14.4c and 14.5e; and Federal Interagency Committee on Noise, Federal Agency Review of Selected Airport Noise Issues, August 1992.

3/ Source FAA Order 1050.1E, Appendix A, Paragraph 14.5e.

Source: FAA Order 1050.1E, Appendix A. June 8, 2004.

Prepared By: ATAC Corporation, September 2013.

### 5.1.3 Potential Impacts – 2014 and 2019

**Table 5-3** summarizes the results of the noise analysis for 2014 and 2019 conditions. The results for both years indicate that, when compared to the No Action Alternative, the Proposed Action would not result in a DNL 1.5 dB or higher increase in noise-sensitive areas exposed to DNL 65 dB or higher. Furthermore, no population would experience a reportable noise increase in areas exposed to DNL between 60 dB and 65 dB or between 45 dB and 60 dB. These results indicate that Proposed Action would not result in a significant noise exposure impact on population exposed to DNL 65 dB or higher levels

under the Proposed Action or produce reportable noise increases in areas exposed to DNL 45 dB to 65 dB.

**Table 5-3 Change in Potential Population Exposed to Aircraft Noise – 2014 and 2019**

DNL Noise Exposure Level Under the Proposed Action	Increase in DNL with the Proposed Action	Population Exposed to Noise that Exceeds the Threshold	
		2014	2019
DNL 65 and higher	DNL 1.5 dB or greater	0	0
DNL 60 to 65	DNL 3.0 dB or greater	0	0
DNL 45 to 60	DNL 5.0 dB or greater	0	0

Source: U.S. Census Bureau, 2010 Census (population centroid data), accessed August 2012; ATAC Corporation, December 2013 (NIRS modeling results).

Prepared by: ATAC Corporation, December 2013.

## 5.2 Compatible Land Use

This section discusses potential impacts to compatible land use under the Proposed Action and the No Action Alternative.

### 5.2.1 Summary of Impacts

Under both the Proposed Action and No Action Alternative, there would be no changes in aircraft noise exposure that would exceed the FAA’s significance threshold for noise impacts on people. Likewise, there are no conflicts with Federal, regional, State, local land use plans, policies and controls. Therefore, neither the Proposed Action nor the No Action Alternative would result in compatible land use impacts.

### 5.2.2 Methodology

FAA Order 1050.1E requires that EA documents discuss possible conflicts between the proposed action and the objectives of Federal, regional, State, local and Tribal land use plans, policies and controls for the area concerned. Potential impacts to compatible land use were focused on changes in aircraft noise exposure resulting from implementation of the Proposed Action. FAA Order 1050.1E states, “The compatibility of existing and planned land uses in the vicinity of an airport is usually associated with the extent of the airport’s noise impact. If the noise analysis concludes that there is no significant impact, a similar conclusion usually may be drawn with respect to compatible land use.”<sup>32</sup> Air traffic actions like the NorCal OAPM Project do not result in direct impacts to land such as ground disturbance. Accordingly, the compatible land use analysis relies on changes in aircraft noise exposure between the Proposed Action and the No Action Alternative (discussed in Section 5.1) as the basis for determining compatible land use impacts within the General Study Area.

### 5.2.3 Potential Impacts – 2014 and 2019

As stated in Section 5.1, the Proposed Action, when compared with the No Action Alternative, would not result in changes in aircraft noise exposure in 2014 or 2019 that would exceed FAA’s significance threshold. Likewise, there are no conflicts with Federal,

<sup>32</sup> U.S. Department of Transportation, Federal Aviation Administration, Order 1050.1E, Appendix A, Sec. 4.1.a.

regional, State, local land use plans, policies and controls. Therefore, the Proposed Action would not result in significant compatible land use impacts.

Under the No Action Alternative, there would be no changes to air traffic routing in the General Study Area and no changes in aircraft noise exposure expected to occur in either 2014 or 2019. Therefore, the No Action Alternative would not result in significant compatible land use impacts.

## **5.3 Department of Transportation Act, Section 4(f) Resources**

This section discusses potential impacts to Department of Transportation (DOT) Act, Section 4(f) Resources. **Exhibit 4-4** depicts Section 4(f) resources within the General Study Area as described in Section 4.3.3.

### **5.3.1 Summary of Impacts**

Evaluation of potential impacts to Section 4(f) resources focuses on changes in aircraft noise exposure resulting from implementation of the Proposed Action. Under the Proposed Action, the aircraft noise exposure analysis indicates that the Proposed Action would not substantially change the noise environment at any Section 4(f) resource identified within the General Study Area when compared with the No Action Alternative. Therefore, no constructive use of a Section 4(f) resource associated with the Proposed Action would occur and no impacts would be anticipated.

Under the No Action Alternative, no changes in air traffic routes in the General Study Area would occur; therefore, no changes to aircraft noise exposure or aircraft overflight patterns would occur over Section 4(f) resources and no impacts would be anticipated.

### **5.3.2 Methodology**

The FAA evaluates potential effects on Section 4(f) resources in terms of both direct impacts (i.e., physical use) and indirect impacts (i.e., constructive use). A direct impact would occur as a result of land acquisition, construction, or other ground disturbance activities that would result in physical use of all or a portion of a Section 4(f) property. As land acquisition, construction, or other ground disturbance activities would not occur under either the Proposed Action or the No Action Alternative, neither alternative would have the potential to cause a direct impact to a Section 4(f) resource. Therefore, analysis of potential impacts to Section 4(f) resources is limited to identifying indirect impacts resulting from constructive use. A constructive use of a Section 4(f) resource would occur if there were a substantial impairment of the resource to the degree that the activities, features, or attributes of the site that contribute to its significance or enjoyment are substantially diminished. This could occur as a result of both visual and noise impacts. As regards aircraft noise, a constructive use would occur should noise levels substantially impair the resource.

Noise exposure levels were calculated for grid points placed at Section 4(f) properties. A list of the resources evaluated is provided in the *NorCal OAPM Noise Technical Report* available on the project website (<http://www.oapmenvironmental.com>). Section 5.1.2 includes further discussion on the grid points used in the Section 4(f) analysis. The analysis of potential impacts to Section 4(f) resources considered whether these properties would experience a significant noise increase, when comparing the Proposed Action with the No Action Alternative, using the applicable thresholds shown in **Table 5-2**.

FAA Order 1050.1E requires consideration of additional factors in determining whether to apply the thresholds listed above in determining the significance of noise impacts on Section 4(f) resources. If a reportable noise increase were to occur, the Section 4(f) properties would be evaluated further to determine if the project-related effects would constitute a constructive use. Further evaluation may include confirming that the property is in fact a Section 4(f) resource as well as identifying the specific attributes for which the property is managed (e.g., for traditional recreational uses or where other noise is very low and a quiet setting is a generally recognized purpose and attribute).

In cases where LWCF resources are “used” by a transportation project, FAA Order 1050.1E stipulates that replacement satisfactory to the Secretary of the Interior is specifically required for recreation lands aided by the Department of Interior’s LWCF. Therefore, these resources are considered as part of the Section 4(f) impact analysis process.

### **5.3.3 Potential Impacts – 2014 and 2019**

As stated in Section 5.1, the Proposed Action, when compared with the No Action Alternative, would not result in changes in aircraft noise exposure in 2014 or 2019 that would exceed the FAA’s significance threshold or result in reportable noise increases. Therefore, the Proposed Action would not result in potential impacts to Section 4(f) resources.

Under the No Action Alternative no changes to air traffic routes in the Northern California Metroplex would occur in either 2014 or 2019 and no effects related to changes in aircraft noise exposure would be anticipated. Therefore, the No Action Alternative would not result in potential impacts to Section 4(f) resources.

## **5.4 Historic and Cultural Resources**

This section discusses the analysis of impacts to historic resources and tribal lands under the Proposed Action and the No Action Alternative. Section 4.3.4 provides information on historic resources and tribal lands within the General Study Area. The FAA has initiated consultation with the appropriate State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officers (THPOs), as well as relevant local agencies, in accordance with Section 106 of the *National Historic Preservation Act of 1966* (16 U.S.C. § 470 *et seq.*) and the implementing regulations at 36 C.F.R. Part 800.

### **5.4.1 Summary of Impacts**

The aircraft noise exposure analysis indicates that there would be no substantial change to the noise environment at any historic resources or tribal land under the Proposed Action compared with the No Action Alternative. Furthermore, any changes in aircraft traffic patterns would occur at altitudes and distances from viewers that would not substantially impair the view or setting of historic resources or tribal lands. Therefore, no adverse indirect effects to historic resources or tribal lands under the Proposed Action would be anticipated for 2014 or 2019.

Under the No Action Alternative, no changes to air traffic routes in the Northern California Metroplex would occur in either 2014 or 2019 and no changes to aircraft noise exposure or changes in aircraft overflight patterns over historic resources or tribal lands would be anticipated. Therefore, no historic resources or tribal lands would be affected by aircraft



noise, nor would there be any visual impacts at historic resources or tribal lands under the No Action Alternative.

## 5.4.2 Methodology

The *National Historic Preservation Act of 1966* requires the FAA to consider the effects of its undertakings on properties listed or eligible for listing in the National Register of Historic Places (i.e., National Register). In assessing whether an undertaking, such as the Proposed Action, affects a property listed or eligible for listing on the National Register, FAA must consider both direct and indirect effects. Direct effects include the physical removal or alteration of an historic resource. Indirect effects include changes in the environment of the historic resource that could substantially alter the characteristics that made it eligible for listing on the National Register. Such changes could include changes in noise exposure impacts.

An area of potential effects (APE) has been defined to assess the potential indirect effects of the Proposed Action on historic resources. Federal regulations define the APE as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The scale and nature of an undertaking influences the APE and it may be different for different kinds of effects caused by the undertaking.

For purposes of this analysis, the APE is contiguous with the General Study Area. **Exhibit 4-5** in Section 4.3.4 shows the historic properties listed on the National Register that are found within the General Study Area. In addition, seven tribal properties are located within the General Study Area: the Auburn Rancheria, the Buena Vista Rancheria, the Colusa Rancheria, the Cortina Rancheria, the Lytton Rancheria, the Rumsey Rancheria, and the Shingle Springs Rancheria.

All historic and cultural resources identified within the APE require further evaluation by the FAA to determine if the property may experience a potential adverse effect. Therefore, noise exposure levels at points representing historic properties listed on the National Register listed and tribal lands were calculated for purposes of determining potential adverse effects. A list of the resources evaluated is provided in the *NorCal OAPM Noise Technical Report* available on the project website (<http://www.oapmenvironmental.com>). In addition, noise exposure results for the uniform grid points (located at 0.5 nm intervals throughout the General Study Area) were evaluated for purposes of identifying potential adverse effects to historic properties that are eligible but may not be listed on the National Register. In the event that a significant or reportable noise increase was identified at one of these grid points, the surrounding area would be examined for the presence of eligible-to-be-listed historic properties.

The analysis of potential impacts to historic and cultural resources considers whether these properties would experience a significant noise increase, when comparing the Proposed Action with the No Action Alternative, using the applicable thresholds shown in **Table 5-2**. Properties exposed to DNL 65 dB or higher under the Proposed Action and an increase of DNL 1.5 dB or higher may be considered to be potentially adversely effected by the project. Formal consultation with the appropriate SHPO/THPO would be conducted to confirm this determination. If reportable increases in noise are detected for properties exposed to DNL between DNL 45 dB and lower than 65 dB, the FAA would consider further whether the increase would result in an adverse effect on historic properties. If the noise analysis

indicates a reportable change for the resources, further research and/or survey on the subject property may be conducted to determine if the reportable increase would diminish the integrity of a property's setting for which the setting contributes to historical or cultural significance.

### **5.4.3 Potential Impacts – 2014 and 2019**

As stated in Section 5.1, when compared with the No Action Alternative, the Proposed Action would not result in changes in aircraft noise exposure in 2014 or 2019 that would exceed FAA's significance threshold or result in reportable noise increases. Therefore, the Proposed Action would not result in potential impacts to historic or cultural resources.

Under the No Action Alternative no changes to air traffic routes in the Northern California Metroplex would occur in either 2014 or 2019 and no effects related to changes in aircraft noise exposure would be anticipated. Therefore, the No Action Alternative would not result in impacts to historic or cultural resources.

## **5.5 Wildlife (Avian and Bat Species)**

This section discusses the analysis of potential impacts to avian and bat species under the Proposed Action and the No Action Alternative.

### **5.5.1 Summary of Impacts**

The greatest potential for impacts to wildlife species would result from wildlife strikes on avian and bat species at altitudes below 3,000 feet AGL. Under the Proposed Action, changes to air traffic flows would occur at or above 3,000 feet AGL and operation levels would remain the same as the No Action Alternative. Therefore, the Proposed Action would not result in significant impacts to avian and bat species when compared with the No Action Alternative.

The No Action Alternative would not involve changes to air traffic flows, land acquisition, construction, or other ground disturbance activities. Therefore, the No Action Alternative would not result in significant impacts to fish, wildlife, or plants.

### **5.5.2 Methodology**

The FAA's *Wildlife Strike Database* is the best information available for assessing potential impacts of aircraft on wildlife. Strike reports over the past 22 years aggregated nationally as well as for individual airports are available from the database to understand existing conditions. Strike reports are comparable to known information on the presence of specific species of concern to corroborate the reports.

This analysis involved a review of wildlife strike reports<sup>33</sup> for the Study Airports under both the Proposed Action and the No Action Alternative, and an evaluation of the potential for the presence of federal- and state-listed threatened and endangered species (i.e., special-status species) within the General Study Area. The FAA compared modifications in flight procedures to the occurrence of special-status species to qualitatively assess the likelihood of whether wildlife strikes might change under the Proposed Action.

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<sup>33</sup> U.S. Department of Transportation, Federal Aviation Administration, *Wildlife Strike Database* ([http://www.faa.gov/airports/airport\\_safety/wildlife/database/](http://www.faa.gov/airports/airport_safety/wildlife/database/); accessed March 2013 and January 2014).

### 5.5.3 Potential Impacts – 2014 and 2019

A significant impact would be likely to occur if the Proposed Action were to jeopardize the existence of special-status species or result in the destruction or adverse modification of critical habitat in the General Study Area. However, the Proposed Action would occur at or above 3,000 feet AGL, so there is no potential for the destruction or adverse modification of critical habitat in the General Study Area. Accordingly, the analysis is focused on the potential for significant impacts to species resulting from increased wildlife strikes with aircraft. Since 1990, the FAA has compiled reports of wildlife strikes with aircraft. The information is available to the public through the FAA's *Wildlife Strike Database* and the "Annual Report: Wildlife Strikes to Civil Aircraft in the United States." Between 1990 and 2011, the Wildlife Strike Database reported 133,159 wildlife strikes nationally.<sup>34</sup> Of the records that identify the type of animal involved in the strike incident, birds represent 97.1 percent of all strikes.<sup>35</sup> Of those records, 92 percent of the strikes occurred below 3,000 feet AGL.<sup>36</sup> The Wildlife Strike Database reports that gulls have the highest occurrence of strikes (16 percent), followed by doves/pigeons (15 percent).<sup>37</sup>

The *Wildlife Strike Database* reports strike information by airport and includes information on species struck, strike elevation, and type and extent of aircraft damage. **Table 5-4** provides a summary of wildlife strikes reported for the Study Airport between 1990 and August 2013. In total, 4,176 records provide strike altitude for incidents at the Study Airports involving birds and bats. Of these, a total of 3,781 reported strikes (91 percent of all strike records) occurred at altitudes below 3,000 feet AGL. A total of 1,705 strikes reported at the Study Airports included species identification.

The *Migratory Bird Treaty Act (MBTA) of 1918* (16 U.S.C. §§ 703–712) protects all the bird species identified in these reports. Furthermore, federal and state laws protect listed endangered and threatened species. **Tables 4-3 and 4-4** in Chapter 4, identify the 29 federal- and state-listed threatened and endangered bird species found in California. Seven of these species are unlikely to be found in the General Study Area. Thirteen strike reports for the Study Airports include listed species: one strike report at SFO identifies the Western snowy plover (*Charadrius alexandrinus nivosus*); 12 strike reports at SMF identify Swainson's hawks (*Buteo swainsoni*). However, all thirteen reports identify these strikes as occurring below 200 feet AGL.

The number of aircraft operations between the Proposed Action and No Action Alternative would be the same. Therefore, the assessment of the potential impacts focuses on changes to flight paths and the potential for impact due to wildlife strikes. As shown in **Table 5-4**, only 10 percent of bird/bat strikes (444 of 4,176 total records) occurred at altitudes above 3,000 feet AGL. The decline in the number of strikes reported above 3,000 feet AGL indicates that there is less likelihood of bird/bat strikes at these altitudes. Under the Proposed Action, the changes to proposed flight paths would occur at or above 3,000 feet AGL and no significant changes to arrival and departure corridors below 3,000 feet AGL would be expected. Therefore, no significant impacts to bird or bat species would be

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<sup>34</sup> Id.

<sup>35</sup> Id.

<sup>36</sup> Id.

<sup>37</sup> Id.

anticipated. The No Action Alternative would not involve changes to air traffic flows, land acquisition, construction, or other ground disturbance activities; therefore, no impacts to avian and bat species would occur.

**Table 5-4 FAA Wildlife Strike Database Records for Study Airports by Altitude (1990 - 2013)**

Type of Strike	Airport	3,000 ft. AGL or less	>3,000 ft. AGL to ≤ 10,000 ft. AGL	Greater than 10,000 ft. AGL	Total
Identified Bird and Bat Species	SFO	435	6	0	441
	OAK	217	10	0	227
	SJC	293	7	1	301
	SMF	686	49	1	736
	<b>Total</b>	<b>1,631</b>	<b>72</b>	<b>2</b>	<b>1,705</b>
Unknown Bird and Bat Species	SFO	537	53	6	596
	OAK	337	116	5	458
	SJC	265	42	6	313
	SMF	1,011	89	4	1,104
	<b>Total</b>	<b>2,150</b>	<b>300</b>	<b>21</b>	<b>2,471</b>
<b>Grand Total</b>	<b>3,781</b>	<b>372</b>	<b>23</b>	<b>4,176</b>	
<b>Percentage</b>	<b>91%</b>	<b>9%</b>	<b>1%</b>	<b>100%</b>	

Notes:

1/ The table does not include 637 strike reports that did not report altitudes.

2/ Percentages may not add up due to rounding.

Source: U.S. Department of Transportation, Federal Aviation Administration, *FAA Wildlife Strike Database* (<http://wildlife-mitigation.tc.faa.gov/wildlife/default.aspx>) (accessed December 4, 2013).

Prepared by: ATAC Corporation, December 2013.

## 5.6 Environmental Justice

This section presents a summary of the analysis of environmental justice impacts under the Proposed Action and the No Action Alternative.

### 5.6.1 Summary of Impacts

Neither the Proposed Action nor the No Action Alternative would displace people or businesses; therefore, implementation of the Proposed Action and No Action Alternative would not result in direct impacts in this category. No areas within the General Study Area would experience significant impacts to air quality or a significant impact related to a change in DNL exposure to people (see Section 5.1); therefore, no disproportionately high and adverse effects to children, minority populations, or low-income populations would occur under either the Proposed Action or the No Action Alternative.

### 5.6.2 Methodology

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that federal agencies include environmental justice as part of their mission by identifying and addressing as appropriate, the potential for disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. Environmental justice applies to all environmental resources. Therefore, a

disproportionately high and adverse human health or environmental effect on minority and low-income populations may represent a significant impact.

### **5.6.3 Potential Impacts – 2014 and 2019**

Under the Proposed Action, neither people nor businesses would be displaced. As discussed in Section 5.1, under the Proposed Action, no census block centroids in the General Study Area would experience a change in noise exposure in 2014 or 2019 that exceeds any of the FAA's significance thresholds for noise impacts on people. Therefore, no adverse direct or indirect effects would occur to any environmental justice populations within the General Study Area under the Proposed Action for 2014 and 2019.

Under the No Action Alternative, neither people nor businesses would be displaced. Furthermore, air traffic routes would not change and there would be no change in aircraft noise exposure in 2014 or 2019 that could result in an indirect impact. Therefore, the No Action Alternative would not result in disproportionately high and adverse human health or environmental effects on minority and low-income populations.

## **5.7 Energy Supply (Aircraft Fuel)**

This section discusses whether changes in the movement of aircraft would result in measurable effects on local energy supplies under the Proposed Action and the No Action Alternative.

### **5.7.1 Summary of Impacts**

The Proposed Action would result in a relatively small increase in aircraft fuel burned: 0.40 percent in 2014 and 0.36 percent increase in 2019. Compared to the No Action Alternative, these increases would not be expected to affect local aircraft fuel supplies; therefore, no significant impacts to energy supply would be anticipated.

The No Action Alternative would not involve changes to air traffic flows, construction, or other ground disturbance activities; therefore, the No Action Alternative would not result in the depletion of local energy supply.

### **5.7.2 Methodology**

The Proposed Action would not change the number of aircraft operations relative to the No Action Alternative, but it would involve changes to air traffic flows during the departure, descent, and approach phases of flight. These changes affect both the route an aircraft may follow as well as its climb-out and descent profiles. This in turn may directly affect aircraft fuel burn (or fuel expended). Aircraft fuel burn is considered a proxy for determining whether the Proposed Action would have a measurable effect on local energy supplies when compared with the No Action Alternative.

In addition to calculating aircraft noise exposure, the FAA's NIRS model calculates aircraft-related fuel burn (e.g., AAD flight schedules, flight tracks, and runway use). See Section 5.1.2 for further discussion on NIRS input data. Determining the difference in fuel burn between alternatives can be used as an indicator of changes in fuel consumption resulting from implementation of the Proposed Action when compared with the No Action Alternative.

### 5.7.3 Potential Impacts – 2014 and 2019

**Table 5-5** presents the results of the fuel burn analysis for the Proposed Action and No Action Alternative. In comparison to the No Action Alternative, the Proposed Action would result in approximately ten MT more fuel burned in 2014 (0.40 percent increase) and approximately ten MT more fuel burned in 2019 (0.36 percent increase). Given these relatively small increases, the FAA expects that when compared with the No Action Alternative, the Proposed Action would not adversely affect local fuel supplies. Therefore, no significant impacts to energy supply would be anticipated.

**Table 5-5 Energy Consumption Comparison**

	2014		2019	
	No Action Alternative	Proposed Action	No Action Alternative	Proposed Action
Fuel Burn (MT)	2,452.4	2,462.2	2,708.9	2,718.5
Volume Change (MT) (Proposed Action – No Action Alternative)		9.8		9.6
Percent Change from No Action Alternative		0.40%		0.36%

Note: MT = Metric Ton

Source: ATAC Corporation, December 2013 (NIRS modeling results).

Prepared by: ATAC Corporation, December 2013.

## 5.8 Air Quality

This section discusses the analysis of air quality impacts under the Proposed Action and the No Action Alternative.

### 5.8.1 Summary of Impacts

The Proposed Action would result in a slight increase in emissions when compared to the No Action Alternative. However, changes to procedures associated with the project would occur at or above 3,000 feet AGL, which are presumed to conform with the applicable state implementation plans (SIPs). Regardless, the slight increase in emissions is expected to have little if any effect on emissions or ground concentrations. Therefore, no significant impacts to air quality would be anticipated.

The No Action Alternative would not result in a change in the number of aircraft operations or air traffic routes; therefore, no impacts to air quality would be anticipated.

### 5.8.2 Methodology

Typically, significant air quality impacts would be identified if an action would result in the exceedance of one or more of the NAAQS for any time period analyzed.<sup>38</sup> Section 176(c) of the *Clean Air Act* requires that federal actions conform to the appropriate SIP in order to attain the air quality goals identified in the CAA. However, a conformity determination is not required if the emissions caused by a federal action would be less than the *de minimis* levels established in regulations issued by EPA.<sup>39</sup> FAA Order 1050.1E provides that further

<sup>38</sup> FAA Order 1050.1E, Chg.1, App. A, sec. 2.3.

<sup>39</sup> 40 C.F.R. § 93.153(b).

analysis for NEPA purposes is normally not required where emissions do not exceed the EPA's *de minimis* thresholds.<sup>40</sup> The EPA regulations identify certain actions that would not exceed these thresholds, including ATC activities and adoption of approach, departure, and enroute procedures for aircraft operations above the mixing height specified in the applicable SIP (or 3,000 feet AGL in places without an established mixing height). In addition, the EPA regulations allow federal agencies to identify specific actions as "presumed to conform" (PTC) to the applicable SIP.<sup>41</sup> In a notice published in the Federal Register, the FAA has identified several actions that "will not exceed the applicable *de minimis* emissions levels" and, therefore, are presumed to conform, including ATC activities and adoption of approach, departure, and enroute procedures for air operations.<sup>42</sup> The FAA's PTC notice explains that aircraft emissions above the mixing height do not have an effect on pollution concentrations at ground level. The notice also specifically notes that changes in air traffic procedures above 1,500 feet AGL and below the mixing height "would have little if any effect on emissions and ground concentrations."<sup>43</sup>

### **5.8.3 Potential Impacts – 2014 and 2019**

Under the Proposed Action there would be a slight increase in fuel burn (0.40 percent in 2014 and 0.36 percent in 2019) when compared to the No Action Alternative. While increased fuel burn corresponds with an increase in emissions, the Proposed Action would not affect any procedures below 3,000 feet AGL that would result in an increase in emissions and ground concentrations. Any operational changes that could result in an increase in fuel burn would occur at or above 3,000 feet AGL. Procedures above 3,000 feet AGL are assumed to have little if any effect on emissions and ground concentrations and are presumed to conform to all SIPs for criteria pollutants. Therefore, no further air quality analysis is necessary, a conformity determination is not required, and the Proposed Action would not result in a significant impact to air quality. The No Action Alternative would not result in a change in the number of aircraft operations or air traffic routes; therefore, no impacts to air quality would be anticipated.

## **5.9 Climate**

This section discusses greenhouse gas (GHG) emissions and effects to the climate as they relate to the Proposed Action and the No Action Alternative.

### **5.9.1 Summary of Impacts**

Although fuel burn would increase slightly under the Proposed Action as compared to the No Action Alternative, no significant impacts to the climate would be anticipated.

The No Action Alternative would not result in a change in the number of aircraft operations or air traffic routes; therefore, no impacts to climate would be anticipated.

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<sup>40</sup> FAA Order 1050.1E, Chg. 1, App. A, sec. 2.1c.

<sup>41</sup> Id at 93.153(f).

<sup>42</sup> Federal Presumed to Conform Actions under General Conformity, 72 Fed. Reg. 41565 (July 30, 2007).

<sup>43</sup> Id.

## 5.9.2 Methodology

In accordance with FAA guidance, estimated CO<sub>2</sub> emissions were calculated from the amount of fuel burned under the No Action Alternative and the Proposed Action in 2014 and 2019 (see Section 5.8). The resulting CO<sub>2</sub> emissions were then reported as CO<sub>2</sub>e.

## 5.9.3 Potential Impacts – 2014 and 2019

**Table 5-6** shows project-related CO<sub>2</sub>e emissions. In 2014, the Proposed Action would produce approximately 7,768 metric tons (MT) of CO<sub>2</sub>e and the No Action Alternative would produce approximately 7,738 MT of CO<sub>2</sub>e. This represents a slight increase of approximately 31 MT of CO<sub>2</sub>e or 0.40 percent under the Proposed Action when compared to the No Action Alternative. This would compromise less than 0.0000011 percent of U.S.-based greenhouse gas emissions<sup>44</sup> and less than 0.00000015 percent of global greenhouse gas emissions.<sup>45</sup> Similarly, in 2019, the Proposed Action would produce approximately 8,547 MT of CO<sub>2</sub>e and the No Action Alternative would produce approximately 8,577 MT of CO<sub>2</sub>e. This represents a slight increase of approximately 30 MT of CO<sub>2</sub>e or 0.36 percent under the Proposed Action when compared to the No Action Alternative. This would compromise less than 0.0000011 percent of U.S.-based greenhouse gas emission and less than 0.00000014 percent of global greenhouse gas emissions.

**Table 5-6 CO<sub>2</sub>e Emissions – 2014 and 2019**

	2014		2019	
	No Action Alternative	Proposed Action	No Action Alternative	Proposed Action
CO <sub>2</sub> e Emissions (MT)	7,737.5	7,768.2	8,546.6	8,577.0
Volume Change (MT)		30.7		30.4
(Proposed Action – No Action Alternative)		0.40%		0.36%

Note: CO<sub>2</sub>e = Carbon Dioxide Equivalent

Source: ATAC Corporation, October 2013 (NIRS modeling results).

Prepared by: ATAC Corporation, October 2013.

## 5.10 Cumulative Impacts

Consideration of cumulative impacts applies to the impacts resulting from the implementation of the Proposed Action with other actions. CEQ regulations define cumulative impact as “an impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other

<sup>44</sup> The EPA reports 2011 U.S. greenhouse gas emissions of 6,702 metric tons of CO<sub>2</sub>e. U.S. Environmental Protection Agency, “Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011,” April 20, 2013 (<http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2013-Main-Text.pdf>).

<sup>45</sup> The Intergovernmental Panel on Climate Change (IPCC) estimates global GHGs for 2004 at 49 gigatonnes, with CO<sub>2</sub> being the single largest source. Intergovernmental Panel on Climate Change, Working Group III, “Summary for Policymakers,” 9th Session, Bangkok, Thailand, April 30-May 4, 2007.



actions.”<sup>46</sup> The regulations also state that cumulative impacts can result from individually minor, but collectively significant actions that take place over a period of time.

### **5.10.1 Summary of Impacts**

The implementation of the Proposed Action when considered with other past, present, and reasonably foreseeable future actions would not be expected to result in significant cumulative impacts.

### **5.10.2 Methodology**

**Table 5-8** includes a list of proposed projects on or near the Study Airports that were reviewed to evaluate their potential to contribute to cumulative impacts. Due to the nature of the resources affected by the Proposed Action, only past, present, and reasonably foreseeable future actions with direct or indirect effects on aviation within the General Study Area were considered. Reasonably foreseeable future actions refer to projects likely to be completed before 2019 and for which information is available that provides enough specificity to provide meaningful information to a decision maker and the public.

The same significance thresholds used to determine impacts associated with the Proposed Action are applied to determine significant cumulative impacts. Because there is no potential for impact, those environmental resource categories that are not affected by the Proposed Action (listed in Section 4.2) are not further evaluated for cumulative impacts. Similarly, if no impacts to an environmental resource category were identified under the Proposed Action when compared to the No Action Alternative, then no further analysis for cumulative impacts was required. Environmental resource categories not further evaluated for cumulative impacts include noise, compatible land use, Section 4(f) resources, historic and cultural resources, wildlife (avian and bat species), and environmental justice. The cumulative impact analysis considers the potential for impacts in three categories: energy supply (aircraft fuel), air quality, and climate.

### **5.10.3 Potential Impacts – 2014 and 2019**

For each of the relevant past, present, and reasonably foreseeable future projects identified by the FAA, **Table 5-7** presents a summary of the potential for cumulative effects. Additional discussion of potential cumulative impacts, by environmental resource category, follows the table.

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<sup>46</sup> 40 C.F.R § 1508.7

**Table 5-7 Past, Present, and Reasonably Foreseeable Future Actions**

<b>Airport Runway Related Projects</b>		
<b>Project</b>	<b>Description</b>	<b>Cumulative Effects Analysis</b>
SFO - San Francisco International Airport Runway Safety Area Program	This project consists of improvements to the runway safety areas (RSAs) at SFO. Project components include displacing the landing thresholds for Runways 28L and 28R by approximately 300 feet to the west to provide 600 feet of RSA; relocating the west end of the Runway 10R-28L pavement by approximately 781 feet west; shifting Runway 1R-19L approximately 200 feet to the south and reducing the north end of the runway by a similar distance; shifting Runway 1L-19R approximately 450 feet to the south and reducing the north end of the runway by a similar distance; constructing EMAS beds beyond the Runway 01L/19R and 01R/19L thresholds; constructing taxiway improvements; relocating NAVAIDs and lighting systems; implementing declared distances, and various other airfield improvements. Project construction is scheduled to commence in Summer 2014.	This project received a Finding of No Significant Impact (FONSI) Record of Decision (ROD) in December 9, 2011. The environmental analysis prepared for this project found no significant impacts to the environmental resources evaluated. No significant cumulative impacts are anticipated with the Proposed Action.
OAK - Oakland International Airport Runway Safety Area Improvement Project	This project involves shifting Runway 15/33 by 75 feet to the southeast; relocating the Runway 12 approach threshold 520 feet to the northwest; displacing the Runway 30 landing threshold 115 feet to the northwest; constructing an EMAS bed beyond the approach end of Runway 10R; constructing taxiway improvements; relocating NAVAIDs and lighting systems; implementing declared distances, and various other airfield improvements. Project construction is scheduled to commence in late 2013. <sup>1</sup>	This project received a Finding of No Significant Impact (FONSI) Record of Decision (ROD) on August 17, 2012. The environmental analysis prepared for this project found no significant impacts to the environmental resources evaluated. No significant cumulative impacts are anticipated with the Proposed Action.

Notes: /1 OAK runway designations changed due to magnetic variation (MAGVAR) in October 2013.  
Source: City of San Francisco, Planning Department, *Mitigated Negative Declaration for the SFO Runway Safety Area Program*, November 2011 ([http://sfmea.sfplanning.org/2010.0755E\\_FMND.pdf](http://sfmea.sfplanning.org/2010.0755E_FMND.pdf); accessed October 2013); U.S. Department of Transportation, Federal Aviation Administration *Finding of No Significant Impact/Record of Decision for the SFO Runway Safety Area Program*, December 2011 (<https://archive.org/details/finalenvironment11ursc>; accessed November 2013); U.S. Department of Transportation, Federal Aviation Administration, *Finding of No Significant Impact/Record of Decision for the Oakland International Airport Runway Safety Area Improvement Project*, August 2012 (<http://www.portoakland.com/environment/publications.aspx>; accessed October 2013).

Prepared by: ATAC Corporation, December 2013.

#### 5.10.3.1 Potential Cumulative Impacts on Energy Supply (Aircraft Fuel)

The Proposed Action would result in a slight increase in fuel burn when compared to the No Action Alternative: for 2014, an increase of approximately ten MT (0.40 percent); for 2019, approximately ten MT (0.36 percent). However, as discussed in Section 5.7, aircraft fuel consumed under the Proposed Action would not exceed local supplies.

**Table 5-7** identifies two projects that in combination with the Proposed Action have the potential for cumulative impacts to energy supply. Environmental documentation completed for both these projects found no significant impacts to energy supply. Accordingly, no cumulative impacts would be anticipated. Therefore, none of the past, present, and reasonably foreseeable projects identified in **Table 5-7** have the potential to contribute cumulatively to impacts to energy supply.

#### 5.10.3.2 Potential Cumulative Impacts on Air Quality

As discussed in Section 4.3.8, portions of the General Study Area are in nonattainment for ozone (O<sub>3</sub>) and PM<sub>10</sub>. **Table 4-6** identifies the counties that are in nonattainment for O<sub>3</sub> and PM<sub>10</sub> standards. As discussed in Section 5.8, the Proposed Action would not have a significant impact on air quality when compared to the No Action Alternative, and the Proposed Action is presumed to conform with the SIP.

Environmental documentation completed for both the OAK and SFO RSA Projects found no significant long-term impacts to air quality. A potential for temporary construction related impacts to air quality were identified, but these impacts would be mitigated and short-term in nature. Accordingly, no cumulative impacts would be anticipated. Therefore, none of the past, present, and reasonably foreseeable projects identified in **Table 5-7** have the potential to contribute cumulatively to impacts to air quality.

#### 5.10.3.3 Potential Cumulative Impacts on Climate

The Proposed Action would result in a very slight increase in emissions of CO<sub>2</sub>e when compared to the No Action Alternative: for 2014, a slight increase of approximately 31 MT of CO<sub>2</sub>e (0.40 percent); for 2019, a slight increase of approximately 30 MT of CO<sub>2</sub>e (0.36 percent). However, as discussed in Section 5.9, this slight increase in CO<sub>2</sub>e would not represent a significant impact. Environmental documentation completed for the OAK RSA Project did not evaluate effects to climate. However, as implementation of project components were not anticipated to result in increases in the amount of fuel burned with corresponding increases in emissions, there should be no effect to climate. Accordingly, no cumulative impacts would be anticipated.

Environmental documentation completed for the SFO RSA Project identified GHG emissions that would result from Project construction. However, construction activities would not result in increases in emissions substantial enough to affect climate. Therefore, none of the past, present, and reasonably foreseeable projects identified in **Table 5-7** have the potential to contribute cumulatively to impacts to climate.

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