5.5 AIR QUALITY

This section presents an assessment of the potential for significant adverse air quality impacts resulting from the No Action Alternative and Alternatives B, D, and E. The analysis of significant air quality impacts was prepared using the latest version of the *Aviation Environmental Design Tool* (AEDT), Version 2d, to develop emissions inventories and in accordance with guidelines established under Federal Aviation Administration (FAA) Order 1050.1F, *Environmental Impacts: Policies and Procedures,* and *Aviation Emissions and Air Quality Handbook Version 3.*[1]

5.5.1 SIGNIFICANCE CRITERIA

FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures,* states air quality impacts are considered significant when an action would cause pollutant concentrations to exceed one or more of the National Ambient Air Quality Standards (NAAQS), as established by the U.S. Environmental Protection Agency (USEPA) under the Clean Air Act, including the 1990 Amendments (CAA), for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations.

An airport air quality assessment requires consideration under both the CAA, and the National Environmental Policy Act (NEPA). These two unique legislative acts require distinct analyses and may be separately applicable to an airport project. The CAA provides for the establishment of standards and programs to evaluate, achieve, and maintain acceptable air quality in the U.S. Under the CAA, the USEPA established a set of standards or criteria, the NAAQS, for six[2] pollutants determined to be potentially harmful to human health and welfare including carbon monoxide (CO), ozone (O_3), nitrogen oxides (NO_x), sulfur oxides (SO_x), particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb).[3] A description of the criteria pollutants and the NAAQS for the criteria pollutants intended to protect public health are provided in Appendix F-1, *Air Quality*. Areas of the country where air pollution levels consistently exceed these standards may be designated nonattainment by the USEPA.

According to FAA guidelines[4] that establish procedures to meet NEPA requirements, an air quality assessment prepared pursuant to NEPA regulations should include an analysis by evaluating the impact of the Proposed Action on the NAAQS. To conduct this impact analysis the air emissions associated with the No Action Alternative are compared to the air emissions from the Proposed Action and other alternatives evaluated in detail in the Environmental Impact Statement (EIS). The net emissions derived from the comparison of the No Action Alternative to the Proposed Action and other alternatives evaluated in detail indicates the impact to air quality of the Proposed Action and other alternatives evaluated in detail.

---

1 *Aviation Emissions and Air Quality Handbook, Version 3,* January 2015.

2 The Clean Air Act required EPA to set National Ambient Air Quality Standards for six pollutants. The EPA still considers there to be six not seven criteria pollutants. Particulate Matter is still considered one pollutant even though PM_{10} and $PM_{2.5}$ are analyzed. See EPA website. https://www.epa.gov/criteria-air-pollutants

3 Code of Federal Regulations, Title 40, Part 50 (Title 40 CFR Part 50) *National Primary and Secondary Ambient Air Quality Standards (*NAAQS), July 2011.

4 FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

The General Conformity regulations under the CAA establishes minimum values, referred to as the *de minimis* thresholds, for the criteria and precursor pollutants[5] that would have potential for significant air quality impacts. The Federal *de minimis* thresholds established under the CAA are provided in Appendix F-1.

When a Federal action would not cause annual net emissions that equal or exceed the relevant *de minimis* thresholds for the pollutants of concern, the action would not exceed the threshold for detailed consideration under the General Conformity Rule and further analysis to prepare a General Conformity Determination would not be required. Further, when an action with *de minimis* annual net emissions would not cause an exceedance of the NAAQS, a dispersion analysis to show compliance to the NAAQS would not be required.[6] Under these circumstances, no further analysis under the CAA or NEPA would be required.

The results of the emissions inventory prepared for each alternative were compared to the emissions for Alternative A (No Action) of the same year to disclose the potential increase in emissions caused by each alternative. The comparison of the emissions inventories, which included an inventory of construction emissions, was used for the evaluation of General Conformity as required under the CAA.[7]

All input data, assumptions, and methodologies used to develop this air quality assessment are provided in Appendix F-1. The Air Quality Technical Report provides an overview of the requirements under NEPA and the CAA, and documents FAA's coordination with Federal, state, and local air quality agencies. The existing air quality conditions at DVO are described in Chapter Four, *Affected Environment*.

5.5.2 FUTURE CONDITIONS: 2024

Alternative A:
No Action

Airfield Configuration: Alternative A is the No Action alternative for 2024. Airport physical conditions such as the airfield configuration are assumed to be unchanged.

Aircraft Activity Levels and Fleet Mix Characteristics: With or without the development of a runway alternative, air traffic is projected to increase each year and by 2024 the number of annual aircraft operations is expected to be 84,404, which is higher than Existing Conditions (2018) by 1,674 operations.

---

5 Precursor pollutants are pollutants that are involved in the chemical reactions that form the resultant pollutant. Ozone precursor pollutants are NO_x, VOC, and SO_2, whereas $PM_{2.5}$ precursor pollutants include NO_x, VOC, SO_x, and ammonia (NH_3).

6 *Aviation Emissions and Air Quality Handbook, Version 3,* January 2015.

7 The FAA continues working to identify an unleaded replacement for leaded aviation fuel (Avgas) for piston-engine propeller aircraft (Turbo-prop propeller aircraft and jet aircraft fuel contains no lead). Currently, the FAA is in Phase II testing of unleaded Avgas and the completion date for the program is set for December 2019. Lead emissions for future years would be less than calculated in this Supplement to the Final EIS if the amount of lead in Avgas is reduced or eliminated.

Mobile Sources: Future mobile sources were projected assuming the increase in the number of vehicles at the Airport would be directly related to projected increases in aircraft annual operations.

Stationary Sources: Energy consumption for stationary sources for the 2024 Alternative A analysis year was projected using the growth in aircraft operations.

Emissions Inventory: The emissions inventory for this alternative provided in **Table 5.5-1** shows the greatest overall emission contribution comes from aircraft operations.

Table 5.5-1
ALTERNATIVE A (2024) EMISSIONS INVENTORY
Gnoss Field Airport

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)						
	CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	273.69	3.58	0.94	0.33	0.23	0.23	1.1
GSE	0.29	0.13	0.18	0.01	0.01	0.01	NA
GAV	0.93	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	1.22	0.00	0.05	0.05	NA
TOTAL	***275.44***	***3.93***	***2.52***	***0.34***	***0.29***	***0.29***	**1.1**

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM_{10}: Course particulate matter
$PM_{2.5}$: Fine particulate matter
Pb: Lead
GSE: Ground Support Equipment, which includes the Airport's two fuel trucks and mowing tractor
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018

Alternative B:
Extend Runway to the Northwest by 1,100 Feet (Sponsor's Proposed Project)

Airfield Configuration: 2024 Alternative B includes a 1,100-foot extension of Runway 13/31 to the northwest.

Aircraft Activity Levels and Fleet Mix Characteristics: With or without the implementation of this alternative the number of annual aircraft operations for 2024 would be the same as discussed for 2024 Alternative A. However, aircraft air emissions would increase slightly as compared to the 2024 Alternative A because the extension of the runway would cause an increase in aircraft taxiing time to get to the ends of the longer runway. The distance from the central aircraft parking area to the runway ends under Alternative B would also be longer as compared to Alternatives D and E. Therefore, Alternative B would have increased air emissions associated with this increased aircraft taxi time as compared to Alternatives D and E.

In addition to the increase in taxi time, more aircraft would be able to take off with 100 percent of its Maximum Take Off Weight (MTOW) as compared to a reduced MTOW in the 2018 Alternative A. The ability to take off with 100 percent of MTOW as compared to a reduced MTOW would result in a slight increase in annual aircraft emissions. This is because when an aircraft is heavier it takes slightly longer to takeoff and climb-out as compared to a lighter aircraft thus burning slightly more fuel and producing slightly greater air emissions. However, this increase is partially offset because under Alternative B, aircraft would no longer be required to make stops at alternate airports to refuel to reach their final destination. Eliminating an extra aircraft takeoff and landing while en route to a final destination would slightly reduce air emissions associated with this alternative. However, given the variability of this activity in terms of which aircraft and airports, and to present the greatest potential air emissions, the potential reduction in air emissions at DVO or other area airports associated with implementation of this alternative was not quantified in this analysis.

Mobile Sources: Alternative B would not increase the number of ground access vehicles using DVO beyond the 2024 Alternative A condition because there would be no new buildings, hangars, or additional annual aircraft operations.

Stationary Sources: No new buildings or hangars are proposed for 2024 Alternative B; therefore, emissions from stationary sources would be the same as 2024 Alternative A.

Emissions Inventory: The emissions inventory for 2024 Alternative B provided in **Table 5.5-2** shows the greatest overall emission contribution comes from aircraft operations. See Table 5.5-10 at the end of this section for a comparison of the increase in emissions of each alternative against Alternative A for each year.

Table 5.5-2
ALTERNATIVE B (2024) EMISSIONS INVENTORY
Gnoss Field Airport

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)						
	CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	316.51	5.96	1.00	0.39	0.24	0.24	1.10
GSE	0.30	0.13	0.18	0.01	0.01	0.01	NA
GAV	0.93	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	1.22	0.00	0.05	0.05	NA
TOTAL	***318.26***	***6.31***	***2.57***	***0.40***	***0.31***	***0.31***	***1.10***

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM_{10}: Course particulate matter
$PM_{2.5}$: Fine particulate matter
Pb: Lead
GSE: Ground Support Equipment, which includes the Airport's two fuel trucks and mowing tractor
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available

Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018

Alternative D:
Extend Runway to the Southeast by 240 Feet and to the Northwest by 860 Feet

Airfield Configuration: 2024 Alternative D includes an extension of Runway 13/31 to the southeast by 240 feet and to the northwest by 860 feet.

Aircraft Activity Levels and Fleet Mix Characteristics: With or without the implementation of this alternative the number of annual aircraft operations for 2024 would be the same as discussed for 2024 Alternative A. However, aircraft air emissions would increase slightly as compared to the 2024 Alternative A because the extension of the runway would cause an increase in aircraft taxiing time to get to the ends of the longer runway. However, the distance from the central aircraft parking area to the runway ends under Alternative D would be shorter as compared to Alternative B but longer as compared to Alternative E. Therefore, Alternative D would have slightly lower air emissions associated with this increased aircraft taxi time as compared to Alternative B.

In addition to the increase in taxi time, in this alternative more aircraft would be able to take off with 100 percent of its MTOW as compared to a reduced MTOW in the 2024 Alternative A. The ability to take off with 100 percent of MTOW as compared to a reduced MTOW would result in a slight increase in annual aircraft emissions. This is because when an aircraft is heavier it takes slightly longer to takeoff and climb-out as compared to a lighter aircraft thus burning slightly more fuel and producing slightly greater air emissions. However, this increase is partially offsite because under Alternative D, aircraft would no longer be required to make stops at alternate airports to refuel to reach their final destination. Eliminating an extra aircraft takeoff and landing while en route to a final destination would slightly reduce air emissions associated with this alternative. However, given the variability of this activity in terms of which aircraft and airports, and to present the greatest potential air emissions, the potential reduction in air emissions at DVO or other area airports associated with implementation of this alternative was not quantified in this analysis.

Mobile Sources: Alternative D would not increase the number of ground access vehicles using DVO beyond the 2024 Alternative A condition because there would be no new buildings, hangars, or additional annual aircraft operations.

Stationary Sources: No new buildings or hangars are proposed for 2024 Alternative D; therefore, emissions from stationary sources would be the same as 2024 Alternative A.

Emissions Inventory: The emissions inventory for 2024 Alternative D provided in **Table 5.5-3** shows the greatest overall emission contribution comes from aircraft operations. See Table 5.5-10 at the end of this section for a comparison of the increase in emissions of each alternative against Alternative A for each year.

Table 5.5-3
ALTERNATIVE D (2024) EMISSIONS INVENTORY
Gnoss Field Airport

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)						
	CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	316.08	5.93	1.00	0.39	0.24	0.24	1.10
GSE	0.30	0.13	0.18	0.01	0.01	0.01	NA
GAV	0.93	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	1.22	0.00	0.05	0.05	NA
TOTAL	**317.83**	**6.29**	**2.57**	**0.40**	**0.31**	**0.31**	**1.10**

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM_{10}: Course particulate matter
$PM_{2.5}$: Fine particulate matter
Pb: Lead
GSE: Ground Support Equipment, which includes the Airport's two fuel trucks and mowing tractor
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available

Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018

Alternative E:
Extend Runway to the Northwest by 300 Feet

Airfield Configuration: 2024 Alternative E includes a 300-foot extension of Runway 13/31 to the northwest.

Aircraft Activity Levels and Fleet Mix Characteristics: With or without the implementation of this alternative, the number of annual aircraft operations for 2024 would be the same as discussed for 2024 Alternative A. However, aircraft air emissions would increase slightly as compared to the 2024 Alternative A because the extension of the runway would cause an increase in aircraft taxiing time to get to the ends of the longer runway. The distance from the central aircraft parking area to the runway ends under Alternative E would be shorter as compared to Alternatives B and D. Therefore, Alternative E would have slightly reduced air emissions associated with this reduced aircraft taxi time as compared to Alternatives B and D.

In addition to the increase in taxi time, in this alternative more aircraft would be able to take off with 100 percent of its MTOW as compared to a reduced MTOW with the 2024 Alternative A. The ability to take off with 100 percent of MTOW as compared to a reduced MTOW would result in a slight increase in annual aircraft emissions. This is because when an aircraft is heavier it takes slightly longer to takeoff and climb-out as compared to a lighter aircraft thus burning slightly more fuel and producing slightly greater air emissions. However, this increase is partially offsite because under Alternative E, aircraft would no longer be required to make stops at alternate airports to refuel to reach their final destination. Eliminating an extra aircraft takeoff and landing while en route to a final destination would slightly reduce air emissions associated with this alternative. However, given the variability of this activity in terms of which aircraft and airports, and to present the greatest potential air emissions, the potential reduction in air emissions at DVO or other area airports associated with implementation of this alternative was not quantified in this analysis.

Mobile Sources: Alternative E would not increase the number of ground access vehicles using DVO beyond the 2024 Alternative A condition because there would be no new buildings, hangars, or additional annual aircraft operations.

Stationary Sources: No new buildings or hangars are proposed for 2024 Alternative E; therefore, emissions from stationary sources would be the same as 2024 Alternative A.

Emissions Inventory: The emissions inventory for 2024 Alternative E provided in **Table 5.5-4**, shows the greatest overall emission contribution comes from aircraft operations. See Table 5.5-10 at the end of this section for a comparison of the increase in emissions of each alternative against Alternative A for each year.

Table 5.5-4
ALTERNATIVE E (2024) EMISSIONS INVENTORY
Gnoss Field Airport

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)						
	CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	311.51	5.69	0.99	0.38	0.24	0.24	1.10
GSE	0.30	0.13	0.18	0.01	0.01	0.01	NA
GAV	0.93	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	1.22	0.00	0.05	0.05	NA
TOTAL	**313.26**	**6.04**	**2.56**	**0.39**	**0.30**	**0.30**	**1.10**

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM_{10}: Course particulate matter
$PM_{2.5}$: Fine particulate matter
Pb: Lead
GSE: Ground Support Equipment, which includes the Airport's two fuel trucks and mowing tractor
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available

Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018

5.5.3 CONSTRUCTION

Although a final construction schedule has not been determined, construction is assumed to be complete before 2024. During the years prior to 2024, a two year construction program is proposed. A total inventory of construction emissions was prepared using the computer model California Emissions Estimator Model (CalEEMod) program (version 2016.3.2). The CalEEMod results reflect the anticipated emissions due to the use of construction equipment and vehicles for the construction of each alternative. The type and number of construction vehicles and equipment required is based on CalEEMod defaults have been provided by the various California Air Districts to account for local requirements and conditions. Modeling assumptions regarding construction vehicles and anticipated equipment required and details of construction tasks are provided in Appendix F-1.

The inventory of construction emissions for Alternatives B, D, and E are summarized in **Table 5.5-5**. Alternative E proposes to shift Runway 13/31 106 feet to the north to extend the Runway Safety Area south of the end of the runway (south of the threshold of Runway 13), and extend Runway 13/31 300 feet to the northwest, an overall length of 406 feet while Alternative B and Alternative D would both have an extension of 1,100 feet. Therefore, both Alternative B and Alternative D would be expected to involve more intense construction quantities and materials than those used in Alternative E. Therefore, construction emissions of Alternative E would be lower than those estimated for Alternative B and D.

Table 5.5-5
ANNUAL CONSTRUCTION EMISSIONS INVENTORY – ALTERNATIVES B, D, AND E
Gnoss Field Airport

CONSTRUCTION YEARS	ANNUAL CONSTRUCTION EMISSIONS (tons per year)					
	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
ALTERNATIVE B						
Year 1	2.54	NA	5.27	0.01	0.21	0.19
Year 2	0.61	NA	0.53	0.00	0.03	0.03
ALTERNATIVE D						
Year 1	2.59	NA	5.49	0.01	0.21	0.19
Year 2	0.61	NA	0.53	0.00	0.03	0.03
ALTERNATIVE E						
Year 1	2.48	NA	4.96	0.01	0.21	0.19
Year 2	0.61	NA	0.53	0.00	0.03	0.03

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM_{10}: Course particulate matter
$PM_{2.5}$: Fine particulate matter
Note: PM_{10} and $PM_{2.5}$ values are for construction exhaust emissions only.
Source: CalEEMod, version 2016.3.2; Landrum & Brown Analysis, 2018.

Airport construction activities would result in a short-term increase in emissions of criteria air pollutants. Air pollution during the construction period would be a consequence of direct emissions from construction equipment. The evaluation of construction emissions showed the annual net emissions would be below the *de minimis* thresholds established under the CAA conformity rules. Construction would not cause a significant adverse air quality impact. In addition, these emissions would be temporary and would be mitigated to the extent possible by Marin County through the construction contractor as they comply with the guidelines in AC 150/5370-10H, *Standard Specifications for Construction of Airports, Item C-102, Temporary Air and Water Pollution Control, Soil Erosion, and Siltation Control*. Additional mitigation measures to reduce the amount of fugitive dust from construction are provided in Appendix F-1.

5.5.4 FUTURE CONDITIONS: 2029

For air quality impacts, a second timeframe was analyzed that represents five years beyond the opening of the project. The following provides an overview of the potential air quality impacts from operation of the Airport in 2029 under each alternative condition.

Alternative A:
No Action

Airfield Configuration: Alternative A is the No Action alternative for 2029. Airport physical conditions are assumed to be consistent with Existing Conditions (2018).

Aircraft Activity Levels and Fleet Mix Characteristics: With or without the development of a runway alternative, air traffic is projected to increase each year and by 2029 the number of annual aircraft operations is expected to be 85,990, which is higher than 2024 conditions by 1,586 operations.

Mobile Sources: Future mobile sources were projected assuming the increase in the number of vehicles at the Airport would be directly related to projected increases in aircraft annual operations.

Stationary Sources: Energy consumption for stationary sources for the 2029 Alternative A analysis year was projected using the growth in aircraft operations.

Emissions Inventory: The emissions inventory for this alternative provided in **Table 5.5-6** shows the greatest overall emission contribution comes from aircraft operations.

Table 5.5-6
ALTERNATIVE A (2029) EMISSIONS INVENTORY
Gnoss Field Airport

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)						
	CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	281.00	3.66	0.97	0.34	0.23	0.23	1.10
GSE	0.31	0.13	0.17	0.01	0.01	0.01	NA
GAV	0.95	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	1.22	0.00	0.05	0.05	NA
TOTAL	**282.78**	**4.01**	**2.54**	**0.35**	**0.29**	**0.29**	**1.10**

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM_{10}: Course particulate matter
$PM_{2.5}$: Fine particulate matter
Pb: Lead
GSE: Ground Support Equipment, which includes the Airport's two fuel trucks and mowing tractor
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.

Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018

Alternative B:
Extend Runway to the Northwest by 1,100 Feet (Sponsor's Proposed Project)

Airfield Configuration: 2029 Alternative B would include no additional development, so the airfield layout would be the same as 2024 Alternative B.

Aircraft Activity Levels and Fleet Mix Characteristics: With or without the implementation of this alternative the number of annual aircraft operations for 2029 would be the same as discussed for 2029 Alternative A. However, emissions due to aircraft would change as compared to the 2029 Alternative A because the extension of the runway would cause a change in taxi time. This alternative would result in an increase in average aircraft taxi time as compared to the 2029 Alternative A. Longer taxi times increase annual aircraft emissions. It is expected that Alternative B would have an increased taxi time and therefore increased annual emissions over Alternatives D and E because the extension of Alternative B increases the distance from the central aircraft parking area to the runway ends as compared to Alternatives D and E.

In addition to the increase in taxi time, more aircraft in this alternative would be able to take off with 100 percent of its MTOW as compared to a reduced MTOW in the 2029 Alternative A. The ability to take off with 100 percent of MTOW as compared to a reduced MTOW would result in a slight increase in annual aircraft emissions. This is because when an aircraft is heavier it takes slightly longer to takeoff and climbout as compared to a lighter aircraft thus burning slightly more fuel and producing slightly greater air emissions. It is anticipated that under Alternative B, aircraft would no longer be required to make stops at alternate airports to refuel to reach their final destination and thus reduce emissions. However, given the variability of this activity in terms of which aircraft and airports, and to present an estimate of the greatest potential emissions, the potential reduction in air emissions at DVO or other area airports was not quantified in this analysis.

Mobile Sources: Alternative B would not increase the number of ground access vehicles using DVO beyond the 2029 Alternative A condition because there would be no new buildings, hangars, or additional annual aircraft operations.

Stationary Sources: No new buildings or hangars are proposed for 2029 Alternative B; therefore, emissions from stationary sources would be the same as 2029 Alternative A.

Emissions Inventory: The emissions inventory for 2029 Alternative B provided in **Table 5.5-7**, shows the greatest overall emission contribution comes from aircraft operations. See Table 5.5-10 at the end of this section for a comparison of the increase in emissions of each alternative against Alternative A for each year.

Table 5.5-7
ALTERNATIVE B (2029) EMISSIONS INVENTORY
Gnoss Field Airport

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)						
	CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	324.99	6.09	1.03	0.40	0.25	0.25	1.10
GSE	0.31	0.13	0.17	0.01	0.01	0.01	NA
GAV	0.95	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	1.22	0.00	0.05	0.05	NA
TOTAL	**326.77**	**6.45**	**2.60**	**0.41**	**0.32**	**0.32**	**1.10**

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM_{10}: Course particulate matter
$PM_{2.5}$: Fine particulate matter
Pb: Lead
GSE: Ground Support Equipment, which includes the Airport's two fuel trucks and mowing tractor
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available

Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018

Alternative D:
Extend Runway to the Southeast by 240 Feet and to the Northwest by 860 Feet

Airfield Configuration: 2029 Alternative D would include no additional development, so the airfield layout would be the same as 2024 Alternative D.

Aircraft Activity Levels and Fleet Mix Characteristics: With or without the implementation of this alternative the number of annual aircraft operations for 2029 would be the same as discussed for 2029 Alternative A. However, emissions due to aircraft would change as compared to the 2029 Alternative A because the extension of the runway would cause a change in taxi time. This alternative would result in an increase in average aircraft taxi time as compared to the 2029 Alternative A. Longer taxi times increase annual aircraft emissions. It is expected that Alternative D would have a decreased taxi time compared to Alternative B and an increased taxi time compared to Alternative E. Alternative B increases the distance from the central aircraft parking area to the runway ends as compared to Alternative D. However, Alternative E reduces the distance from the central aircraft parking area to the runway ends as compared to Alternative D. Therefore, Alternative D would have decreased annual emissions compared to Alternative B and increased annual emissions compared to Alternative E.

In addition to the increase in taxi time, more aircraft in this alternative would be able to take off with 100 percent of its MTOW as compared to a reduced MTOW in the 2029 Alternative A. The ability to take off with 100 percent of MTOW as compared to a reduced MTOW would result in a slight increase in annual aircraft emissions. This is because when an aircraft is heavier it takes slightly longer to takeoff and climbout as compared to a lighter aircraft thus burning slightly more fuel and producing slightly greater air emissions. It is anticipated that under Alternative D, aircraft would no longer be required to make stops at alternate airports to refuel to reach their final destination and thus reduce emissions. However, given the variability of this activity in terms of which aircraft and airports, and to present a worst-case scenario for estimated emissions, the potential reduction in air emissions at DVO or other area airports was not quantified in this analysis.

Mobile Sources: Alternative D would not increase the number of ground access vehicles using DVO beyond the 2029 Alternative A condition because there would be no new buildings, hangars, or additional annual aircraft operations.

Stationary Sources: No new buildings or hangars are proposed for 2029 Alternative D; therefore, emissions from stationary sources would be the same as 2029 Alternative A.

Emissions Inventory: The emissions inventory for 2029 Alternative D provided in **Table 5.5-8**, shows the greatest overall emission contribution comes from aircraft operations. See Table 5.5-10 at the end of this section for a comparison of the increase in emissions of each alternative against the No Action condition for each year.

Table 5.5-8
ALTERNATIVE D (2029) EMISSIONS INVENTORY
Gnoss Field Airport

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)						
	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$	Pb
Aircraft	324.54	6.07	1.03	0.40	0.25	0.25	1.10
GSE	0.31	0.13	0.17	0.01	0.01	0.01	NA
GAV	0.95	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	1.22	0.00	0.05	0.05	NA
TOTAL	**326.32**	**6.43**	**2.60**	**0.41**	**0.32**	**0.32**	**1.10**

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM_{10}: Course particulate matter
$PM_{2.5}$: Fine particulate matter
Pb: Lead
GSE: Ground Support Equipment, which includes the Airport's two fuel trucks and mowing tractor
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available

Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018

Alternative E:
Extend Runway to the Northwest by 300 Feet

Airfield Configuration: 2029 Alternative E would include no additional development, so the airfield layout would be the same as 2024 Alternative E.

Aircraft Activity Levels and Fleet Mix Characteristics: With or without the implementation of this alternative the number of annual aircraft operations for 2029 would be the same as discussed for 2029 Alternative A. However, emissions due to aircraft would change as compared to the 2029 Alternative A because the extension of the runway would cause a change in taxi time. This alternative would result in an increase in average aircraft taxi time as compared to the 2029 Alternative A. Longer taxi times increase annual aircraft emissions. It is expected that Alternative E would have a decreased taxi time and therefore decreased annual emissions over Alternatives B and D because the extension of Alternative E decreases the distance from the central aircraft parking area to the runway ends as compared to Alternatives B and D.

In addition to the increase in taxi time, more aircraft in this alternative would be able to take off with 100 percent of its MTOW as compared to a reduced MTOW in the 2029 Alternative A. The ability to take off with 100 percent of MTOW as compared to a reduced MTOW would result in a slight increase in annual aircraft emissions. This is because when an aircraft is heavier it takes slightly longer to takeoff and climbout as compared to a lighter aircraft thus burning slightly more fuel and producing slightly greater air emissions. It is anticipated that under Alternative E, aircraft would no longer be required to make stops at alternate airports to refuel to reach their final destination and thus reduce emissions. However, given the variability of this activity in terms of which aircraft and airports, and to present an estimate of the greatest potential emissions, the potential reduction in air emissions at DVO or other area airports was not quantified in this analysis.

Mobile Sources: Alternative E would not increase the number of ground access vehicles using DVO beyond the 2029 Alternative A condition because there would be no new buildings, hangars, or additional annual aircraft operations.

Stationary Sources: No new buildings or hangars are proposed for 2029 Alternative E; therefore, emissions from stationary sources would be the same as 2029 Alternative A.

Emissions Inventory: The emissions inventory for 2029 Alternative E provided in **Table 5.5-9**, shows the greatest overall emission contribution comes from aircraft operations. See Table 5.5-10 at the end of this section for a comparison of the increase in emissions of each alternative against Alternative A for each year.

Table 5.5-9
ALTERNATIVE E (2029) EMISSIONS INVENTORY
Gnoss Field Airport

EMISSION SOURCES	ANNUAL EMISSIONS (tons per year)						
	CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**Pb**
Aircraft	319.84	5.82	1.02	0.39	0.25	0.25	1.10
GSE	0.31	0.13	0.17	0.01	0.01	0.01	NA
GAV	0.95	0.13	0.17	0.00	0.00	0.00	NA
Stationary Sources	0.52	0.09	1.22	0.00	0.05	0.05	NA
TOTAL	**321.62**	**6.17**	**2.59**	**0.40**	**0.31**	**0.31**	**1.10**

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM_{10}: Course particulate matter
$PM_{2.5}$: Fine particulate matter
Pb: Lead
GSE: Ground Support Equipment, which includes the Airport's two fuel trucks and mowing tractor
GAV: Ground Access Vehicles
Total emissions may not sum exactly due to rounding.
NA = Not applicable/Not available
Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018

5.5.5 DETERMINATIONS

5.5.5.1 NEPA Analysis for Air Quality

The FAA has a responsibility under NEPA to include in its EIS's sufficient analysis to disclose the extent of a project's impact on the attainment and maintenance of the NAAQS and any applicable state air quality standards. The emissions inventories are compared to Alternative A emissions of the same year to discern the net emissions (the difference between the total emissions from each of the development alternatives and Alternative A). (**Table 5.5-10**, summarizes the net difference in emissions and compares that to the CAA conformity threshold for each pollutant.) If an alternative's net emissions exceed the conformity threshold, then a significant impact would occur. Conversely, if an alternative's net emissions do not exceed the conformity threshold then a significant impact would not occur.

Section 176(c) of the CAA, as amended in 1990, requires that Federal actions conform to the appropriate Federal or State air quality plans (FIP's or SIP's) in order to attain the CAA's air quality goals. Marin County is located within the Bay Area Air Quality Management (BAAQMD) District of California. The BAAQMD is responsible for assuring the NAAQS are attained. Therefore, BAAQMD thresholds have been included in the analysis.

Alternatives B, D, and E were compared to Alternative A of the same year. Annual net emissions of CO for Alternative B, D, and E for 2024, are well below the threshold of 100 tons per year. Annual net emissions of CO for Alternative B and D for 2029, are also well below the threshold of 100 tons per year. Annual net emissions of $PM_{2.5}$ for Alternative B, D, and E for 2024, as compared to Alternative A, are well below the Federal threshold of 100 tons per year and the California threshold of 10 tons per year. Annual net emissions of VOC and NO_X for Alternative B, D, and E are also well below the Federal thresholds established under the CAA.

The evaluation showed that the net emissions for each project alternative in 2024 and 2029 and from construction activities would be below the CAA thresholds, would not exceed any NEPA significance criteria, and the impact of Alternative B, D, or E on air quality is not significant.

Table 5.5-10
ANNUAL NET EMISSIONS OF CRITERIA AND PRECURSOR AIR POLLUTANTS AND CONFORMITY THRESHOLD (BUILD ALTERNATIVES COMPARED TO NO ACTION OF THE SAME YEAR)
Gnoss Field Airport

ALTERNATIVES	IMPACT OF CRITERIA AND PRECURSOR POLLUTANT EMISSIONS (in tons per year)						
	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$	Pb
CLEAN AIR ACT Conformity Threshold	**100**	**100**	**100**	**100**	**NA**	**100**	**NA**
BAAQMD Threshold	**NA**	**NA**	**10**	**NA**	**15**	**10**	**NA**
Construction Year 1							
Alternative B	2.54	NA	5.27	0.01	0.21	0.19	N/A
Alternative D	2.59	NA	5.49	0.01	0.21	0.19	N/A
Alternative E	2.48	NA	4.96	0.01	0.21	0.19	N/A
Construction Year 2							
Alternative B	0.61	NA	0.53	0.00	0.03	0.03	N/A
Alternative D	0.61	NA	0.53	0.00	0.03	0.03	N/A
Alternative E	0.61	NA	0.53	0.00	0.03	0.03	N/A
2024							
Alternative B	42.82	2.38	0.06	0.05	0.02	0.02	0.0
Alternative D	42.39	2.36	0.06	0.05	0.02	0.02	0.0
Alternative E	37.82	2.12	0.04	0.05	0.01	0.01	0.0
2029							
Alternative B	43.99	2.44	0.06	0.06	0.02	0.02	0.0
Alternative D	43.54	2.42	0.06	0.06	0.02	0.02	0.0
Alternative E	38.84	2.16	0.05	0.05	0.02	0.02	0.0

CO: Carbon Monoxide
VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
SOx: Sulfur Oxides
PM_{10}: Course particulate matter
$PM_{2.5}$: Fine particulate matter
Pb: Lead
NA = Not applicable/Not available
Total emissions may not sum exactly due to rounding.

Source: AEDT, version 2d; MOVES, version 2014a; Landrum & Brown Analysis, 2018

5.5.5.2 State Implementation Plan (SIP) Compliance

According to the CAA, each state must provide the USEPA with a SIP. The SIP must include a strategy for air quality improvement in local areas for each criteria pollutant that exceeds the NAAQS. The SIP must also include a plan to maintain acceptable air quality in areas that do not exceed the NAAQS.

The California SIP is made up of a series of plans for each of the major air basins in the state. The Final Bay Area 2017 Clean Air Plan[8] was adopted on April 19, 2017.

The air quality evaluation showed that annual net emissions caused by operation and construction of the alternatives would not equal or exceed the relevant *de minimis* thresholds for any criteria and precursor air pollutant. Therefore, the alternatives would comply with the Final Bay Area 2017 Clean Air Plan/SIP because the alternatives would not cause or contribute to new violations of any NAAQS; increase the frequency or severity of existing violations of any NAAQS; or, delay the timely attainment of any NAAQS or any required interim emission reductions or milestones. A more detailed discussion of the Final Bay Area 2017 Clean Air Plan is provided in Appendix F-1.

5.5.5.3 General Conformity Evaluation

The General Conformity Rule establishes the procedures and criteria for determining whether certain Federal actions conform to state or Federal (EPA) air quality implementation plans (SIPs/FIPs). The evaluation of General Conformity showed that annual net emissions caused by operation and construction of Alternative B, D, or E, would not equal or exceed the applicable *de minimis* thresholds for the pollutants of concern. Therefore, implementation of Alternative B, D, or E would not have a significant impact on air quality. A CAA General Conformity Determination is not necessary for Alternative B, D, or E.

Further, because the emissions caused by Alternative B and the other alternatives are *de minimis*, in accordance with FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures,* and *Aviation Emissions and Air Quality Handbook Version 3,*[9] the project's emissions will not exceed the *de minimis* thresholds. Therefore, there is no requirement to conduct dispersion analysis to compare project-related emissions to the NAAQS. Consequently, Alternatives B, D and E comply with CAA Section 176(c) (1). No further analysis or reporting is required under the provisions of the CAA or NEPA.

[8] Bay Area Air Quality Management District. Final Bay Area Clean Air Plan. April 19, 2017.

[9] *Aviation Emissions and Air Quality Handbook, Version 3, Update 1,* January 2015.

5.5.5.4 Assessment of Climate

FAA Order 1050.1F states the FAA has not established a significance threshold assessment of climate, and FAA 1050.1F *Desk Reference* further states that the FAA has not identified specific factors to consider in making a significance determination.

Although there are no Federal standards for aviation-related GHG emissions, it is well-established that GHG emissions can affect climate. The Council on Environmental Quality (CEQ) has indicated that climate should be considered in NEPA analyses. The following provides an estimate of GHG emissions for each alternative. These estimates are provided for information only as no Federal NEPA standard for the significance of GHG emissions from individual projects on the environment has been established.

Alternative A:
No Action

Under Alternative A, there would be no increase in project specific GHG emissions.

Alternative B:
(Sponsor's Proposed Project)

For 2024 conditions, the Sponsor's Proposed Project would increase GHG emissions by 165.8 metric tons over the No Action alternative of the same year, an increase of approximately 20 percent. This increase would comprise less than 2.43×10^{-8} percent of U.S. based GHG emissions and less than 3.35×10^{-9} percent of global GHG emissions.[10] For 2029 conditions, the Sponsor's Proposed Project would increase GHG emissions by 137.1 metric tons over the No Action alternative of the same year, an increase of approximately 17 percent. This increase would comprise less than 2.01×10^{-8} percent of U.S. based GHG emissions and less than 2.77×10^{-9} percent of global GHG emissions.

[10] U.S. based GHG emission estimated in 2016 at 6,821.8511 million metric tons CO_2 equivalent in Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-20160, (April 2018). The IPCC estimates global GHGs in 2010 at 49.5 Gigatonnes (approximately 49.5×10^9 metric tons).

Alternative D:

For 2024 conditions, Alternative D would increase GHG emissions by 164.4 metric tons over the No Action alternative of the same year, an increase of approximately 20 percent. This increase would comprise less than $2.41x10^{-8}$ percent of U.S. based GHG emissions and less than $3.32x10^{-9}$ percent of global GHG emissions. For 2029 conditions, Alternative D would increase GHG emissions by 135.7 metric tons over the No Action alternative of the same year, an increase of approximately 17 percent. This increase would comprise less than $1.99x10^{-8}$ percent of U.S. based GHG emissions and less than $2.74x10^{-9}$percent of global GHG emissions.

Alternative E:

For 2024 conditions, Alternative E would increase GHG emissions by 148.1 metric tons over the No Action alternative of the same year, an increase of approximately 18 percent. This increase would comprise less than $2.17x10^{-8}$ percent of U.S. based GHG emissions and less than $2.99x10^{-9}$ percent of global GHG emissions. For 2029 conditions, Alternative E would increase GHG emissions by 118.9 metric tons over the No Action alternative of the same year, an increase of approximately 15 percent. This increase would comprise less than $1.74x10^{-8}$ percent of U.S. based GHG emissions and less than $2.40x10^{-9}$ percent of global GHG emissions.

Summary

Based on the findings presented, no further consideration of GHGs is necessary.[11] There is no substantive difference in GHG emissions between Alternatives B, D, and E. See Appendix F-1 for additional details regarding the GHG evaluation.

[11] *Aviation Emissions and Air Quality Handbook, Version 3, Update 1,* January 2015.

THIS PAGE INTENTIONALLY LEFT BLANK