CHAPTER 7. AIR QUALITY

7.1 INTRODUCTION

This chapter describes the potential environmental consequences associated with implementation of the alternatives within the four regions of influence (ROI) – North, Central, Apra Harbor, and South – for air quality resources. A description of the air quality resources in these four ROIs is provided in Section 5.1 of Volume 2 (Marine Corps Relocation – Guam), inclusive of a regulatory overview, stationary sources, mobile sources, ambient air quality modeling, climate, and greenhouse gas (GHG) emissions that are quantified in Volume 7, Chapter 3 for the preferred alternatives. The locations described in that Volume include the ROIs for the utilities and off base roadway project components of the proposed action.

7.2 ENVIRONMENTAL CONSEQUENCES

The comprehensive air quality consequences analysis performed in this Volume includes the following analysis components that examine potential impacts of utilities and roadway projects on Guam on air quality:

Utilities

- A discussion of microscale (localized) criteria pollutant analysis for each affected major Combustion Turbine (CT) under Basic Alternative including a dispersion modeling analysis for an affected CT under its permitted condition.
- A Clean Air Act (CAA) general conformity applicability analysis of direct and indirect sulfur dioxide (SO_2) emission increases that would result from the proposed action within the two SO_2 nonattainment areas on Guam that were identified in Volume 2, Section 5.1.
- A net incremental emissions analysis of criteria pollutants and GHGs in terms of carbon dioxide (CO_2) emissions with the potential to emit from the following stationary sources:
- Affected CT facilities
- Solid waste landfill facility
- Note that a full analysis of CO_2 equivalent compounds GHG contributions at the regional level is provided in Volume 7.
- A net incremental emissions analysis of criteria pollutants and CO_2 with the potential to emit from the following mobile sources during the construction period:
- Construction equipment and hauling trucks
- Workers' commuting vehicles

Roadway Projects

- A microscale carbon monoxide (CO) analysis of potential impacts from local traffic at congested intersections
- A qualitative particulate matter (PM) and primary Mobile Source Air Toxic (MSAT) analysis
- A quantitative microscale MSAT analysis of potential impacts from local traffic at congested intersections and highest volume freeflow location using United States (U.S.) Environmental Protection Agency (USEPA)-recommended methodologies

- A net incremental emissions analysis of criteria pollutants and CO_2 emissions with the potential to emit from the following mobile sources during the construction period:
- Traffic-related on-road motor vehicle operations
- Roadway construction equipment and hauling trucks

Regional Analysis

The regional or mesoscale analysis of a project determines the overall impact of a project on regional air quality levels. A transportation project is analyzed as part of a regional transportation network developed by the county or state. Projects included in this network are found in Government of Guam's (GovGuam) Territorial Transportation Improvement Plan (GovGuam 2009) developed by the Department of Public Works. The Territorial Transportation Improvement Plan is the basis for the regional analysis; utilizing vehicle miles traveled (VMT) and vehicle hours traveled within the region to determine daily "pollutant burden" levels. The results of this analysis determine if an area is in conformity with regulations set forth in the USEPA's Final Transportation Conformity Rule.

Particulate Matter

On March 10, 2006, the USEPA issued a Final Rule regarding localized or "hot-spot" analyses of PM less than 2.5 microns in diameter ($PM_{2.5}$) and PM less than 10 microns in diameter (PM_{10}) (40 Code of Federal Regulations [CFR] Part 93). This rule requires that a $PM_{2.5}$ and/or PM_{10} hot-spot analysis be performed only for transportation projects with significant diesel traffic in areas not meeting $PM_{2.5}$ and/or PM_{10} air quality standards. The project area is classified as an attainment area for $PM_{2.5}$ and PM_{10}. The project is also not anticipated to generate significant additional diesel traffic. As such, a hot-spot analysis is not required. However, a qualitative hot-spot analysis was conducted following Federal Highway Administration (FHWA)/USEPA's March 29, 2006 joint guidance Transportation Conformity Guidance for Qualitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas (USEPA 2006).

Attainment of National Ambient Air Quality Standards (NAAQS)

The USEPA, under the requirements of the 1970 CAA, as amended in 1977 and 1990 (CAA Amendments), has established NAAQS for six contaminants, referred to as criteria pollutants (40 CFR 50). The regulations establish the NAAQS criteria in order to protect public health and the environment by limiting the amount of pollutants allowed in the ambient air. These six criteria pollutants are:

- CO
- Nitrogen dioxide (NO_2)
- Ozone, with nitrogen oxides (NO_x) and volatile organic compounds (VOCs) as precursors
- $PM_{2.5}$ and PM_{10}
- Lead
- SO_2

Areas where concentration levels are below the NAAQS for a criteria pollutant are designated as being in "attainment." Areas where a criteria pollutant level equals or exceeds the NAAQS are designated as being in "nonattainment." Based on the severity of the pollution problem, nonattainment areas are categorized as marginal, moderate, serious, severe, or extreme. Where insufficient data exist to determine an area's attainment status, it is designated as either unclassifiable or in attainment.

Components of the proposed action would occur in various locations on Guam. Many of the areas where the actions are proposed are currently designated as attainment areas for all criteria pollutants. There are

two areas on Guam that are designated as attainment areas for CO, NO_x, ozone, PM, and lead, but are designated as nonattainment areas for SO_2, as follows:

- Piti: Portion of Guam within a 2.2-mile (mi) (3.5- kilometers [km]) radius of the Piti Power Plant
- Tanguisson: Portion of Guam within a 2.2 mi (3.5-km) radius of the Tanguisson Power Plant

On June 3, 2010 the USEPA issued a final new standard for SO_2, setting the 1-hour SO_2 standard at 75 parts per billion (ppb), a level designed to protect against short-term exposures ranging from 5 minutes to 24 hours. USEPA also revoked the previous 24-hour and annual SO_2 standards and anticipates that the attainment/nonattainment designation for the new standard will occur in 2012.

The primary contributors of SO_2 in the environment are from burning fossil fuels such as fuel oil like that used by power plants: gasoline used by vehicles and diesel fuel used by vehicles and non-road engines. One way that USEPA limits SO_2 emissions in the ambient air is to require the use of low sulfur fuels in power plants. It also requires the production and use of gasoline with a low sulfur content (termed "Tier 2 Standards") and diesel fuel with low sulfur content. These requirements were promulgated as part of the CAA, and implemented in the CFR. These low sulfur fuels are readily available in the continental U.S. but not on U.S. Pacific Island Territories.

Although Guam is in nonattainment for SO_2 in the two areas around the Piti and Tanguisson power plants, on December 28, 2006 USEPA issued a partial waiver to Guam that conditionally exempts Guam from the requirements to use low sulfur fuels in its power plants and in gasoline that is used islandwide in vehicles. The exemption also applies to American Samoa and the Commonwealth of the Northern Mariana Islands. In its decision to grant the partial waiver, USEPA cited both economic and environmental reasons for granting the waiver as follows:

> "We are exempting American Samoa, Guam, and CNMI from the Tier 2 gasoline sulfur standard due to the high economic burden of compliance, isolated nature of the territories, both in terms of gasoline importation and pollution transport, and minimal air quality effects."
>
> "Generally, the Far East market, primarily Singapore, supplies gasoline to the U.S. Pacific Island Territories. The Tier 2 sulfur standard effectively requires special gasoline shipments, which would increase the cost and could jeopardize the security of the gasoline supply to the Pacific Island Territories. The air quality in American Samoa, Guam, and C.N.M.I. is generally pristine, due to the wet climate, strong prevailing winds, and considerable distance from any pollution sources. We recognize that exempting the U.S. Pacific Island Territories from the gasoline sulfur standard will result in smaller emission reductions. However, Tier 2 vehicles using higher sulfur gasoline still emit 30% less hydrocarbons and 60% less nitrogen oxide (NO_X) than Tier 1 vehicles and negative effects on the catalytic converter due to the higher sulfur levels are, in many cases, reversible. Additionally, these reduced benefits are acceptable due to the pristine air quality, the fact that gasoline quality will not change, and the cost and difficulty of consistently acquiring Tier 2 compliant gasoline."
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> "Guam is in attainment with the primary NAAQS, with the exception of sulfur dioxide in two areas. This action is not expected to have any significant impact on the ambient air quality status of Guam, including the status of the two areas designated as nonattainment for sulfur dioxide. Both areas are designated nonattainment for SO_2 as a result of monitored

> and modeled exceedances in the 1970's prior to implementing changes to power generation facilities. In the 1990's both plants were rebuilt, upgrading their emission controls. Guam has submitted a redesignation request to the USEPA. That pending redesignation request shows that they are now in attainment. An emissions inventory shows that the power plants are the major source of SO_2 on Guam. Both plants are on the western side of the island. The Trade Winds blow persistently from east-to-west, further lessening the impact of the SO_2 emissions on the people of Guam from the power plants."
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> "Mobile sources, like cars, are a minor contributor to the SO_2 emission budget. Exempting Guam from the Tier 2 gasoline sulfur and vehicle emission standards would not cause an increase in emissions. Guam has received enforcement discretion for the Tier 2 gasoline sulfur standards from the onset of the program and therefore the gasoline sent to Guam has not been required to meet the Tier 2 sulfur levels. Emissions from older vehicles will remain unchanged. Tier 2 vehicles using high sulfur gasoline will be cleaner than Tier 1 vehicles. Tier 2 vehicles using gasoline with 330 ppm sulfur emit 30% less hydrocarbons and 60% less NO_X than Tier 1 vehicles. While this rule will lead to a smaller reduction in emissions than would occur if the Tier 2 sulfur regulations are required, Guam's current air quality does not require further reductions. Because of Guam's remoteness, there are no cross border issues."

As cited in the USEPA waiver decision, both Piti and Tanguisson areas are designated nonattainment for SO_2 as a result of monitored and modeled exceedances in the 1970's prior to implementing changes to power generation facilities. Since that time, changes have been made to these power generation facilities. In accordance with 40 CFR Parts 80 and 86, both plants were rebuilt, upgrading their emission controls in the 1990s. Based on these improvements, Guam has submitted a redesignation request to USEPA. The pending redesignation request shows that the Piti power plant is now in attainment. However, it should be noted that the USEPA revised the short-term standard for SO_2 on June 3, 2010 from 140 ppb, averaged over 24 hours to 75 ppb, measured hourly. The future attainment/nonattainment designation of the new SO_2 hourly standard is anticipated to occur in 2012.

In addition, as both plants are located on the western side of the island and the trade winds blow persistently from east-to-west, the impact of the SO_2 emissions on the people of Guam from the power plants is reduced. Mobile sources, such as cars, are a minor contributor to SO_2 emissions. Despite the USEPA partial waiver, the Department of Defense (DoD) is currently working with relevant stakeholders, including USEPA, Guam Environmental Protection Agency (GEPA), Guam Power Authority (GPA), and suppliers to determine an appropriate strategy for implementing an islandwide switch to lower sulfur for diesel fuel. There are several ongoing logistics, economics, contracts, and regulatory issues, which must be resolved before an islandwide switch to ultra low sulfur fuel is committed.

MSAT Analysis

MSATs are hazardous air pollutants. USEPA has classified over 150 air toxics as MSATs. Of the 150 MSATs, 7 are identified as having significant contributions from mobile sources and are listed among the national and regional-scale cancer risk drivers (USEPA 1999): napthalene, acrolein, benzene, 1-3 butadiene, formaldehyde, polycyclic organic matter, and diesel PM plus diesel exhaust organic gases (diesel PM). This list is subject to change and may be adjusted in consideration of future USEPA rules.

As part of the National Environmental Policy Act (NEPA) process, Environmental Impact Statements (EISs) require review and evaluation of air toxics as they could affect the quality of the human environment. For these analyses, a tiered approach developed by the FHWA in the Interim Guidance

Update on Mobile Source Air Toxic Analysis in NEPA Documents (FHWA 2009) was used, which includes the following three levels of analysis:

- No analysis for projects with no potential for meaningful MSAT effects;
- Qualitative analysis for projects with low potential MSAT effects; or
- Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

Using this methodology, an initial MSAT analysis for this project indicated that it would have a low potential for MSAT effects. However, a quantitative MSAT analysis was developed for this project based on the methodology described in the research report *Analyzing, Documenting and Communicating the Impacts of Mobile Source Air Toxic Emissions in the NEPA Process* (American Association of State Highway and Transportation Officials [AASHTO] 2007).

The analysis approach was developed based on available project information, potential community impact, and the public's level of concern. Not only were the impacts of the project on localized MSAT levels raised as a concern with this project, but several intersections in the project area under the Build alternatives are projected to have Annual Average Daily Traffic (AADT) over the 40,000 threshold specified in the AASHTO report.

As a result, a screening-level MSAT dispersion modeling analysis was conducted based on the procedures provided in Appendix C of the AASHTO report to estimate whether the incremental health-related risk associated with the proposed project would exceed the following thresholds:

- A maximum total incremental carcinogenic risk from the exposure to all identified pollutants of 10 in a million (i.e., 10×10^{-6}); and
- A maximum total incremental non-carcinogenic Hazard Index risk from the exposure to all identified pollutants of 1.

The analysis focused on the potential impacts of operational emissions rather than construction phase emissions because the health-related risks, if any, associated with this project would primarily be the result of long-term exposure. This is because the roadway construction phase of this project is temporary (i.e., less than 5 years) and would occur at any given location for a relatively short period of time. Therefore, this analysis has focused on the long-term operational impacts of the project.

- A 30-year exposure duration was used in this analysis. This duration is based on recommendations included in USEPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (USEPA 2005b). According to Table C-2-1 of this protocol, a reasonable maximum exposure duration for an adult resident is 30 years, and the reference given for this value is USEPA's Proposed Guidelines for Carcinogen Risk Assessment (USEPA 1996). In addition, this 30-year value is incorporated into Trinity's BREEZE Risk Analyst – Human Health Risk Software, which is an industry standard tool for conducting multi-pathway human health risk assessments. Comments from USEPA have suggested that a 70-year exposure duration should be applied to this analysis, rather than the 30-year exposure duration. Applying the 70-year exposure value would increase the predicted cancer risk value by approximately 2.4 times. The values reported in the tables presented in this document, represent the 30-year exposure duration. The effects of applying the more conservative 70-year exposure duration are discussed in the results of the analysis.

The following tasks were conducted for the dispersion modeling analysis:

- Local microscale sites (congested intersections) were selected for analysis.
- MSAT emission factors were estimated using USEPA's MOBILE6.2 model (Note: input parameters to accurately model MSAT were determined through consultation with USEPA and FHWA).
- CAL3QHCR dispersion modeling was conducted using worst case meteorology to estimate 1-hour concentrations of each MSAT, which were used to estimate acute (short-term) impacts. These 1-hour values were then converted, using conservative traffic and meteorological persistence factors, to annual values in order to estimate annual impacts.

Diesel PM was not quantitatively considered in the screening-level dispersion modeling analysis because of the significant limitations of the MOBILE6.2 model noted by the USEPA in the 2006 Conformity Rule (71 Federal Register 12498):

> "We continue to believe that appropriate tools and guidance are necessary to ensure credible and meaningful PM2.5 and PM10 hot-spot analyses. Before such analyses can be performed, technical limitations in applying existing motor vehicle emission factor models must be addressed, and proper federal guidance for using dispersion models for PM hot-spot analysis must be issued. With the release of MOBILE6.2, state and local transportation agencies now have an approved model for estimating regional PM2.5 and PM10 emission factors in SIP [State Implementation Plan] inventories and regional emissions analyses for transportation conformity. However, MOBILE6.2 has significant limitations that make it unsatisfactory for use in microscale analysis of PM2.5 and PM10 emissions as necessary for quantitative hot-spot analysis."

Federal guidance for using dispersion models for PM hot-spot analyses has not been issued. As a result, a qualitative analysis for diesel PM was completed based on FHWA/USEPA's March 29, 2006 joint direction Transportation Conformity Guidance for Qualitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas (USEPA 2006).

The seven priority MSAT compounds considered were as follows:

- Acrolein, benzene, 1,3-butadiene, formaldehyde, and naphthalene were analyzed quantitatively.
- Polycyclic organic matter was considered as being comprised of the following compounds, which were quantitatively analyzed on a pollutant-by-pollutant basis:
    - acenaphthene
    - acenaphylene
    - anthracene
    - benzo(g,h,i) perylene
    - benzo[b]fluoranthene
    - benzo[k]fluoranthene
    - benz[a]anthracene
    - benzo[a]pyrene
    - chrysene
    - dibenz[a,h]anthracene
    - fluoranthene
    - fluorene
    - ideno[1,2,3-cd]pyrene
    - phenanthrene, and
    - pyrene
- Diesel PM was analyzed qualitatively.

Absent the appropriate tools and guidance necessary to ensure credible and meaningful quantitative PM hot-spot analyses, a qualitative analysis of diesel PM was conducted. The objective of the analysis is to determine if the proposed project could produce levels in excess of the annual $PM_{2.5}$ NAAQS, which is designed to provide protection from the noncancer and premature mortality effects of $PM_{2.5}$ as a whole, of which diesel PM is a constituent. The two-step approach was adopted based on the March 10, 2006 Final Rule issued by the USEPA regarding the localized or "hot-spot" analysis of $PM_{2.5}$ (40 CFR Part 93): 1) apply criteria to determine if the project would involve a significant number of significant increase in the number of diesel vehicles; and 2) comparing air monitoring values from an area representative of project conditions. As previously discussed, the study area is classified as attainment for $PM_{2.5}$ NAAQS.

The criteria to determine if the project would involve a significant number or significant increase in the number of diesel vehicles are follows:

- New or expanded highway projects that have a significant number of or significant increase in diesel vehicles.
- Projects affecting intersections that are at Level of Service (LOS) D, E, or F with a significant number of diesel vehicles, or those that would change to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project.
- New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location.
- Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location.
- Projects in or affecting locations, areas, or categories of sites which are identified in the PM2.5 applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

Based on the above criteria, it is determined if the project is one of air quality concern with respect to $PM_{2.5}$.

Microscale CO Air Quality Analysis

Microscale air quality modeling was performed using the most recent version of the USEPA mobile source emission factor model (MOBILE6.2) (USEPA 2003) and the CAL3QHC (Version 2.0) air quality dispersion model (USEPA 1995b) to estimate future no-build (without the proposed project) and future build (with the proposed project) CO levels at selected locations in the project area.

Dispersion Model

Mobile source models are the basic analytical tools used to estimate CO concentrations expected under given traffic, roadway geometry, and meteorological conditions. The mathematical expressions and formulations that comprise the various models attempt to describe an extremely complex physical phenomenon as closely as possible. The dispersion modeling program used in this project for estimating pollutant concentrations near roadway intersections is the CAL3QHC (Version 2.0) dispersion model developed by USEPA and first released in 1992.

CAL3QHC is a Gaussian model recommended in the USEPA's Guidelines for Modeling Carbon Monoxide from Roadway Intersections (USEPA 1992). Gaussian models assume that the dispersion of pollutants downwind of a pollution source follow a normal distribution from the center of the pollution source.

Different emission rates occur when vehicles are stopped (i.e., idling), accelerating, decelerating, and moving at different average speeds. CAL3QHC simplifies these different emission rates into two components:

- Emissions when vehicles are stopped (i.e., idling) during the red phase of a signalized intersection
- Emissions when vehicles are in motion during the green phase of a signalized intersection

The CAL3QHC (Version 2.0) air quality dispersion model has undergone extensive testing by USEPA and has been found to provide reliable estimates of inert (i.e., nonreactive) pollutant concentrations resulting from motor vehicle emissions. A complete description of the model is provided in the User's Guide to CAL3QHC (Version 2.0): A Modeling Methodology for Predicting Pollutant Concentrations near Roadway Intersections (Revised) (USEPA 1995b).

Vehicular Emissions

Vehicular emissions were estimated using the USEPA MOBILE6.2 vehicular emission factor model (USEPA 2003). MOBILE6.2 is a mobile source emission estimate program that provides current and future estimates of emissions from highway motor vehicles. The latest in the MOBILE series, which dates back to 1978, MOBILE6.2 was designed by USEPA to address a wide variety of air pollution modeling needs and incorporates updated information on basic emission rates, more realistic driving patterns, separation of start and running emissions, improved correction factors, and changing fleet composition. It also includes impacts of new regulations promulgated since the previous version, MOBILE5b released in 1996.

Site Selection and Receptor Locations

A screening evaluation was performed to identify which intersections in the project area are most congested and most affected by the build alternatives. Sites fail the screening evaluation if (1) the LOS decreases below D in one of the build alternatives compared to the no-action alternative, or (2) if the delay and/or volume increase from the no-action alternative to build alternatives along with an LOS below D. The LOS describes the quality of traffic operating conditions, ranging from A to F, and it is measured as the duration of delay that a driver experiences at a given intersection. LOS A represents free-flow movement of traffic and minimal delays to motorists. LOS F generally indicates severely congested conditions with excessive delays to motorists. Intermediate grades of B, C, D, and E reflect incremental increases in congestion.

Determination of Significance

Potential project impacts were evaluated against the appropriate thresholds and regulations set forth by the federal and local government, including USEPA and GEPA.

7.2.1 Approach to Analysis

7.2.1.1 Methodology

Utility Stationary Sources

The following new or existing stationary sources are associated with the utility development:

- Major existing power generation facilities under the Basic Alternative described in Chapter 2.
- Wastewater treatment plant under Basic Alternative 1a and 1b and one long-term alternative.
- One Basic Alternative for solid waste landfill alternative.

The major facility-associated potential annual emissions under the basic alternatives are predicted based on the design capacities discussed in this EIS and on manufacturer-provided emission factors or using USEPA-approved emission factor models. USEPA emission factor models that were used include:

- USEPA AP-42 Compilation of Air Pollutant Emission Factors for Stationary Point and Area Sources (USEPA 1995a and after) – AP-42 provides emission factors for combustion source emissions
- Landfill Gas Emissions Model (LandGEM) (USEPA 2005c) – LandGEM is a screening tool to assist in estimating emission rates for total landfill gas, methane, CO_2, and non-methane VOCs from municipal solid waste landfills

A detailed discussion on emissions estimates is provided in Volume 9, Appendix I, Sections 3.1 and 3.2. Note that the existing CTs use a maximum sulfur content of 0.6 percent (%).

Annual emissions thresholds for air pollutants for a major source and a major source modification are summarized in Table 7.2-1. If sources with annual emission levels exceed the threshold of a major stationary source or major modification of the existing major stationary source, microscale ambient concentration levels from these sources are predicted and compared with the applicable significance thresholds. The analysis is conducted in accordance with the NEPA requirements, and the air permitting requirements established in various USEPA programs and GEPA's Air Pollution Control Standards and Regulations § 1104.6 (c) (12) (ix) (GEPA 2004).

Table 7.2-1. Applicable Major Source and Major Modification Thresholds

Pollutant	*Major Source Threshold (TPY)*	*Major PSD Source Threshold (TPY)*	*Major Modification Threshold (TPY)*
SO_2	100	250/100[a]	40
CO	100	250/100[a]	100
PM_{10}	100	250/100[a]	15
NO_x	100	250/100[a]	40
VOCs	100	250/100[a]	40

Note: [a] 100 TPY applies to certain sources such as fossil fuel fired steam electric plants with more than 250 British thermal unit per hour heat input.
Legend: CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulate matter less than 10 microns in diameter; PSD = Prevention of Significant Deterioration; SO_2 = sulfur dioxide; TPY = tons per year; VOC = volatile organic compound.
Source: 40 CFR 52.

As discussed in Section 5.1 of Volume 2, Prevention of Significant Deterioration (PSD) regulations were established by the USEPA to ensure that air quality in clean (attainment) areas does not significantly deteriorate and that a margin for future industrial growth is maintained. This is to be accomplished by requiring major emission sources and major modifications to employ the Best Available Control Technology to curb air pollutant emissions.

According to CAA regulations, a facility is considered to be a major source when annual emissions exceed 100 tons per year (TPY) of any criteria pollutants in an attainment area or a SO_2 nonattainment area. Under the PSD regulations, last modified under the 1990 CAA Amendments (42 U.S. Code §§7470-7479), a facility is considered to be a major stationary source when annual emissions exceed 250 or 100 TPY of attainment pollutants, depending on the specific source category. Examples of source categories with a 100 TPY major stationary source threshold include fossil-fuel-fired steam electric plants with more than 250 British Thermal Units per hour heat input and many specific types of plants, mills, and smelters. For an existing major stationary source, the net emission increase of each attainment pollutant that exceeds a specified significant emission increase level is considered to be a major

modification that is subject to the provisions of the PSD regulations and a PSD New Source Review (NSR).

Because Guam has two nonattainment areas for SO_2, a nonattainment NSR would be required by the project for SO_2 if the proposed stationary facility and the existing major stationary source modification within the SO_2 nonattainment area exceed the nonattainment NSR threshold. If applicable, the new sources would likely be required to use Lowest Achievable Emission Rate technology, obtain emission offsets to satisfy the nonattainment NSR regulatory requirements, and reduce overall emissions facility-wide. Nonattainment area-specific regulations on emission offsets are provided in Guam Air Pollution Control Standards and Regulations § 1105.4 and § 1105.5 (GEPA 2004).

Air dispersion modeling was conducted only for the Marbo CT facility, an affected existing major source (under the Basic Alternative), for which the compliance demonstration of the NAAQS cannot be found, the estimated emission rates were further used in ambient concentration dispersion modeling, as discussed below.

The dispersion modeling approach is designed to estimate near-field impacts, defined as within a 31-mi (50-km) transport radius (USEPA 2005c). The modeling approach was developed in accordance with the following USEPA guidance:

- Guideline on Air Quality Models (Revised), incorporated as Appendix W of 40 CFR Part 51, Federal Register Revision to the Guideline on Air Quality Models (USEPA 2005a)
- Draft NSR Workshop Manual (USEPA 1990)

The USEPA-recommended regulatory dispersion model for near-field applications, American Meteorological Society/USEPA Regulatory Model (AERMOD) (USEPA 2007), was used for the Basic Alternative impact analysis. AERMOD is a steady-state plume dispersion model that simulates transport and dispersion from multiple point, area, or volume sources based on an up-to-date characterization of the atmospheric boundary layer. The model employs hourly sequential pre-processed meteorological data to estimate concentrations for selected averaging times ranging from 1 hour to 1 year.

Because the existing sources to be impacted under the basic alternative are located inland in areas remote from coastal effects, and under the influence of the relatively constant nature of the trade winds, the near-source steady-state regulatory model, AERMOD, is an appropriate tool for estimating air impacts from the affected existing major stationary sources.

The hourly emission rates and the daily and annual emission rates, as appropriate, from the existing sources to be utilized under the Basic Alternative were used as the inputs to AERMOD in order to determine both long-term (annual) and short-term (24-hour average or shorter) impact concentration levels with respect to the applicable impact thresholds.

A detailed discussion of dispersion modeling methodology, meteorological data, receptor grid used, and dispersion modeling results is provided in Volume 9, Appendix I, Section 3.1 Major Sources.

Utility Construction Mobile Sources

Potential air quality impacts from mobile sources were evaluated in terms of net incremental annual emissions levels for each criteria pollutant and CO_2 associated with each source type and the annual activity level. The mobile sources considered in this evaluation include construction equipment and hauling truck emissions during the utility resources construction period. Construction activities involving the operation of construction equipment, trucks, and workers' commuting vehicles may have short-term air quality impacts.

In order to predict construction emissions, estimates of construction crew and equipment requirements and productivity including the hours of equipment use were made, based on the data presented in 2003 RSMeans Facilities Construction Cost Data (RSMeans 2003) and 2006 RSMeans Heavy Construction Cost Data (RSMeans 2006). Given the lack of a specific construction schedule for each applicable project during the early planning stage, the overall length of utility construction for each project is assumed to be 4 years from 2011 through 2014. The subsequent emissions for construction were evenly distributed over the 4-year construction period to determine the average annual emissions levels.

The weekly duration for each activity was assumed to be 8 hours per day, 5 days per week. The emissions estimate assumes for only one piece of equipment because the same amount of construction activities can be accomplished by using one piece of equipment for 1 week, or can be shortened to half a week by using two pieces simultaneously. The key input in the emissions calculations is the total number of equipment hours required to complete the work. Therefore, the input of one piece of equipment used in the calculations is only for the purposes of completing them and does not reflect the actual number of pieces equipment that would be used on site during construction.

Estimates of construction equipment operational emissions were based on (1) the estimated hours of equipment use as described above, and (2) the emission factors for each piece of equipment, as provided by the USEPA in the nonroad emission factor model based on the national default model inputs (USEPA 2008). The average equipment horsepower values and equipment power load factors are also provided in association with the nonroad emission factors.

A maximum sulfur content of 0.5% was used based on USEPA's Heavy-Duty Standards/Diesel Fuel Regulatory Impact Analysis (USEPA 2000). Based on the Regulatory Impact Analysis, data observed in 1992 shows that No. 2 diesel fuel imports actually had sulfur content ranging from 0.39% to 0.5%. Therefore, using the actual highest sulfur content observed in 1992 (0.5%) for vehicles in this analysis is considered appropriate and conservative and is also coincident with the highest sulfur content fuel input available in the nonroad model. It should also be noted that with the introduction of the Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements (40 CFR Parts 69, 80, and 86) in 2006, refiners were required to start producing diesel fuel for use in highway vehicles with a sulfur content of no more than 15 parts per million (ppm) (i.e., 0.0015% content). Therefore, the sulfur content of fuels since 1992 has decreased in general although Guam has been granted an exemption from using low sulfur fuel (see Section 7.2 of this Volume). The DoD is currently examining the potential use of ultra low sulfur fuel for construction activities and highway diesel vehicles on Guam, so that the actual sulfur content may be far lower than the level used in the analysis.

Because the operational activity data presented in RSMeans' books are generated based on the overall duration of equipment presence on site, an equipment actual running time factor (i.e., actual usage factor) was further employed to determine actual equipment usage hours for the purposes of estimating equipment emissions. The usage factor for each equipment type was obtained from FHWA's Roadway Construction Noise Model User's Guide (FHWA 2006). Emission factors related to construction-associated delivery trucks and workers' commuting vehicles were estimated using the USEPA Mobile6 emission factor model (USEPA 2003). The detailed methodology used to calculate these emissions is presented in Volume 9, Appendix I, Section 3.4 Construction Activity Emissions.

Under the General Conformity Rule (GCR), emissions associated with all operational and construction activities from a proposed federal action, both direct and indirect, must be quantified and compared to annual *de minimis* (threshold) levels for pollutants that occur within the applicable nonattainment area. Direct emissions are emissions of a criteria pollutant or its precursors that are caused or initiated by a

federal action and occur at the same time and place as the action. Indirect emissions are emissions occurring later in time and/or further removed in distance from the action itself. Indirect emissions must be included in the determination if both of the following apply:

- The federal agency proposing the action can practicably control the emissions and has continuing program responsibility to maintain control
- The emissions caused by the federal action are reasonably foreseeable

As previously mentioned, Guam has two SO_2 nonattainment areas around the Piti and Tanguisson power plants. The emissions from both stationary and mobile sources with potential to occur within the two SO_2 nonattainment areas were quantified using the same methodologies discussed previously for both stationary and mobile sources. If a proposed stationary and/or mobile source emission level is below the *de minimis* threshold, it is exempt from the GCR. Also, according to the GCR, if a proposed stationary source is a major stationary source or major PSD source, and/or a proposed existing major source modification is a major modification that is required to be in compliance with the PSD and/or nonattainment NSR programs, it is exempt from the GCR. Therefore, the operational emissions from this source or source modification are not considered in the general conformity applicability analysis.

Estimates of direct and indirect annual emissions within SO_2 nonattainment areas for utility resources are described in detail in Volume 9, Appendix I, Section 3.6 CAA General Conformity Applicability Analysis.

Roadway Mobile Sources

The primary on-road vehicle-related air pollutants are CO, PM, NO_x, and VOCs (NO_x and VOCs are precursors to the formation of ozone). MSAT are also a concern. The project-level air quality impacts of traffic-related projects are generally evaluated on the following two scales for specific pollutants:

- Microscale (hot-spot) level for CO, PM (PM_{10} and $PM_{2.5}$) and MSAT. A microscale analysis of traffic-related impacts at intersections or free flow sites provides estimates of localized pollutant concentrations for direct comparison to the NAAQS and/or applicable impact thresholds.
- Mesoscale (regional) level for NO_x, VOC, CO, and PM (PM_{10} and $PM_{2.5}$). Emissions of these typical pollutants are calculated on a mesoscale basis to provide a comparison of regional emissions among alternatives.

On-road vehicular emissions impacts are predicted to estimate the CO concentration levels at the worst-case congested intersections under future conditions with and without the proposed action. If the model-predicted CO levels are below the NAAQS at the worst-case congested intersections, the traffic-related microscale air quality impacts are expected to be in compliance at other less-congested intersections where lower emissions would be generated.

Though the potential traffic-related PM ($PM_{2.5}$ and PM_{10}) impact hot-spot analyses were not warranted based on the attainment status of the study area, a qualitative analysis was conducted. This rule requires that a PM_{10} and/or a $PM_{2.5}$ hot-spot analysis be performed only for transportation projects with substantial diesel traffic in areas not meeting PM_{10} and/or $PM_{2.5}$ air quality standards. Refer to MSAT Analysis for Diesel PM in Section 7.2 of this Volume.

The mesoscale vehicular and roadway construction emissions of criteria pollutants as well as GHG emissions in terms of CO_2 emissions were also considered through an estimate of vehicular emissions on the affected roadway system on Guam and construction equipment emissions during roadway

construction. GHG emissions in terms of CO_2 equivalent compounds are presented in Volume 7 for all proposed alternatives, as these emissions are evaluated on a regional, rather than local level.

7.2.1.2 Determination of Significance

The selected impact thresholds (significance criteria) for making a determination of the significance of impact using the analysis approach outlined in the previous section are summarized in Table 7.2-2 along with measuring metrics for individual utilities and roadway project mobile sources.

Table 7.2-2. Impact Analysis Thresholds

Emission Sources	*Measuring Metric*	*Significance Criteria*
Utility Operation and Construction Emissions		
CT Facility	Criteria pollutant concentration from each affected existing CT facility	NAAQS
Solid waste landfill	VOC emission	250 TPY [a] (PSD major stationary source threshold)
Construction of power, water, wastewater and landfill facilities	Criteria pollutant emissions	
Construction mobile source and non-major stationary source operation within nonattainment areas	SO_2 annual emissions in Piti and Tanguisson nonattainment areas	100 TPY[a] (*de minimis* level)
Roadway Project Mobile Sources		
On-road vehicles	CO concentration	NAAQS
On-road vehicles	PM and air toxics emissions and/or concentrations	Health Risk Assessment [b]: Project of Air Quality Concern for PM. Incremental carcinogenic risk greater than 10 in a million. Incremental non-carcinogenic hazard index less than 1.
Mesoscale on-road vehicle emissions and roadway construction emissions	Criteria pollutant emissions	250 TPY[a] (PSD major stationary source threshold)
All sources with emission factor data	CO_2 Eq emissions	NA

Notes: [a] Emissions from corresponding source activities are combined with the emissions from other components of the proposed action and presented in Volume 7. These impact significance threshold are considered as de minimis levels and are used to make an impact determination from a disclosure comparison with the combined annual emission levels. However, if such levels are exceeded for a specific pollutant, a further formal analysis is considered, when appropriate, in order to make a formal determination of impact significance.

[b] A health risk assessment is not required, but is being performed on the request of USEPA.

Legend: CO = carbon monoxide; CO_2 Eq = carbon dioxide equivalent compound; CT = Combustion Turbine; NA= not applicable; NAAQS = National Ambient Air Quality Standards; PM = particulate matter; PSD = Prevention of Significant Deterioration; SO_2 = sulfur dioxide; TPY = tons per year; VOC = volatile organic compound.

Microscale Concentration Impact

For major emission source impacts where no compliance demonstration of NAAQS was performed historically or found, the NAAQS shown in Table 7.2-3 were used to evaluate the impact significance potentially resulting from the proposed operations of each affected existing CT within its individual permitted capacity under the basic alternative. If a predicted concentration under the CT permitted condition showed no exceedances of the corresponding NAAQS, the operation of the affected existing CT is not considered to have a significant impact for that specific criteria pollutant. Conversely, if the

NAAQS are predicted to be exceeded, a further mitigation modeling analysis of the affected existing major sources would be required to eliminate the potential NAAQS exceedance.

Table 7.2-3. National Ambient Air Quality Standards

Pollutant	*Averaging Period*	*NAAQS ($\mu g/m^3$)*
NO_2	Annual	100
SO_2	Annual 24-hour 3-hour	80 365 1,300
PM_{10}	24-hour	150
$PM_{2.5}$	Annual 24-hour	15 35
CO	8-hour 1-hour	10,000 40,000

Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standard; NO_2 = nitrogen dioxide; $PM_{2.5}$ =particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; $\mu g/m^3$ = microgram per cubic meter.

For traffic-related microscale impacts, the predicted CO concentrations at the worst-case congested intersections were compared with the CO NAAQS to determine the potential significance of traffic-related microscale air quality impacts. Additionally, the MSAT analysis uses the MSAT thresholds established in the AASHTO 2007 research report to evaluate potential health risk, as per the USEPA recommendation.

GCR *de minimis* Threshold

Under the GCR, total emissions resulting from the proposed federal actions must be compared to applicable *de minimis* levels on an annual basis. As defined by the GCR, if the emissions of a criteria pollutant (or its precursors) do not exceed the *de minimis* level, the federal action has minimal air quality impact and the action is determined to be in conformity for the pollutant under study. Therefore, no further analysis is necessary. Conversely, if the total direct and indirect emissions of a pollutant are above the *de minimis* level, a formal general conformity determination is required for that pollutant. According to the GCR, the *de minimis* level applicable to the two nonattainment areas on Guam is 100 TPY for SO_2. Therefore, if the total direct and indirect emissions of SO_2 are below 100 TPY, no formal conformity determination is required and no significant air quality impact would result from the implementation of the proposed action.

It should be noted that according to the GCR, if a proposed stationary source is a major stationary source or major PSD source and/or a proposed existing major source modification is a major modification that is required to be in compliance with the regulations established in the PSD and/or nonattainment NSR programs, the emissions from this source are exempt from the general conformity requirement. Therefore, the proposed operational emissions from those PSD/NSR sources within the nonattainment area should not be included in the comparison with the SO_2 *de minimis* criterion.

Mobile Source and Non-Major Stationary Source Incremental Emissions

Under the CAA, motor vehicles, other self-propelled vehicles with internal combustion engines, and non-self-propelled non-road engines are exempt from air-permitting requirements. The GCR is not applicable to these mobile source emissions associated with the construction and operation of the proposed

improvements in areas that are in attainment of the NAAQS for all criteria pollutants. Nonetheless, NEPA and its implementing regulations require analysis of the significance of air quality impacts from these sources, as well as non-major stationary sources. However, neither NEPA nor its implementing regulations have established emissions criteria for determining the significance of air quality impacts from such sources in CAA attainment areas.

In the GCR applicable to nonattainment areas, USEPA uses the "major stationary source" definition under the NSR program as the *de minimis* level to separate presumably exempt actions from those requiring a positive conformity determination. Because the proposed action and alternatives would occur mostly in areas that have always been in attainment, the EIS selected the "major stationary source" definition (≥ 250 TPY of any air pollutant is subject to regulations under the CAA) from the PSD program. The "major stationary source" definition applies to locations that are in the attainment area as the criteria for determining the potential significance of air quality impacts from these sources.

As noted above, neither the PSD permitting program nor the GCR are applicable to mobile sources and non-major stationary sources in attainment areas. Therefore, the analysis of construction and operational incremental emissions from these sources in attainment areas and the significance criteria selected (250 TPY) are solely for the purpose of informing the public and decision makers about the relative air quality impacts from the proposed action and the alternatives under NEPA. However, since the 250 TPY threshold is selected in the context of the *de minimis* threshold established in the GCR providing only an indication of potential significant impact, a further formal impact analysis should be conducted if such threshold is exceeded, where appropriate. For example, CO is a localized pollutant, if the 250 TPY threshold is exceeded for CO, a subsequent dispersion modeling for major emission contributing sources is conducted to further evaluate potential impact significance with respect to the NAAQS.

7.2.1.3 Issues Identified During Public Scoping Process

The impact analyses focus on addressing potential air quality impacts from the proposed utility and roadway improvement actions. As part of the analyses, public concerns, including those of regulatory stakeholders, raised during public scoping meetings that relate to air quality effects were addressed (if sufficient project data and available impact criteria were available). Concerns relating to potential air quality impacts are listed below:

- Increase in vehicle and vessel emissions, and need for disclosure of available information of health risks associated with vehicle emissions and MSAT
- Increase in emissions from existing power sources due to power demand or construction of new power sources
- Increase in construction-related emissions and impacts including emissions estimates of criteria pollutants and diesel PM from construction of alternatives
- Compliance with the GCR in siting project facilities
- Emissions mitigation plans during construction
- Discussion of a potential installation of an air quality monitoring network on Guam
- Discussion of project elements that would be major contributors to GHGs and identification of practices or project elements to reduce GHGs
- Need to control and monitor the relocation activities to ensure good air quality on Guam

7.2.2 Power

7.2.2.1 Historical Monitoring Observations and Existing Background Conditions

The existing major source contributions under current operational conditions around the ROIs where the CT reconditioning actions would occur were evaluated. The ROIs with the potential to be affected by the proposed power improvement actions include North, Central, and Apra Harbor.

The GovGuam has not collected ambient air quality data since 1991. Therefore, no existing ambient air quality data are available to represent current air quality conditions with respect to the criteria pollutants for which the NAAQS were established. Historical data are available from 1972 through 1991, when ambient air quality data were collected at a number of sites through a USEPA-sponsored monitoring program. The monitored pollutants were total suspended particles (TSP), SO_2, NO_2, and nitrogen monoxide. In 1991, PM_{10} was monitored in addition to TSP.

Prior to 1991, TSP were monitored at 20 sites, SO_2 at 14 sites, NO_2 at five sites, and nitrogen monoxide at one site. In 1991, PM_{10} was monitored at four sites.

In addition to the historical monitoring identified above, the GPA established a network of five stations to measure SO_2 at locations that are not downwind or close to any major electrical generating units during normal trade wind conditions from the fall of 1999 through the summer of 2000. All of the observed SO_2 concentrations were below the 24-hour NAAQS. According to 40 CFR Parts 80 and 86, Guam has submitted a redesignation request to USEPA for the Piti power plant. That pending redesignation request shows that the Piti power plant is now in attainment; however, USEPA has not taken action on this request, so the area remains in a nonattainment status. USEPA did, however, recognize the need for this redesignation in their decision to allow a waiver for the use of low sulfur fuels in power plants and vehicles in Guam (see Section 7.2, "National Ambient Air Quality Standards"). An emissions inventory shows that the power plants are the major source of SO_2 on Guam. Both plants are on the western side of the island. The trade winds blow persistently from east-to-west, further lessening the impact of the SO_2 emissions on the people of Guam from the power plants. Mobile sources, like cars, are a minor contributor to the SO_2 emission budget.

The areas around affected existing sources (Figure 7.2-1) under the Basic Alternative are in attainment areas. Ambient air quality conditions are expected to be affected by existing stationary source operations and other minor source operations such as vehicular traffic. Given the lack of existing ambient background levels, the applicable modeling results for each affected CT under its permitted capacity were compared directly with the NAAQS to determine potential impact significance.

7.2.2.2 Basic Alternative

Basic Alternative would recondition up to 5 existing CTs and upgrade Transmission and Distribution (T&D) systems and would not require new construction or enlargement of the existing footprint of the facilities. These reconditioned units would have the necessary reliability to serve as reserve capacity to ensure reliable operation of the Island-Wide Power System. They would serve as peaking and reserve units.

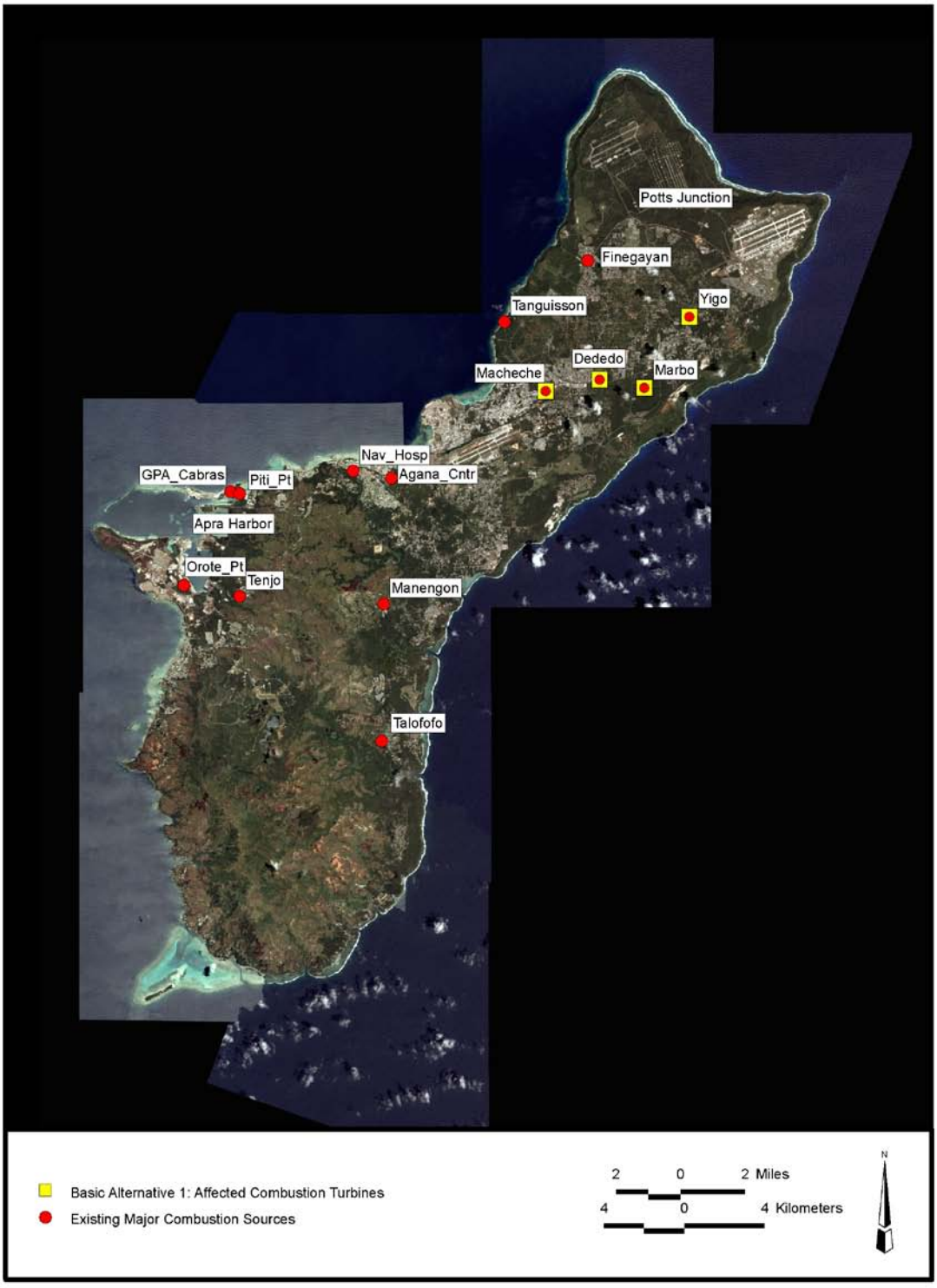

Figure 7.2-1. Locations of Major Existing Electrical Generating Unit Sources on Guam

This work would be undertaken by the GPA on its existing permitted facilities, and potentially utilize a special purpose entity to obtain funds, recondition the CTs, install the T&D upgrades, and operate the CTs for a fee to enable repayment of the financing. Reconditioning would be made to existing permitted facilities at the Marbo, Yigo, Dededo, and Macheche CTs. These CTs are not currently being used up to permit limits. T&D system upgrades would be on existing above ground and underground transmission lines. This alternative supports Main Cantonment Alternatives 1 and 2 and Main Cantonment Alternatives 3 and 8 would require additional upgrades to the T&D system.

Construction

Table 7.2-4 presents the total annual construction emissions for Basic Alternative that were calculated for the utilization and repair of the CTs, and associated facility transmission line upgrade, using the methodology described in Section 7.2.1.1 and described in Volume 9, Appendix I, Section 3.4.

Table 7.2-4. Total Annual Construction Emissions – Basic Alternative

	Pollutant						
Construction Activity	*SO_2*	*CO*	*PM_{10}*	*$PM_{2.5}$*	*NO_x*	*VOC*	*CO_2*
Total Annual Emissions (TPY)	0.1	3.8	0.0	0.0	0.4	0.1	52.0

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns per diameter; SO_2 = sulfur dioxide; TPY = tons per year; VOC = volatile organic compound.

Operation

Potential increases of air emissions, as compared to the actual affected operational conditions of the existing CTs, are anticipated from the proposed action. For NEPA disclosure purposes, the annual emissions above the current actual condition were estimated based on the anticipated total number of hours in power output required at each affected CT under the peaking condition and summarized in Table 7.2-5. The operation of reconditioned CTs (at Marbo, Dededo, Yigo, and Macheche) is anticipated to require up to a total of 2,500 hours increase (maximum) from the baseline. The air emission impact analysis calculations assume an average of 500 hours per CT. A detailed calculation is discussed in Volume 9, Appendix I, Section 3.1.4.4.

Table 7.2-5. Net Increase in Annual Emissions – Basic Alternative

	Pollutant						
Affected Source	*SO_2*	*CO*	*PM_{10}*	*NO_x*	*VOC*	*CO_2*	*HAP*
Dededo CT#1	54.5	5.3	5.0	20.8	1.0	7,695.9	0.12
Dededo CT#2	54.5	5.35	5.0	20.8	1.0	7,695.9	0.12
Yigo	31.3	5.5	5.0	14.05	1.0	7,361.3	0.07
Marbo	16.2	5.5	1.6	9.1	2.6	5,353.7	0.08
Macheche	31.3	5.5	5.0	14.0	1.0	7,361.3	0.07
Combined Sources	187.7	26.9	21.5	78.5	6.6	35,468.3	0.46

Legend: CO = carbon monoxide; CO2 = carbon dioxide; CT = Combustion Turbine; HAP = Hazardous Air Pollutant; NOx = nitrogen oxides; PM_{10} = particulate matter less than 10 microns per diameter; SO2 = sulfur dioxide; VOC = volatile organic compound.

It is anticipated that the limited increase in power required under the proposed action would be well below the permitted capacity at each affected CT for which the compliance of any applicable CAA air quality standards should have been already demonstrated during the air permitting process when GPA obtained the air permit for each affected source. Based on record searches, it was found that GPA conducted a health-based NAAQS compliance analysis for the Dededo, Macheche, and Yigo power facilities as listed below:

- PSD Air Quality Impact Analysis for Dededo Facility (GPA 1992b).
- Environmental Impact Assessment for Proposed Macheche Generating Facility (GPA 1992a).
- Environmental Impact Assessment for Proposed Yigo Generating Facility (GPA 1993).

According to these documents, the CTs that would be potentially affected by the proposed action in Dededo, Macheche, and Yigo facilities (operating under the permitted conditions) were modeled and demonstrated to be in compliance with the NAAQS.

However, a health-based NAAQS compliance analysis was not found at this time for the Marbo CT facility. The DoD in coordination with GPA conducted an ambient concentration dispersion modeling analysis, using the methodology described previously in Section 7.2.1, for the Marbo CT facility under its permitted capacity. The modeling results (Table 7.2-6) show that the affected Marbo CT facility would be in compliance with the NAAQS under its permitted condition. Detailed modeling discussions are presented in Volume 9, Appendix I, Section 3.1.4.

Table 7.2-6. Predicted Criteria Pollutant Concentrations at Marbo

Pollutant	*Station Name*	*Averaging Period*	*Concentration (µg/m3)*	*Distance (m)*	*NAAQS (µg/m3)*
SO_2	Marbo	3-hour	447.9	99	1,300
	Marbo	24-hour	145.3	99	365
	Marbo	Annual	2.3	301	80
NO_2	Marbo	Annual	0.9	301	100
CO	Marbo	1-hour	92.6	99	40,000
	Marbo	8-hour	57.4	99	10,000
PM_{10}	Marbo	24-hour	3.1	201	150
$PM_{2.5}$	Marbo	24-hour	1.2	401	35
	Marbo	Annual	0.1	301	15

Legend: CO = carbon monoxide; m = meter; NAAQS = National Ambient Air Quality Standard; NO_2 = nitrogen dioxide; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; $\mu g/m^3$ = microgram per cubic meter.

Because the overall permitted capacity and the operational scheme for these CTs would not change, the resulting potential air quality impact would remain the same as the current permitted conditions and in compliance with the NAAQS.

Although it is concluded that the operation of affected CTs would not result in a significant health-based air quality impact, whether a major permit modification is required at any of these CTs remain to be determined. There is an ongoing DoD CT study to determine the specific repairs needed to recondition the CTs. Based on the study, if it is determined that Title V modifications (including PSD modifications for PSD sources) are required for one or more of the CT facilities, then modifications to the respective Title V permits would be obtained prior to the commencement of any reconditioning activities and would result in a less than significant impact.

Proposed Mitigation Measures

There would be no significant impacts from construction emissions under this alternative. Proposed mitigation measures, if applicable to combined construction activity-associated emissions, are discussed in Volume 7 where the combined air quality effects are addressed.

Since no significant operational air quality impact would occur under this alternative, mitigation measures would not be required.

7.2.2.3 Summary of Impacts

Table 7.2-7 summarizes the potential air quality impacts associated with Basic Alternative. Construction activities for this alternative would result in less than a significant impact to air quality resources because the existing power facility reconditioning associated emissions were well below the significance criterion of 250 TPY. Operational activities for Basic Alternative would also result in less than significant impacts to air quality resources because required power output would be within the CAA Title V permitted capacity for each affected existing facility. Since the affected existing facilities had demonstrated their compliance under the permitted condition with all CAA regulations and standards in obtaining Title V permits, Basic Alternative would result in less than a significant impact.

Table 7.2-7. Summary of Potential Air Quality Impacts – Power

	Basic Alternative
Power	LSI

Legend: LSI = Less than significant impact.

7.2.3 Potable Water

Water resource facilities to provide potable water for the proposed action would consist of various water pumps operated periodically for a number of processes. Water pumps are expected to be powered by electricity; therefore, no air emissions would be generated during water pumping operations. The potential air quality impacts addressed in this chapter only include estimates of air emissions associated with the construction of water resources.

7.2.3.1 Basic Alternative 1 (Preferred Alternative)

Basic Alternative 1 would provide additional water capacity of 11.3 MGd (42.8 MLd), which is anticipated to be met by an estimated 22 new wells at Andersen Air Force Base (AFB), rehabilitate existing wells, interconnect with the Guam Waterworks Authority (GWA) water system, and associated treatment, storage and distribution systems. Two new 2.5 MG (9.5 ML) water storage tanks would be constructed at ground level at NCTS Finegayan. Up to two new elevated 1 MG (3.8 ML) water storage tanks would be constructed at Finegayan within the Main Cantonment footprint.

Construction

Estimates on construction activities were calculated to identify equipment, material, and manpower requirements for the construction associated with the proposed water resources components. Assumptions were made to develop a list of major construction items, necessary equipment, and productivity levels necessary for the completed construction of these facilities. The calculated emissions produced from potential construction and vehicle activities that would occur from 2011 to 2014 form the basis from which the total air pollutant emissions in TPY were calculated (Table 7.2-8).

Table 7.2-8. Total Annual Construction Emissions – Basic Alternative 1

	Pollutant						
Construction Activity	*SO_2*	*CO*	*PM_{10}*	*$PM_{2.5}$*	*NO_x*	*VOC*	*CO_2*
Total Annual Emissions (TPY)	0.3	2.2	0.2	0.2	2.7	0.3	422.9

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns per diameter; SO_2 = sulfur dioxide; TPY = tons per year; VOC = volatile organic compound.

These predicted emissions are combined with the emissions from other components of the proposed action in Volume 7 to determine the overall potential air emissions impact significance using the impact

thresholds described in Section 7.2.1.2. The construction emissions shown in Table 7.2-8, and described in Volume 9, Appendix I, Section 3.4, Construction Activity Emissions, are all well below impact thresholds.

Operation

As described at the beginning of this section, water pumps are expected to be powered by electricity, therefore no air emissions would be generated during water pumping operations.

Proposed Mitigation Measures

Proposed mitigation measures, if applicable, are discussed in Volume 7 where the combined air quality impacts are addressed.

7.2.3.2 Basic Alternative 2

Basic Alternative 2 would provide additional water capacity of 11.7 MGd (44.3 MLd), which is anticipated to be met by an estimated 20 new wells at Andersen Air Force Base (AFB) and 11 new wells at Air Force Base Barrigada, rehabilitate existing wells, interconnect with the Guam Waterworks Authority (GWA) water system, and associated treatment, storage and distribution systems. Two new 1.8 MG (6.8 ML) water storage tanks would be constructed at ground level at NCTS Finegayan and one 1 MG (3.8 ML) water storage tank would be construction at Air Force Base Barrigada. Up to two new elevated 1 MG (3.8 ML) water storage tanks would be constructed at Finegayan within the Main Cantonment footprint.

Construction

The improvements planned for in Basic Alternative 2 would produce slightly lower total annual construction emissions than Basic Alternative 1, as summarized below in Table 7.2-9 and presented in Volume 9, Appendix I, Section 3.4, Construction Activity Emissions.

Table 7.2-9. Total Annual Construction Emissions – Basic Alternative 2

	Pollutant						
Construction Activity	*SO_2*	*CO*	*PM_{10}*	*$PM_{2.5}$*	*NO_x*	*VOC*	*CO_2*
Total Annual Emissions (TPY)	1.2	2.0	0.2	0.2	2.6	0.3	398.4

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns per diameter; SO_2 = sulfur dioxide; TPY = tons per year; VOC = volatile organic compound.

Operation

As described previously, water pumps are expected to be powered by electricity; therefore, no air emissions would be generated during water pumping operations.

Proposed Mitigation Measures

The predicted construction emissions (2011 to 2014) and operational emissions (2015 and after) for criteria pollutants within each ROI are all below the 250 TPY threshold or 100 TPY SO_2 threshold applicable for SO_2 nonattainment areas. Therefore potential air quality impacts under Basic Alternative 2 are considered less than significant and emissions mitigation measures are not warranted.

7.2.3.3 Summary of Impacts

Table 7.2-10 summarizes the potential air quality impacts associated with the two potable water alternatives. The construction activities associated with the water supply were well below the significance

criterion of 250 TPY. Water pumps are expected to be powered by electricity so that no air emissions would be generated during water pumping operations. Therefore, both alternatives would result in less than significant impacts to air quality resources.

Table 7.2-10. Summary of Potential Air Quality Impacts – Potable Water

	Basic Alternative 1	*Basic Alternative 2*
Potable Water	LSI	LSI

Legend: LSI = Less than significant impact.

7.2.4 Wastewater

Construction and operation of wastewater treatment facilities would generate additional air emissions, including odor-related emissions. This section addresses potential air quality impacts, including odor impacts from the proposed basic and the long-term alternative using the methodologies described in Section 7.2.1. Given the relatively short duration of the construction period (i.e., mostly between 2011 and 2014), odor impacts under the basic alternatives were addressed qualitatively. A detailed analysis is provided in Volume 9, Appendix I, Section 3.2.1.

7.2.4.1 Basic Alternative 1a (Preferred Alternative) and 1b

Basic Alternative 1 (Alternative 1a supports Main Cantonment Alternatives 1 and 2; and Alternative 1b supports Main Cantonment Alternatives 3 and 8) combines upgrade to the existing primary treatment facilities and expansion to secondary treatment at the Northern District Wastewater Treatment Plant (NDWWTP). The difference between Alternatives 1a and 1b is a requirement for a new sewer line from Barrigada housing to NDWWTP for Alternative 1b.

Construction

The plant construction activities would result in a short-term increase in criteria pollutant and CO_2 emissions. However, given the small scale of the activity, the emissions predicted are minimal and would have negligible air quality impacts associated with them, as shown in Table 7.2-11 and described in Volume 9, Appendix I, Section 3.4. In Volume 7, these emissions are combined with the emissions from other components of the proposed action to determine the overall significance of potential air emissions impacts using the impact thresholds described in Section 7.2.1.2.

Table 7.2-11. Total Annual Construction Emissions - Alternative 1a and 1b

	Pollutant						
Construction Activity	*SO_2*	*CO*	*PM_{10}*	*$PM_{2.5}$*	*NO_x*	*VOC*	*CO_2*
Total Annual Emissions (TPY)	0.0	0.0	0.0	0.0	0.0	0.0	1.4

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns per diameter; SO_2 = sulfur dioxide; TPY = tons per year; VOC = volatile organic compound.

Operation

As additional wastewater flow would be treated at the NDWWTP, no changes to baseline operation impacts are predicted for Alternative 1a or 1b.

Proposed Mitigation Measures

Proposed mitigation measures, if applicable, are discussed in Volume 7, where the combined air quality impacts are addressed.

7.2.4.2 Long-Term Alternative 1

Given the incomplete design data provided for the programmatic long-term alternative, potential air quality impacts resulting from this alternative are not analyzed in this study and, if required, would be addressed in a future NEPA document. However, given the size of a typical treatment plant and the limited combustion sources, potential criteria pollutants and Hazardous Air Pollutant air quality impacts are expected to be minimal under both construction and operational conditions.

However, potential odor emissions from the long-term wastewater treatment facilities are expected to be significant particularly within the neighborhoods located around each facility, and given the relatively high temperature in Guam. Odor control measures are anticipated to be required for the long-term alternative.

7.2.4.3 Summary of Impacts

Table 7.2-12 summarizes the potential impacts associated with Basic Alternatives 1a and 1b for wastewater treatment. The construction and operation activities associated with wastewater facilities under this basic alternative would be well below the significance criterion of 250 TPY and therefore the alternative would result in less than significant impacts to air quality resources.

Table 7.2-12. Summary of Potential Air Quality Impacts – Wastewater

	Basic Alternative 1a and 1b
Wastewater	LSI

Legend: LSI = Less than significant impact.

7.2.5 Solid Waste

Operation of the existing Navy Landfill at Apra Harbor to handle additional solid waste generated as a result of the proposed action would increase air emissions. This section addresses potential air quality impacts from Basic Alternative 1 using the methodologies described in Section 7.2.1. A detailed analysis is provided in Volume 9, Appendix I, Section 3.2.2.

7.2.5.1 Basic Alternative 1 (Preferred Alternative)

The Preferred Alternative would be to continue to use the Navy Landfill at Apra Harbor for municipal solid waste (MSW) until the new GovGuam Layon Landfill at Dandan is available for use. Disposal of other waste streams excluded from Layon Landfill would continue at the Navy Landfill. Construction and demolition (C&D) debris would continue to be disposed of at the Navy hardfill.

Construction

For Solid Waste Basic Alternative 1, there would be no new construction. Therefore, there are no construction impacts to air quality.

Operation

The USEPA LandGEM model (USEPA 2005c) was used to predict the increase in VOC, CO_2, and methane emissions associated with the added solid waste disposal at the Navy Sanitary Landfill from the proposed action. The landfill throughput (input) was based on a 7.4 pounds (3.4 kilograms) per capita per day waste generation rate. The future additional waste throughput associated with Basic Alternative 1 utilizing the Navy Sanitary Landfill was considered to begin in 2010 and the resulting net annual increases in air emissions, shown in Table 7.2-13, were predicted up to 2011.

Table 7.2-13. Total Annual Operation Emissions – Basic Alternative 1 / Apra Harbor

	Pollutant (TPY)				
Year	*Uncontrolled VOC*	*Controlled VOC*	*Uncontrolled Methane*	*Controlled Methane*	*CO_2*
2011	2.6	NA	59.9	NA	164

Legend: CO_2 = carbon dioxide; NA = not applicable; TPY = tons per year; VOC = volatile organic compound.

Once the new Layon Landfill is opened, solid waste from the Navy Sanitary Landfill would be diverted to Layon per the Memorandum of Understanding between the DoD and GovGuam. The new landfill is assumed to open in 2011 and close in 2051.

The same methodology used for Basic Alternative 1 in Apra Harbor was used to predict the increase in VOC and CO_2 emissions associated with the added solid waste disposal at the proposed GovGuam landfill beyond 2011. Table 7.2-14 summarizes the predicted emissions for each year after the interim period. According to the *Revised Final Report, Guam Solid Waste Utility Study for Proposed USMC Relocation* (Naval Facilities Engineering Command, Pacific 2008), a flare system to control VOC emissions would be installed in 2013. Therefore, the controlled VOC and methane emission increase shown in Table 7.2-14 for 2014 reflects the presence of a flare controlling VOC and methane emissions with a destruction rate of 98% or greater (USEPA 2003).

The predicted construction and operational emissions are combined with the emissions from other components of the proposed action in Volume 7 to determine the overall significance of potential air emissions impacts using the thresholds described in Section 7.2.1.2.

Proposed Mitigation Measures

Mitigation measures, if applicable, for combined air quality effects are discussed in Volume 7.

7.2.5.2 Summary of Impacts

Table 7.2-15 summarizes the potential air quality impacts associated with the solid waste alternatives. The construction activities associated with solid waste facilities were well below the significance criterion of 250 TPY for all alternatives, as were operational emissions of criteria pollutants. Therefore, Basic Alternative 1 would result in less than significant impacts to air quality resources with standard control measures.

It should be noted that CO_2 and methane are not criteria pollutants and therefore are not compared to criteria pollutant thresholds. The potential effects of CO_2, methane, and other GHG emissions are by nature global and are based on cumulative impacts. Hence, the impact of proposed CO_2, methane and other GHG emissions is discussed in the context of cumulative impacts in Volume 7.

Table 7.2-14. Total Annual Operation Emissions – Basic Alternative 1 / Layon

	Pollutant (TPY)				
Year	*Uncontrolled VOC*	*Controlled VOC*	*Uncontrolled Methane*	*Controlled Methane*	*CO_2*
2012	9.0	NA	208.4	NA	572
2013	18.7	NA	435.5	NA	1195
2014	NA	0.6	NA	13.9	1903
2015	NA	0.9	NA	21.1	2900
2016	NA	1.1	NA	26.7	3665
2017	NA	1.3	NA	29.6	4055
2018	NA	1.3	NA	31.4	4302
2019	NA	1.4	NA	33.1	4537
2020	NA	1.5	NA	34.7	4763
2021	NA	1.6	NA	36.3	4978
2022	NA	1.6	NA	37.8	5182
2023	NA	1.7	NA	39.2	5377
2024	NA	1.7	NA	40.5	5562
2025	NA	1.8	NA	41.8	5738
2026	NA	1.9	NA	43.0	5905
2027	NA	1.9	NA	44.2	6065
2028	NA	1.9	NA	45.3	6216
2029	NA	2.0	NA	46.4	6360
2030	NA	2.0	NA	47.4	6497
2031	NA	2.1	NA	48.3	6628
2032	NA	2.1	NA	49.2	6752
2033	NA	2.2	NA	50.1	6870
2034	NA	2.2	NA	50.9	6982
2035	NA	2.2	NA	51.7	7089
2036	NA	2.3	NA	52.4	7190
2037	NA	2.3	NA	53.1	7287
2038	NA	2.3	NA	53.8	7379
2039	NA	2.3	NA	54.4	7466
2040	NA	2.4	NA	55.0	7549
2041	NA	2.4	NA	55.6	7628
2042	NA	2.4	NA	56.2	7703
2043	NA	2.4	NA	56.7	7775
2044	NA	2.5	NA	57.2	7843
2045	NA	2.5	NA	57.6	7908
2046	NA	2.5	NA	58.1	7969
2047	NA	2.5	NA	58.5	8028
2048	NA	2.5	NA	58.9	8084
2049	NA	2.5	NA	59.3	8137
2050	NA	2.6	NA	59.7	8187
2051	NA	2.6	NA	60.0	8235

Legend: CO_2 = carbon dioxide; NA = not applicable; TPY = tons per year; VOC = volatile organic compound.

Table 7.2-15. Summary of Potential Air Quality Impacts – Solid Waste

	Basic Alternative 1 / Apra Harbor	*Basic Alternative 1 / Layon*
Solid waste	LSI	LSI

Legend: LSI = Less than significant impact.

7.2.6 Off Base Roadways

Roadway projects are covered by four alternatives for the location of the cantonment area functions and family housing/community support functions, as summarized below. A detailed description of these alternatives is provided in Chapter 2 of this Volume. Alternative 2 (the preferred alternative) with only a limited of number projects that have been identified for funding and implementation (Alternative 2 Constrained) is also included in this analysis:

- Alternative 1. Represents one contiguous location for cantonment area functions and family housing/community support functions. It would include portions of NCTS Finegayan and South Finegayan, as well as acquisition or long-term leasing of non-DoD lands at the Former Federal Aviation Administration (FAA) parcel and the Harmon Annex parcel. A portion of the development would be constructed in the undeveloped Overlay Refuge.
- Alternative 2 (Preferred Alternative). Represents one contiguous land area for the cantonment and family housing/community support functions. It would include portions of NCTS Finegayan, portions of South Finegayan, and the acquisition or long-term leasing of portions of privately-held lands in the Former FAA parcel. A portion of the development would be constructed in the undeveloped Overlay Refuge.
- Alternative 2 Constrained. Similar to Alternatives 1 and 2, this alternative represents one contiguous land area for the Main Cantonment and family housing/community support functions. It would include portions of NCTS Finegayan, portions of South Finegayan, and the acquisition or long-term leasing of portions of privately-held lands in the Former FAA parcel. A portion of the development would be constructed in the undeveloped Overlay Refuge. This alternative would have limited local roadway improvements (already identified for funding under the Defense Access Road program) as compared to Alternative 2.
- Alternative 3. Plans for the Main Cantonment to include portions of NCTS Finegayan, and housing would be located on three geographically separated DoD parcels, including South Finegayan, Air Force Barrigada, and Navy Barrigada. No privately held lands would be acquired. Housing would be located non-contiguous to the Main Cantonment functions and a portion of the Main Cantonment would be constructed in the undeveloped Overlay Refuge.
- Alternative 8. would include portions of NCTS Finegayan, a portion of South Finegayan, the Former FAA parcel, and a portion of the housing would be located on the geographically separated Air Force Barrigada parcel. A portion of privately held lands would be acquired by purchase or long-term lease. A portion of the Main Cantonment would be constructed in the undeveloped Overlay Refuge and a portion of the required housing would be non-contiguous to the Main Cantonment Area.

7.2.6.1 Alternative 1

Mesoscale Emissions Burden

Air quality impacts would also result from the provision of on-road vehicle operations and roadway constructions associated with the proposed action. As shown in Table 7.2-16 and Volume 9, Appendix I, Section 3.3.7.2, regional emissions are predicted to increase from 18% to 19% under Alternative 1 as compared to the no-action alternative. This is primarily due to the estimated 18% increase in VMT under Alternative 1.

Table 7.2-16. Regional Annual Emission Burdens, Alternative 1

Scenario	*VMT*	*Speed*	*Emission Burden (TPY)*						
			CO	*NO_x*	*VOC*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*CO_2*
2030 No-Action Alternative	3,535,224	28.6	13,388	478	801	78	57	562	80,499
2030 Alternative 1	4,160,544	28.0	15,813	566	951	91	67	661	94,687
Net Change from No-Action			2,425	88	150	13	10	99	14,188
Percent Change from No-Action			18%	18%	19%	18%	18%	18%	18%

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; VOC = volatile organic compound; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; TPY = tons per year; NOx = nitrogen oxides; VMT = vehicle miles traveled.

North

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-17. Based on these results, the following conclusions can be made:

- Cancer and non-cancer risks at the actual receptors are substantially lower than the values estimated at the sidewalk receptors;
- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated increases in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

Table 7.2-17. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 1, North Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 1/28	1.60 / 0.41	1.00 / 0.03	10	0.19 / 0.05	0.12 / 0.00	1
Route 9/Andersen AFB North Gate	0.97	0.26		0.18	0.07	

Legend: AFB = Air Force Base.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks under both No Build (i.e., no-action alternative) and Build (Alternative 1) conditions are less than existing risks in most cases.

The criteria to determine if the project is one of air quality concern regarding PM were applied and evaluated as follows:

(i) New or expanded highway projects that have a significant number of or significant increase in diesel vehicles.

The Average Daily Traffic (ADT) on the highest volume roadways under the No Build and Build Alternative 1 are provided in Table 7.2-18. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options.

The largest increase in AADT for the roadways presented in Table 7.2-18 is predicted to occur on Route 3 and the North Commercial Gate in 2014. By applying a 2% truck percentage, the largest daily increase of 66,900 vehicles would result in a daily increase of 1,338 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-18. Average Daily Traffic for Major Roadways in North Project Section under Alternative 1

	2014			*2030*		
Roadway	*No Build*	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 3 and North Commercial Gate	0	66,900	NA	0	45,900	NA
Route 3 South of Route 28	11,499	53,100	362%	12,070	34,000	182%

(ii) Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles, or those that would change to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project. The proposed project is expected to affect intersections with a LOS of D, E, or F. However, the effect on LOS due to the project options is due to an overall increase in volumes rather than a significant increase in diesel vehicles.

(iii) New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location. The project does not involve bus and rail terminals.

(iv) Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location. The project does not involve bus and rail terminals.

(v) Projects in or affecting locations, areas, or categories of sites which are identified in the PM_{10} or $PM_{2.5}$ applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation. The area is classified as attainment of the $PM_{2.5}$ NAAQS. There is no applicable implementation plan or implementation plan submission.

Based on the above analysis, it is determined that the project would not involve a significant number or significant increase in the number of diesel vehicles and is not a project of air quality concern with respect to $PM_{2.5}$. A detailed discussion is provided in Volume 9, Appendix I.

Microscale CO Impact Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project examining each ROI. As detailed in Volume 9, Appendix I, Section 3.3.7.2, 10 North ROI locations were screened based on changes in intersection volumes, delay, and LOS between the no-action alternative and build alternatives. Five of these locations failed the screening criteria. The Route 1/28 intersection has the highest overall

volume of all the intersections that failed the screening. This site was chosen for detailed analysis. The Route 9/Andersen AFB North Gate intersection was also chosen for analysis due to the extremely high delay predicted in the build scenario and the predicted high volumes at this location. These intersections represent the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from these sites represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-19 and Table 7.2-20 and are described in Volume 9, Appendix I, Section 3.3.7.2. The values in these tables represent the background CO concentration combined with the modeled results from USEPA's CAL3QHC microscale dispersion model using worst-case meteorological parameters, along with a.m. and p.m. peak traffic data. Emission factors were calculated using USEPA's MOBILE6.2 emission factor program. A background value must be added into the results of the dispersion analysis to account for others sources of CO that are not accounted for in the CAL3QHC modeling. Usually a value from a representative local ambient air quality monitor is used. Guam, however, does not have any local monitoring stations, as discussed earlier in this chapter. Due to this, values from Hawaii were examined to determine their applicability to Guam. Using the 2006–2008 monitored data from the Punchbowl monitor, (rated as a middle scale monitor) located in Honolulu, Hawaii, the second highest maximum 1-hour reading was 1.7 parts ppm. This value was conservatively rounded to 2.0 ppm and represents the background CO concentration for this analysis. A persistence factor (that accounts for hourly variation of traffic and meteorological conditions) of 0.7, as recommended by USEPA, was applied to the 1-hour CO concentrations to obtain 8-hour concentrations. As shown in Table 7.2-19 and Table 7.2-20, no violations of the applicable NAAQS are predicted.

Table 7.2-19. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – North, Alternative 1

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/28	5.5	6.0	6.9	7.3	6.0	4.2
Route 9/Andersen AFB North Gate	3.8	4.5	4.2	4.5	3.6	4.5

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; ppm = parts per million.

Table 7.2-20. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – North Alternative 1

Analysis Site	*Existing*	*2014*	*2030*
Route 1/28	4.2	5.1	4.2
Route 9/Andersen AFB North Gate	3.2	3.2	3.2

Notes: 8-hour CO NAAQS = 9 ppm Includes a background concentration of 1.4 ppm
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed emission construction analysis was conducted. Using the estimated project schedule, along with typical equipment requirements for specific tasks, emission burden estimates of CO, NO_x, PM_{10}, and $PM_{2.5}$ were calculated. Equipment emissions were presumed to be Tier 3, with high sulfur fuel as confirmed by the construction management team. Based on the preliminary schedule, the highest emissions levels per year, per month, and the year that these emissions are predicted to occur in the North Region are shown in Table 7.2-21 and also presented in Volume 9, Appendix I, Section 3.4.

Table 7.2-21. Estimated Construction Emission Burden – North, Alternative 1

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	13.0	20.3	8.4	4.1	1.4	15.3	3,881
Highest Monthly Emission Burden (Tons)	4.7	7.3	1.8	1.3	0.51	5.4	1,462
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.23	0.36	0.09	0.06	0.03	0.27	73.1
Year Highest Monthly Emission Burden Predicted to Occur	2011	2011	2011	2011	2011	2011	2011

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Central

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-22. Based on these results, the following conclusions can be made:

- Cancer and non-cancer risks at the actual receptors are substantially lower than the values estimated at the sidewalk receptors;
- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated increases in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

Table 7.2-22. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 1, Central Region

	Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)		*Cancer Risk*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard*
Analysis Site	2014	2030	*Threshold*	2014	2030	*Index*
Route 1/8	1.64	0.78	10	0.19	0.10	1
Route 4/7A	1.22/0.66	-0.09/-0.01		0.62/0.08	0.00/0.00	
Route 16/27	2.97	1.99		0.32	0.20	
Route 1 West of Route 30	0.26	0.06		0.03	0.01	

Applying a more conservative exposure duration of 70 years, as suggested by USEPA (rather than 30 years) would not cause the maximum estimated increases in cancer risk at any receptor to increase over the threshold criteria of 10 in a million. In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions, are less than existing risks in most cases.

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 1 are provided in Table 7.2-23. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options.

Table 7.2-23. Average Daily Traffic for Major Roadways in Central Project Section under Alternative 1

	2014			*2030*		
Roadway	*No Build*	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 1	79,337	100,300	26	84,935	95,600	13
Route 8	48,221	65,600	36	53,248	58,600	10
Route 18	49,196	74,000	50	59,980	70,500	18

The largest increase in AADT for the roadways presented in Table 7.2-24 is predicted to occur at Route 8 in 2014. By applying a 2% truck percentage, the largest daily increase of 20,963 vehicles would result in a daily increase of 4,193 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which Central ROI intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.2, 34 locations were screened based on changes in intersection volumes, delay, and LOS between the no-action alternative and build alternatives. Twenty-one (21) of these locations failed the screening criteria. The Route 1/8 intersection has the highest overall volume of all the intersections that failed the screening. This site was chosen for detailed analysis. The Route 4/7A intersection has the highest overall delay of any signalized intersection that failed the screening. This site was chosen for detailed analysis. The Route 16/27 intersection fails the screening criteria in other alternatives and was evaluated in this alternative for consistency. These intersections represent the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from these sites represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-24 and Table 7.2-25 and are presented in Volume 9, Appendix I, Section 3.3.7.2. The values in these tables, using the same analysis techniques and parameters as those applied in the North Region, represent the predicted worst-case CO concentrations. As shown in Table 7.2-24 and Table 7.2-25, no violations of the applicable NAAQS are predicted.

Table 7.2-24. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – Central, Alternative 1

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/8	6.0	6.4	7.3	7.6	6.2	6.4
Route 4/7A	5.3	3.8	5.1	5.6	4.6	5.1
Route 16/27	8.4	9.4	8.1	9.0	7.0	7.9

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; ppm = parts per million.

Table 7.2-25. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – Central, Alternative 1

Analysis Site	*Existing*	*2014*	*2030*
Route 1/8	4.5	5.3	4.5
Route 4/7A	3.7	3.9	3.6
Route 16/27	6.6	6.3	5.5

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed emission construction analysis was conducted using the same method as described for the North ROI. The highest predicted construction emissions per year, per month, and the year that these emissions are predicted to occur are shown in Table 7.2-26 and also presented in Volume 9, Appendix I, Section 3.4.

Table 7.2-26. Estimated Construction Emission Burden – Central, Alternative 1

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	54.6	84.2	17.2	14.4	5.9	62.4	16,707
Highest Monthly Emission Burden (Tons)	8.5	13.1	2.2	2.2	0.9	9.7	2,590
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.42	0.65	0.11	0.11	0.05	0.48	129
Year Highest Monthly Emission Burden Predicted to Occur	2012	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Apra Harbor

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-27. Based on these results, the following conclusions can be made:

- Maximum estimated changes in cancer risk at these locations are expected to decrease at any of the receptors analyzed due to the project. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and

- Maximum estimated changes in the total chronic hazard index are expected to decrease at any of the receptors analyzed due to the project. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

Table 7.2-27. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 1, Apra Harbor

	Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)		*Cancer Risk*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors*		*USEPA Hazard*
Analysis Site	2014	2030	*Threshold*	2014	2030	*Index*
Route 1/2A	-0.82	-0.06	10	-0.09	0.00	1

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions are less than existing risks in most cases.

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 1 are provided in Table 7.2-25. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options. As shown in this table, the largest increase in AADT for the roadways presented is predicted to occur at Route 1 near Route 18 in 2030. By applying a 2% truck percentage, the largest daily increase of 7,158 vehicles would result in a daily increase of 143 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-28. Average Daily Traffic for Major Roadways in Apra Harbor Project Section under Alternative 1

	2014			*2030*		
Roadway	*No Build*	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 1 near Route 18	46,407	49,800	11	41,142	48,300	17

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.2, three locations were screened based on changes in intersection volumes, delay, and LOS between the no-action alternative and build alternatives. One of these locations failed the screening criteria. The Route 1/2A intersection has the highest overall volume and highest delay of all the signalized intersections that failed the screening. This site was chosen for detailed analysis. This intersection represents the worst-case combination of volumes, LOS, and delay of the intersections

screened. As such, the predicted CO levels from this site represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-29 and Table 7.2-30 and are presented in Volume 9, Appendix I, Section 3.3.7.2. The values in these tables, using the same analysis techniques and parameters as those applied in the North Region, represent the predicted worst-case CO concentrations. As shown in Table 7.2-29 and Table 7.2-30, no violations of the applicable NAAQS are predicted.

Table 7.2-29. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – Apra Harbor, Alternative 1

			2014		*2030*	
	Existing		*Alternative 1*		*Alternative 1*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/2A	4.7	4.3	5.3	5.1	4.3	3.9

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-30. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – Apra Harbor, Alternative 1

		2014	*2030*
Analysis Site	*Existing*	*Alternative 1*	*Alternative 1*
Route 1/2A	3.3	3.7	3.0

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted using the same method as described for the North Region. The highest predicted construction emissions per year, per month, and the year that these emissions are predicted to occur are shown in Table 7.2-31 and presented in Volume 9, Appendix I, Section 3.4.

Table 7.2-31. Estimated Construction Emission Burden – Apra Harbor, Alternative 1

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	13.5	20.9	5.0	3.7	1.2	15.4	4,199
Highest Monthly Emission Burden (Tons)	1.6	2.5	0.59	0.44	0.34	1.82	494
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.08	0.12	0.03	0.02	0.02	0.0.9	24.7
Year Highest Monthly Emission Burden Predicted to Occur	2011	2011	2011	2011	2011	2011	2011

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

South

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-32. Based on these results, the following conclusions can be made:

- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

Table 7.2-32. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 1, South Region

	Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)		*Cancer Risk*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard*
Analysis Site	2014	2030	*Threshold*	2014	2030	*Index*
Route 5/2A	0.46	0.08	10	0.05	0.01	1

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions are less than existing risks in most cases.

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 1 are provided in Table 7.2-33. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options. As shown in this table, the largest increase in AADT for the roadways presented is predicted to occur at Route 4 in 2014. By applying a 2% truck percentage, the largest daily increase of 1,767 vehicles would result in a daily increase of 35 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-33. Average Daily Traffic for Major Roadways in South Project Section under Alternative 1

	2014			*2030*		
Roadway	*No Build*	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 4	15,833	17,600	11	21,504	20,100	-7

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.2, four locations were screened based on changes in intersection volumes,

delay, and LOS between the no-action alternative and build alternatives. Two of these locations failed the screening criteria. The Route 5/2A intersection has the highest overall volume and highest delay of all the signalized intersections that failed the screening. This site was chosen for detailed analysis. This intersection represents the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from this site represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-34 and Table 7.2-35 and are presented in Volume 9, Appendix I, Section 3.3.7.2. The values in these tables, using the same analysis techniques and parameters as those applied in the North Region, represent the predicted worst-case CO concentrations. As shown in Table 7.2-34 and Table 7.2-35 no violations of the applicable NAAQS are predicted.

Table 7.2-34. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – South, Alternative 1

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 5/2A	4.2	3.9	4.5	4.0	4.0	3.7

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-35. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – South, Alternative 1

Analysis Site	*Existing*	*2014*	*2030*
Route 5/2A	2.9	3.2	2.8

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted using the same method as described for the North Region. As shown in Table 7.2-36 and Volume 9, Appendix I, Section 3.4, construction emissions are negligible.

Proposed Mitigation Measures

Because the alternative is not predicted to cause a significant impact on air quality levels, no mitigation is proposed.

Table 7.2-36. Estimated Construction Emission Burden – South, Alternative 1

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	11.1	17.3	2.9	2.8	1.2	12.9	3310
Highest Monthly Emission Burden (Tons)	3.1	4.9	0.83	0.81	0.34	3.7	957
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.16	0.25	0.04	0.04	0.02	0.18	47.8
Year Highest Monthly Emission Burden Predicted to Occur	2012	2013	2012 & 2013	2012 & 2013	2013	2013	2013

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

7.2.6.2 Alternative 2 (Preferred Alternative)

Mesoscale Emissions Burden

As shown in Table 7.2-37 and Volume 9, Appendix I, Section 3.3.7.3, regional emissions are predicted to increase in the range of 18% to 19% under Alternative 2 and are the same as compared to Alternative 1. This is primarily due to the estimated 18% increase in VMT under Alternative 2.

Table 7.2-37. Regional Annual Emission Burdens, Alternative 2

Scenario	*VMT*	*Speed*	*Emission Burden (TPY)*						
			CO	*NO_x*	*VOC*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*CO_2*
2030 No-Action Alternative	3,535,224	28.6	13,388	478	801	78	57	562	80,499
2030 Alternative 2	4,160,544	28.0	15,813	566	951	91	67	661	94,687
Net Change from No-Action			2,425	88	150	13	10	99	14,188
Percent Change from No-Action			18	18	19	18	18	18	18

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; NO_x = nitrogen oxides; SO_2 = sulfur dioxide; TPY = tons per year; VMT = vehicle miles traveled; VOC = volatile organic compound.

North

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-38. Based on these results, the following conclusions can be made:

- Cancer and non-cancer risks at the actual receptors are substantially lower than the values estimated at the sidewalk receptors;
- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

Table 7.2-38. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 2, North Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 1/28	1.60 / 0.41	1.00 / 0.03	10	0.19 / 0.05	0.12 / 0.00	1
Route 9/Andersen AFB North Gate	0.97	0.26		0.18	0.07	

Legend: AFB = Air Force Base.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build (i.e., no-action alternative) and Build (i.e., Alternative 2) conditions are less than existing risks in most cases.

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 2 are provided in Table 7.2-39. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options.

Table 7.2-39. Average Daily Traffic for Major Roadways in North Project Section under Alternative 2

	2014			*2030*		
Roadway	*No Build*	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 3 and North Commercial Gate	0	66,900	NA	0	45,900	NA
Route 3 South of Route 28	11,499	53,100	362	12,070	34,000	182

The largest increase in AADT for the roadways is predicted to occur on Route 3 and the North Commercial Gate in 2014. By applying a 2% truck percentage, the largest daily increase of 66,900 vehicles would result in a daily increase of 1,338 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.3, 10 locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. Five of these locations failed the screening criteria. The Route 1/28 intersection has the highest overall volume of all the intersections that failed the screening. This site was chosen for detailed analysis. The Route 9/Andersen AFB North Gate intersection was also chosen for analysis due to the extremely high delay predicted in the build scenario and the predicted high volumes at this location. These intersections represent the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from these sites represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-40 and Table 7.2-41 and are presented in Volume 9, Appendix I, Section 3.3.7.3. The values in these tables, using the same analysis techniques and parameters as those applied in the North Region under Alternative 1, represent the predicted worst-case CO concentrations. As shown in Table 7.2-40 and Table 7.2-41, no violations of the applicable NAAQS are predicted.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted using the same method as described for the North Region (Alternative 1). The highest predicted construction emissions per year, per month, and the year that these emissions are predicted to occur are shown in Table 7.2-42 and Volume 9, Appendix I, Section 3.4. These

emissions were further combined with those from other project components and discussed in Volume 7 to determine the potential impact significance.

Table 7.2-40. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – North, Alternative 2

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/28	5.5	6.0	6.9	7.3	6.0	4.2
Route 9/Andersen AFB North Gate	3.8	4.5	4.2	4.5	3.6	4.5

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-41. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – North Region, Alternative 2

Analysis Site	*Existing*	*2014*	*2030*
Route 1/28	4.2	5.1	4.2
Route 9/Andersen AFB North Gate	3.2	3.2	3.2

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-42. Estimated Construction Emission Burden – North, Alternative 2

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	13.0	20.3	8.4	4.1	1.4	15.3	3,881
Highest Monthly Emission Burden (Tons)	4.7	7.3	1.8	1.3	0.51	5.4	1,462
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.23	0.36	0.09	0.06	0.03	0.27	73.1
Year Highest Monthly Emission Burden Predicted to Occur	2011	2011	2011	2011	2011	2011	2011

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; TPY = tons per year; VMT = vehicle miles traveled; VOC = volatile organic compound.

Central

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-43. Based on these results, the following conclusions can be made:

- Cancer and non-cancer risks at the actual receptors are substantially lower than the values estimated at the sidewalk receptors;
- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions are less than existing risks in most cases.

Table 7.2-43. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 2, Central Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 1/8	1.64	0.78	10	0.19	0.10	1
Route 4/7A	1.22/0.66	-0.09/-0.01		0.62/0.08	0.00/0.00	
Route 16/27	2.97	1.99		0.32	0.20	
Route 1 West of Route 30	0.26	0.06		0.03	0.01	

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 2 are provided in Table 7.2-44. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options.

The largest increase in AADT for the roadways presented in Table 7.2-44 is predicted to occur under Route 8 in 2014. By applying a 2% truck percentage, the largest daily increase of 20,963 vehicles would result in a daily increase of 4,193 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-44. Average Daily Traffic for Major Roadways in Central Project Section under Alternative 2

Roadway	*2014*			*2030*		
	No Build	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 1	79,337	100,300	26	84,935	95,600	13
Route 8	48,221	65,600	36	53,248	58,600	10
Route 18	49,196	74,000	50	59,980	70,500	18

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.3, 34 locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. Twenty-one (21) of these locations failed the screening criteria. The Route 1/8 intersection has the highest overall volume of all the intersections that failed the screening. This site was chosen for detailed analysis. The Route 4/7A intersection has the highest overall delay of any signalized intersection that failed the screening. This site was chosen for detailed analysis. The Route 16/27 intersection fails the screening criteria in other alternatives and was evaluated in this alternative for consistency. These intersections represent the worst-case combination of volumes, LOS,

and delay of the intersections screened. As such, the predicted CO levels from these sites represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-45 and Table 7.2-46 and are presented in Volume 9, Appendix I, Section 3.3.7.3. The values in these tables, using the same analysis techniques and parameters as those applied in the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in Table 7.2-45 and Table 7.2-46, no violations of the applicable NAAQS are predicted.

Table 7.2-45. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – Central, Alternative 2

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/8	6.0	6.4	7.3	7.6	6.2	6.4
Route 4/7A	5.3	3.8	5.1	5.6	4.6	5.1
Route 16/27	8.4	9.4	8.1	9.0	7.0	7.9

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-46. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – Central, Alternative 2

Analysis Site	*Existing*	*2014*	*2030*
Route 1/8	4.5	5.3	4.5
Route 4/7A	3.7	3.9	3.6
Route 16/27	6.6	6.3	5.5

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed emission construction analysis was conducted using the same method as described for the North Region (Alternative 1). The highest emissions per year, per month, and the year that these emissions are predicted to occur are shown in Table 7.2-47 and Volume 9, Appendix I, Section 3.4. These emissions were further combined with those from other project components and discussed in Volume 7 to determine the potential impact significance.

Apra Harbor

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-48. Based on these results, the following conclusions can be made:

- Maximum estimated changes in cancer risk at these locations are expected to decrease at any of the receptors analyzed due to the project. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and

- Maximum estimated changes in the total chronic hazard index are expected to decrease at any of the receptors analyzed due to the project. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

Table 7.2-47. Estimated Construction Emission Burden – Central, Alternative 2

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	54.6	84.2	17.2	14.4	5.9	62.4	16,707
Highest Monthly Emission Burden (Tons)	8.5	13.1	2.2	2.2	0.9	9.7	2,590
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.42	0.65	0.11	0.11	0.05	0.48	129
Year(s) Highest Monthly Emission Burden Predicted to Occur	2012	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Table 7.2-48. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 2 Apra Harbor

	Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)			*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		
Analysis Site	2014	2030	*Cancer Risk Threshold*	2014	2030	*USEPA Hazard Index*
Route 1/2A	-0.82	-0.06	10	-0.09	0.00	1

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions are less than existing risks in most cases.

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 2 are provided in Table 7.2-49. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options. As shown in this table, the largest increase in AADT for the roadways presented is predicted to occur at Route 1 near Route 18 in 2030. By applying a 2% truck percentage, the largest daily increase of 7,158 vehicles would result in a daily increase of 143 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-49. Average Daily Traffic for Major Roadways in Apra Harbor Project Section under Alternative 2

	2014			*2030*		
Roadway	*No Build*	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 1 near Route 18	46,407	49,800	11	41,142	48,300	0.0

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.3, three locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. One of these locations failed the screening criteria. The Route 1/2A intersection has the highest overall volume and highest delay of all the signalized intersections that failed the screening. This site was chosen for detailed analysis. This intersection represents the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from this site represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-50 and Table 7.2-51 and are presented in Volume 9, Appendix I, Section 3.3.7.3. The values in these tables, using the same analysis techniques and parameters as those applied in the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in Table 7.2-50 and Table 7.2-51, no violations of the applicable NAAQS are predicted.

Table 7.2-50. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – Apra Harbor, Alternative 2

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/2A	4.7	4.3	5.3	5.1	4.3	3.9

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-51. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – Apra Harbor, Alternative 2

Analysis Site	*Existing*	*2014*	*2030*
Route 1/2A	3.3	3.7	3.0

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted using the same method as described for the North Region (Alternative 1). The highest predicted construction emissions per year, per month, and the year that these emissions are predicted to occur are shown in Table 7.2-52 and Volume 9, Appendix I, Section 3.4. These emissions were further combined with those from other project components and discussed in Volume 7 to determine the potential impact significance.

Table 7.2-52. Estimated Construction Emission Burden – Apra Region, Alternative 2

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	13.5	20.9	5.0	3.7	1.2	15.4	4,199
Highest Monthly Emission Burden (Tons)	1.6	2.5	0.59	0.44	0.34	1.82	494
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.08	0.12	0.03	0.02	0.02	0.0.9	24.7
Year Highest Monthly Emission Burden Predicted to Occur	2011	2011	2011	2011	2011	2011	2011

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

South

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-53. Based on these results, the following conclusions can be made:

- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions are less than existing risks in most cases.

Table 7.2-53. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 2, South Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 5/2A	0.46	0.08	10	0.05	0.01	1

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 2 are provided in Table 7.2-54. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options. As shown in this table, the largest increase in AADT for the roadways presented is predicted to occur at Route 4 in 2014. By applying a 2% truck percentage, the largest daily increase of 1,767 vehicles would result in a daily increase of 35 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-54. Average Daily Traffic for Major Roadways in South Project Section under Alternative 2

Roadway	*2014*			*2030*		
	No Build	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 4	15,833	17,600	11	21,504	20,100	-7

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.3, four locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. Two of these locations failed the screening criteria. The Route 5/2A intersection has the highest overall volume and highest delay of all the signalized intersections that failed the screening. This site was chosen for detailed analysis. This intersection represents the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from this site represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-55 and Table 7.2-56 and are presented in Volume 9, Appendix I, Section 3.3.7.3. The values in these tables, using the same analysis techniques and parameters as those applied for the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in Table 7.2-55 and Table 7.2-56, no violations of the applicable NAAQS are predicted.

Table 7.2-55. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – South, Alternative 2

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 5/2A	4.2	3.9	4.5	4.0	4.0	3.7

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-56. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – South, Alternative 2

Analysis Site	*Existing*	*2014*	*2030*
Route 5/2A	2.9	3.2	2.8

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted using the same method as described for the North Region (Alternative 1). As shown in Table 7.2-57 and Volume 9, Appendix I, Section 3.4, construction emissions are negligible.

Table 7.2-57. Estimated Construction Emission Burden – South, Alternative 2

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	11.1	17.3	2.9	2.8	1.2	12.9	3310
Highest Monthly Emission Burden (Tons)	3.1	4.9	0.83	0.81	0.34	3.7	957
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.16	0.25	0.04	0.04	0.02	0.18	47.8
Year Highest Monthly Emission Burden Predicted to Occur	2012	2013	2012 & 2013	2012 & 2013	2013	2013	2013

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Proposed Mitigation Measures

Because the alternative is not predicted to cause a significant impact on air quality levels, no mitigation is proposed.

7.2.6.3 Alternative 2 Constrained

Mesoscale Emissions Burden

As shown in Table 7.2-58 and Volume 9, Appendix I, Section 3.3.7.3, regional emissions are predicted to increase in the range of 18% to 19% under Alternative 2 Constrained and are the same as compared to Alternative 1and Alternative 2. This is primarily due to the estimated 18% increase in VMT under Alternative 2 Constrained.

Table 7.2-58. Regional Annual Emission Burdens, Alternative 2 Constrained

			Emission Burden (TPY)						
Scenario	*VMT*	*Speed*	*CO*	*NO_x*	*VOC*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*CO_2*
2030 No-Action Alternative	3,535,224	28.6	13,388	478	801	78	57	562	80,499
2030 Alternative 2 Constrained	4,160,544	28.0	15,813	566	951	91	67	661	94,687
Net Change from No-Action			2,425	88	150	13	10	99	14,188
Percent Change from No-Action			18	18	19	18	18	18	18

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; VOC = volatile organic compound; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; TPY = tons per year; NOx = nitrogen oxides; VMT = vehicle miles traveled.

North

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-59. Based on these results, the following conclusions can be made:

- Cancer and non-cancer risks at the actual receptors are substantially lower than the values estimated at the sidewalk receptors;
- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

Table 7.2-59. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 2 Constrained, North Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 1/28	1.14 / 0.29	1.00 / 0.14	10	0.15 / 0.04	0.07 / 0.02	1
Route 9/Andersen AFB North Gate	0.99	0.26		0.23	0.23	

Legend: AFB = Air Force Base.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build (i.e., no-action alternative) and Build (i.e., Alternative 2 Constrained) conditions are less than existing risks in most cases.

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 2 Constrained are provided in Table 7.2-60. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options.

Table 7.2-60. Average Daily Traffic for Major Roadways in North Project Section under Alternative 2 Constrained

Roadway	*2014*			*2030*		
	No Build	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 3 and North Commercial Gate	0	66,900	NA	0	45,900	NA
Route 3 South of Route 28	11,499	53,100	362	12,070	34,000	182

The largest increase in AADT for the roadways presented in Table 7.2-60 is predicted to occur on Route 3 and the North Commercial Gate in 2014. By applying a 2% truck percentage, the largest daily increase of 66,900 vehicles would result in a daily increase of 1,338 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.3, 10 locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. Five of these locations failed the screening criteria. The Route 1/28 intersection has the highest overall volume of all the intersections that failed the screening. This site was chosen for detailed analysis. The Route 9/Andersen AFB North Gate intersection was also chosen for analysis due to the extremely high delay predicted in the build scenario and the predicted high volumes at this location. These intersections represent the worst-case combination of

volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from these sites represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-61 and Table 7.2-62 and are presented in Volume 9, Appendix I, Section 3.3.7.3. The values in these tables, using the same analysis techniques and parameters as those applied in the North Region under Alternative 1, represent the predicted worst-case CO concentrations. As shown in Table 7.2-61 and Table 7.2-62, no violations of the applicable NAAQS are predicted.

Table 7.2-61. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – North, Alternative 2 Constrained

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/28	5.5	6.0	7.0	7.5	5.8	6.2
Route 9/Andersen AFB North Gate	3.8	4.5	4.2	4.4	3.6	4.5

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-62. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – North Region, Alternative 2 Constrained

Analysis Site	*Existing*	*2014*	*2030*
Route 1/28	4.2	5.3	4.3
Route 9/Andersen AFB North Gate	3.2	3.1	3.2

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

Alternative 2 Constrained would involve less construction activity than proposed for Alternative 2. As such, construction emissions for this alternative are expected to be lower than those predicted for Alternative 2.

Central

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-63. Based on these results, the following conclusions can be made:

- Cancer and non-cancer risks at the actual receptors are substantially lower than the values estimated at the sidewalk receptors;
- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

Table 7.2-63. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 2 Constrained, Central Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors /Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 1/8	2.60	1.21	10	0.27	0.11	1
Route 4/7A	1.56/0.81	1.21/0.27		0.66/0.10	0.01/0.01	
Route 16/27	1.58	0.69		0.20	0.09	
Route 1 West of Route 30	0.26	0.06		0.03	0.01	

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions are less than existing risks in most cases.

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 2 Constrained are provided in Table 7.2-64. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options.

The largest increase in AADT for the roadways presented in Table 7.2-64 is predicted to occur under Route 8 in 2014. By applying a 2% truck percentage, the largest daily increase of 20,963 vehicles would result in a daily increase of 4,193 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-64. Average Daily Traffic for Major Roadways in Central Project Section under Alternative 2 Constrained

Roadway	*2014*			*2030*		
	No Build	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 1	79,337	100,300	26	84,935	95,600	13
Route 8	48,221	65,600	36	53,248	58,600	10
Route 18	49,196	74,000	50	59,980	70,500	18

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.3, 34 locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. Twenty-one (21) of these locations failed the screening criteria. The Route 1/8 intersection has the highest overall volume of all the intersections that failed the screening. This site was chosen for detailed analysis. The Route 4/7A intersection has the highest overall delay of any signalized intersection that failed the screening. This site was chosen for detailed analysis. The Route 16/27 intersection fails the screening criteria in other alternatives and was evaluated in this alternative for consistency. These intersections represent the worst-case combination of volumes, LOS,

and delay of the intersections screened. As such, the predicted CO levels from these sites represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-65 and Table 7.2-66 and are presented in Volume 9, Appendix I, Section 3.3.7.3. The values in these tables, using the same analysis techniques and parameters as those applied in the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in Table 7.2-65 and Table 7.2-66, no violations of the applicable NAAQS are predicted.

Table 7.2-65. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – Central, Alternative 2 Constrained

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/8	6.0	6.4	6.7	7.6	5.6	6.2
Route 4/7A	5.3	3.8	6.0	6.1	5.4	5.3
Route 16/27	8.4	9.4	7.9	8.4	6.7	7.3

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-66. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – Central, Alternative 2 Constrained

Analysis Site	*Existing*	*2014*	*2030*
Route 1/8	4.5	5.3	4.3
Route 4/7A	3.7	4.3	3.8
Route 16/27	6.6	5.9	5.1

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

Alternative 2 Constrained would involve less construction activity than proposed for Alternative 2. As such, construction emissions for this alternative are expected to be lower than those predicted for Alternative 2.

Apra Harbor

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-67. Based on these results, the following conclusions can be made:

- Maximum estimated changes in cancer risk at these locations are expected to decrease at any of the receptors analyzed due to the project. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated changes in the total chronic hazard index are expected to decrease at any of the receptors analyzed due to the project. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions, are less than existing risks in most cases.

Table 7.2-67. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 2 Constrained Apra Harbor

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 1/2A	-0.82	-0.06	10	-0.09	-0.00	1

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 2 Constrained are provided in Table 7.2-68. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options. As shown in this table, the largest increase in AADT for the roadways presented is predicted to occur at Route 1 near Route 18 in 2030. By applying a 2% truck percentage, the largest daily increase of 7,158 vehicles would result in a daily increase of 143 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-68. Average Daily Traffic for Major Roadways in Apra Harbor Project Section under Alternative 2 Constrained

	2014			*2030*		
Roadway	*No Build*	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 1 near Route 18	46,407	49,800	11	41,142	48,300	0.0

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.3, three locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. One of these locations failed the screening criteria. The Route 1/2A intersection has the highest overall volume and highest delay of all the signalized intersections that failed the screening. This site was chosen for detailed analysis. This intersection represents the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from this site represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-69 and Table 7.2-70 and are presented in Volume 9, Appendix I, Section 3.3.7.3. The values in these tables, using the same analysis techniques and parameters as those applied in the North Region (Alternative 1), represent the predicted worst-case CO

concentrations. As shown in Table 7.2-69 and Table 7.2-70, no violations of the applicable NAAQS are predicted.

Table 7.2-69. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – Apra Harbor, Alternative 2 Constrained

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/2A	4.7	4.3	5.3	5.1	4.3	3.9

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-70. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – Apra Harbor, Alternative 2 Constrained

Analysis Site	*Existing*	*2014*	*2030*
Route 1/2A	3.3	3.7	3.0

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

Alternative 2 Constrained would involve less construction activity than proposed for Alternative 2. As such, construction emissions for this alternative are expected to be lower than those predicted for Alternative 2.

South

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-71. Based on these results, the following conclusions can be made:

- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions, are less than existing risks in most cases.

Table 7.2-71. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 2 Constrained, South Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 5/2A	0.46	0.08	10	0.05	0.01	1

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 2 Constrained are provided in Table 7.2-72. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options. As shown in this table, the largest increase in AADT for the roadways presented is predicted to occur at Route 4 in 2014. By applying a 2% truck percentage, the largest daily increase of 1,767 vehicles would result in a daily increase of 35 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-72. Average Daily Traffic for Major Roadways in South Project Section under Alternative 2 Constrained

Roadway	*2014*			*2030*		
	No Build	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 4	15,833	17,600	11	21,504	20,100	-7

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.3, four locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. Two of these locations failed the screening criteria. The Route 5/2A intersection has the highest overall volume and highest delay of all the signalized intersections that failed the screening. This site was chosen for detailed analysis. This intersection represents the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from this site represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-73 and Table 7.2-74 and are presented in Volume 9, Appendix I, Section 3.3.7.3. The values in these tables, using the same analysis techniques and parameters as those applied for the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in Table 7.2-73 and Table 7.2-74, no violations of the applicable NAAQS are predicted.

Table 7.2-73. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – South, Alternative 2 Constrained

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 5/2A	4.2	3.9	4.5	4.0	4.0	3.7

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-74. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – South, Alternative 2 Constrained

Analysis Site	*Existing*	*2014*	*2030*
Route 5/2A	2.9	3.2	2.8

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

Alternative 2 Constrained would involve less construction activity than proposed for Alternative 2. As such, construction emissions for this alternative are expected to be lower than those predicted for Alternative 2.

Proposed Mitigation Measures

Because the alternative is not predicted to cause a significant impact on air quality levels, no mitigation is proposed.

7.2.6.4 Alternative 3

Mesoscale Emissions Burden

As shown in Table 7.2-75 and presented in Volume 9, Appendix I, Section 3.3.7.4, regional emissions are predicted to increase in the range of 20% to 23% under Alternative 3, as compared to the no-action alternative. This is primarily due to the estimated 20% increase in VMT under Alternative 3.

Table 7.2-75. Regional Annual Emission Burdens, Alternative 3

			Emission Burden (TPY)						
Scenario	*VMT*	*Speed*	*CO*	*NOx*	*VOC*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*CO_2*
2030 No-Action Alternative	3,535,224	28.6	13,388	478	801	78	57	562	80,499
2030 Alternative 3	4,249,190	27.4	16,211	580	982	93	68	675	96,705
Net Change from No-Action			2,823	102	181	15	11	113	16,206
Percent Change from No-Action			21	21	23	20	20	20	20

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; TPY = tons per year; VMT = vehicle miles traveled; VOC = volatile organic compound.

North

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-76. Based on these results, the following conclusions can be made:

- Cancer and non-cancer risks at the actual receptors are substantially lower than the values estimated at the sidewalk receptors;
- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build (i.e. no-action alternative) and Build (i.e., Alternative 3) conditions are less than existing risks in most cases.

Table 7.2-76. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 3, North Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 1/28	2.36 / 0.46	0.89 / 0.09	10	0.27 /0.06	0.11 / 0.01	1
Route 9/Andersen AFB North Gate	0.97	0.26		0.18	0.07	

Legend: AFB = Air Force Base.

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 3 are provided in Table 7.2-77. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options.

The largest increase in AADT for the roadways presented in Table 7.2-77 is predicted to occur on Route 3 South of Route 28 in 2014. By applying a 2% truck percentage, the largest daily increase of 45,101 vehicles would result in a daily increase of 902 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Table 7.2-77. Average Daily Traffic for Major Roadways in North Project Section under Alternative 3

Roadway	*2014*			*2030*		
	No Build	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 3 and North Commercial Gate	0	24,300	NA	0	18,800	2.7
Route 3 South of Route 28	11,499	56,600	392	12,070	43,000	13

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.4, 10 locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. Nine of these locations failed the screening criteria. The Route 1/28 intersection has the highest overall volume of all the intersections that failed the screening. This site was chosen for detailed analysis. The Route 9/Andersen AFB North Gate intersection was also chosen for analysis due to the extremely high delay predicted in the build scenario and the predicted high volumes at this location. These intersections represent the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from these sites represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-78 and Table 7.2-79 and are presented in Volume 9, Appendix I, Section 3.3.7.3. The values in these tables, using the same analysis techniques and parameters as those applied for the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in these tables, no violations of the applicable NAAQS are predicted.

Table 7.2-78. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – North, Alternative 3

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/28	5.5	6.0	7.1	7.5	5.6	5.9
Route 9/Andersen AFB North Gate	3.8	4.5	4.2	4.5	3.6	4.5

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-79. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – North, Alternative 3

Analysis Site	*Existing*	*2014*	*2030*
Route 1/28	4.2	5.3	4.1
Route 9/Andersen AFB North Gate	3.2	3.2	3.2

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted using the same method as described for the North Region under Alternative 1. The highest predicted construction emissions per year, per month, and the year that these emissions are predicted to occur are shown in Table 7.2-80 and Volume 9, Appendix I, Section 3.4.

Table 7.2-80. Estimated Construction Emission Burden – North, Alternative 3

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	13.0	20.3	8.4	4.1	1.4	15.3	3,881
Highest Monthly Emission Burden (Tons)	4.7	7.3	1.8	1.3	0.51	5.4	1,462
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.23	0.36	0.09	0.06	0.03	0.27	73.1
Year Highest Monthly Emission Burden Predicted to Occur	2011	2011	2011	2011	2011	2011	2011

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$= particulate matter less than 2.5microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Central

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis shown in Table 7.2-81.

Based on these results, the following conclusions can be made:

- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable.
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would cause the receptor at the intersection of Route 16 and Route 17 to increase over the threshold of 10 in a million by 0.2, in 2014. Given the projected decrease in emission rates of MSAT, this increase is not expected to occur in 2030 and the site is predicted to be below the threshold criteria. As this is not the preferred alternative, further refined modeling has not been conducted at this location. It is anticipated that applying refined modeling procedures and receptor placement, as suggested by USEPA, would result in levels below the threshold criteria. If this alternative becomes the preferred alternative, further analysis of this site would be conducted.
- At all other analysis sites in this area, applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million.
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions are less than existing risks in most cases.

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 3 are provided in Table 7.2-82. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options.

Table 7.2-81. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 3, Central Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 1/8	3.54	1.01	10	0.38	0.09	1
Route 4/7A	1.24/1.49	-0.15/0.64		0.62/0.17	-0.02/0.07	
Route 16/27	4.31	2.12		0.46	0.22	
Route 1 West of Route 30	0.24	0.04		0.03	0.01	

The largest increase in AADT for the roadways presented in Table 7.2-82 is predicted to occur under Route 18 in 2014. By applying a 2% truck percentage, the largest daily increase of 43,604 vehicles would result in a daily increase of 872 trucks. This is substantially below the FHWA example for a new highway

project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Table 7.2-82. Average Daily Traffic for Major Roadways in Central Project Section under Alternative 3

	2014			*2030*		
Roadway	*No Build*	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 1	79,337	97,400	23	84,935	93,100	10
Route 8	48,221	68,000	41	53,248	60,400	13
Route 18	49,196	92,800	89	59,980	89,200	49

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.4, 34 locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. Twenty-eight of these locations failed the screening criteria. The Route 16/27 intersection has the highest overall volume of all the intersections that failed the screening. This site was chosen for detailed analysis. The Route 4/7A intersection has the highest overall delay of any signalized intersection that failed the screening. This site was chosen for detailed analysis. These intersections represent the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from these sites represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-83 and Table 7.2-84 and are presented in Volume 9, Appendix I, Section 3.3.7.4. The values in these tables, using the same analysis techniques and parameters as those applied for the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in Table 7.2-83 and Table 7.2-84 no violations of the applicable NAAQS are predicted.

Table 7.2-83. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – Central, Alternative 3

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/8	6.0	6.4	7.3	7.6	6.2	6.4
Route 4/7A	5.3	3.8	5.1	5.6	4.6	5.1
Route 16/27	8.4	9.4	8.1	9.0	7.0	7.9

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted using the same method as described for the North Region (Alternative 1). The highest predicted construction emissions per year, per month, and the year that these emissions are predicted to occur are shown in Table 7.2-85 and Volume 9, Appendix I, Section 3.4.

Table 7.2-84. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – Central, Alternative 3

Analysis Site	*Existing*	*2014*	*2030*
Route 1/8	4.5	5.3	4.5
Route 4/7A	3.7	3.9	3.6
Route 16/27	6.6	6.3	5.5

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-85. Estimated Construction Emission Burden – Central, Alternative 3

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	54.6	84.2	17.2	14.4	5.9	62.4	16,707
Highest Monthly Emission Burden (Tons)	8.5	13.1	2.2	2.2	0.9	9.7	2,590
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.42	0.65	0.11	0.11	0.05	0.48	129
Year(s) Highest Monthly Emission Burden Predicted to Occur	2012	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Apra Harbor

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-86. Based on these results, the following conclusions can be made:

- Maximum estimated changes in cancer risk at these locations are expected to decrease at any of the receptors analyzed due to the project. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated changes in the total chronic hazard index are expected to decrease at any of the receptors analyzed due to the project. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions, are less than existing risks in most cases.

Table 7.2-86. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 3 Apra Harbor

	Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)			*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		
Analysis Site	2014	2030	*Cancer Risk Threshold*	2014	2030	*USEPA Hazard Index*
Route 1/2A	-0.88	-0.06	10	-0.09	0.00	1

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 3 are provided in Table 7.2-87. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be

approximately 2% for both the No Build and Build options. As shown in this table, the largest increase in AADT for the roadways presented is predicted to occur at Route 1 near Route 18 in 2030. By applying a 2% truck percentage, the largest daily increase of 7,258 vehicles would result in a daily increase of 145 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-87. Average Daily Traffic for Major Roadways in Apra Harbor Project Section under Alternative 3

	2014			*2030*		
Roadway	*No Build*	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 1 near Route 18	46,407	49,800	7	41,142	48,400	18

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.4, three locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. One of these locations failed the screening criteria. The Route 1/2A intersection has the highest overall volume and highest delay of all the signalized intersections that failed the screening. This site was chosen for detailed analysis. This intersection represents the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from this site represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-88 and Table 7.2-89 and are presented in Volume 9, Appendix I, Section 3.3.7.4. The values in these tables, using the same analysis techniques and parameters as those applied for the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in Table 7.2-88 and Table 7.2-89 no violations of the applicable NAAQS are predicted.

Table 7.2-88. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – Apra Harbor, Alternative 3

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/2A	4.7	4.3	5.3	5.1	4.3	3.8

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-89. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – Apra Harbor, Alternative 3

Analysis Site	*Existing*	*2014*	*2030*
Route 1/2A	3.3	3.7	3.0

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted using the same method as described for the North Region (Alternative 1). The highest predicted construction emissions per year, per month, and the year that these emissions are predicted to occur are shown in Table 7.2-90 and Volume 9, Appendix I, Section 3.4.

Table 7.2-90. Estimated Construction Emission Burden – Apra Harbor, Alternative 3

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	13.5	20.9	5.0	3.7	1.2	15.4	4,199
Highest Monthly Emission Burden (Tons)	1.6	2.5	0.59	0.44	0.34	1.82	494
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.08	0.12	0.03	0.02	0.02	0.0.9	24.7
Year Highest Monthly Emission Burden Predicted to Occur	2011	2011	2011	2011	2011	2011	2011

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

South

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-91. Based on these results, the following conclusions can be made:

- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions are less than existing risks in most cases.

Table 7.2-91. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 3, South Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 5/2A	0.39	0.00	10	0.05	0.00	1

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 3 are provided in Table 7.2-92. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options. As shown in this table, the largest increase in AADT for the roadways presented is predicted to occur at Route 4 in 2014. By applying a 2% truck percentage, the largest daily increase of 1,767 vehicles would result in a daily increase of 35 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-92. Average Daily Traffic for Major Roadways in South Project Section under Alternative 3

Roadway	*2014*			*2030*		
	No Build	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 4	15,833	17,600	11	21,504	20,000	-7

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.4, four locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. Two of these locations failed the screening criteria. The Route 5/2A intersection has the highest overall volume of all the signalized intersections that failed the screening. This site was chosen for detailed analysis. This intersection represents the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from this site represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-93 and Table 7.2-94 and are presented in Volume 9, Appendix I, Section 3.3.7.4. The values in these tables, using the same analysis techniques and parameters as those applied for the North Region (Alternative 1), represent the predicted worst-case CO concentrations As shown in Table 7.2-93 and Table 7.2-94, no violations of the applicable NAAQS are predicted.

Table 7.2-93. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – South, Alternative 3

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 5/2A	4.2	3.9	4.5	3.9	3.8	3.5

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-94. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – South, Alternative 3

Analysis Site	*Existing*	*2014*	*2030*
Route 5/2A	2.9	3.2	2.7

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted using the same method as described for the North Region (Alternative 1). As shown in Table 7.2-95 and Volume 9, Appendix I, Section 3.4, construction emissions are negligible.

Table 7.2-95. Estimated Construction Emission Burden – South, Alternative 3

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	11.1	17.3	2.9	2.8	1.2	12.9	3310
Highest Monthly Emission Burden (Tons)	3.1	4.9	0.83	0.81	0.34	3.7	957
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.16	0.25	0.04	0.04	0.02	0.18	47.8
Year(s) Highest Monthly Emission Burden Predicted to Occur	2012	2013	2012 & 2013	2012 & 2013	2013	2013	2013

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NOx = nitrogen oxides; $PM_{2.5}$= particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Proposed Mitigation Measures

Because the alternative is not predicted to cause a significant impact on air quality levels, no mitigation is proposed.

7.2.6.5 Alternative 8

Mesoscale Emissions Burden

As shown in Table 7.2-96 and Volume 9, Appendix I, Section 3.3.7.5, regional emissions are predicted to increase in the range of 19% to 21% under Alternative 8, as compared to the no-action alternative. This is primarily due to the estimated 20% increase in VMT under Alternative 8.

Table 7.2-96. Regional Annual Emission Burdens, Alternative 8

			Emission Burden (TPY)						
Scenario	*VMT*	*Speed*	*CO*	*NO_x*	*VOC*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*CO_2*
2030 No-Action Alternative	3,535,224	28.6	13,388	478	801	78	57	562	80,499
2030 Alternative 8	4,247,334	28.0	16,143	578	971	93	68	675	96,662
Net Change from No-Action			2,755	100	170	15	11	113	16,163
Percent Change from No-Action			21	21	21	19	19	20%	20

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; TPY = tons per year; VMT = vehicle miles traveled; VOC = volatile organic compound.

North

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-97. Based on these results, the following conclusions can be made:

- Cancer and non-cancer risks at the actual receptors are substantially lower than the values estimated at the sidewalk receptors;
- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

Table 7.2-97. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 8, North Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 1/28	2.50 / 0.39	0.32 / 0.11	10	0.28 /0.05	0.05 / 0.01	1
Route 9/Andersen AFB North Gate	0.96	0.26		0.17	0.07	

Legend: AFB = Air Force Base.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build (i.e., no-action alternative) and Build (i.e., Alternative 8) conditions are less than existing risks in most cases.

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 8 are provided in Table 7.2-98. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options.

Table 7.2-98. Average Daily Traffic for Major Roadways in North Project Section under Alternative 8

Roadway	*2014*			*2030*		
	No Build	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 3 and North Commercial Gate	0	65,500	NA	0	45,200	NA
Route 3 South of Route 28	11,499	57,000	15.9	12,070	25,000	107

The largest increase in AADT for the roadways presented in Table 7.2-98 is predicted to occur on Route 3 and North Commercial Gate in 2014. By applying a 2% truck percentage, the largest daily increase of

65,500 vehicles would result in a daily increase of 1,310 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.5, 10 locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. Five of these locations failed the screening criteria. The Route 1/28 intersection has the highest overall volume of all the intersections that failed the screening. This site was chosen for detailed analysis. The Route 9/Andersen AFB North Gate intersection was also chosen for analysis due to the extremely high delay predicted in the build scenario and the predicted high volumes at this location. These intersections represent the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from these sites represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-99 and Table 7.2-100 and are presented in Volume 9, Appendix I, Section 3.3.7.5. The values in these tables, using the same analysis techniques and parameters as those applied for the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in Table 7.2-99 and Table 7.2-100, no violations of the applicable NAAQS are predicted.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted. Using the estimated project schedule along with typical equipment requirements for specific tasks, emission burden estimates of CO, NO_x, PM_{10}, and $PM_{2.5}$ were calculated. Equipment emissions were presumed to be Tier 3, with high sulfur fuel as confirmed by the construction management team. Based on the preliminary schedule, the highest emissions per year, per month, and the year that these emissions are predicted to occur are shown in Table 7.2-101 and Volume 9, Appendix I, Section 3.4.

Table 7.2-99. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – North, Alternative 8

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/28	5.5	6.0	7.1	7.4	5.8	5.7
Route 9/Andersen AFB North Gate	3.8	4.5	4.2	4.5	3.6	4.5

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-100. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – North, Alternative 8

Analysis Site	*Existing*	*2014*	*2030*
Route 1/28	4.2	5.2	4.1
Route 9/Andersen AFB North Gate	3.2	3.2	3.2

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-101. Estimated Construction Emission Burden – North, Alternative 8

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	13.0	20.3	8.4	4.1	1.4	15.3	3,881
Highest Monthly Emission Burden (Tons)	4.7	7.3	1.8	1.3	0.51	5.4	1,462
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.23	0.36	0.09	0.06	0.03	0.27	73.1
Year Highest Monthly Emission Burden Predicted to Occur	2011	2011	2011	2011	2011	2011	2011

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Central

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-102. Based on these results, the following conclusions can be made:

- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions, are less than existing risks in most cases.

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 8 are provided in Table 7.2-103. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options.

Table 7.2-102. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 8, Central Region

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors (x^{-6})*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 1/8	3.56	1.31	10	0.31	0.13	1
Route 4/7A	0.63/1.74	-0.08/0.80		0.55/0.20	0.00/0.09	
Route 16/27	3.70	3.37		0.42	0.29	
Route 1 West of Route 30	0.29	0.05		0.04	0.01	

Table 7.2-103. Average Daily Traffic for Major Roadways in Central Project Section under Alternative 8

Roadway	*2014*			*2030*		
	No Build	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 1	79,337	100,500	27	84,935	95,300	12
Route 8	48,221	66,800	39	53,248	59,700	12
Route 18	49,196	80,100	63	59,980	75,100	25

The largest increase in AADT for the roadways presented in Table 7.2-103 is predicted to occur under Route 18 in 2014. By applying a 2% truck percentage, the largest daily increase of 30,904 vehicles would result in a daily increase of 618 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.5, 34 locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. Twenty of these locations failed the screening criteria. The Route 16/27 intersection has the third highest overall volume and the worst delay of the three highest volume intersections. This site was chosen for detailed analysis. The Route 4/7A intersection has the highest overall delay of any signalized intersection that failed the screening. This site was chosen for detailed analysis. These intersections represent the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from these sites represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-104 and Table 7.2-105 and are presented in Volume 9, Appendix I, Section 3.3.7.5. The values in these tables, using the same analysis techniques and parameters as those applied for the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in Table 7.2-104 and Table 7.2-105, no violations of the applicable NAAQS are predicted.

Table 7.2-104. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – Central, Alternative 8

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/8	6.0	6.4	7.3	7.4	5.6	6.0
Route 4/7A	5.3	3.8	5.2	5.3	4.6	5.0
Route 16/27	8.4	9.4	8.3	9.4	7.1	8.0

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-105. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – Central, Alternative 8

Analysis Site	*Existing*	*2014*	*2030*
Route 1/8	4.5	5.2	4.2
Route 4/7A	3.7	3.7	3.5
Route 16/27	6.6	6.6	5.6

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted using the same method as described for the North Region (Alternative 1). The highest predicted construction emissions per year, per month, and the year that these emissions are predicted to occur are shown in Table 7.2-106 and Volume 9, Appendix I, Section 3.4.

Table 7.2-106. Estimated Construction Emission Burden – Central, Alternative 8

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	54.6	84.2	17.2	14.4	5.9	62.4	16,707
Highest Monthly Emission Burden (Tons)	8.5	13.1	2.2	2.2	0.9	9.7	2,590
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.42	0.65	0.11	0.11	0.05	0.48	129
Year Highest Monthly Emission Burden Predicted to Occur	2012	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013	2012 & 2013

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Apra Harbor

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-107**.** Based on these results, the following conclusions can be made:

- Maximum estimated changes in cancer risk at these locations are expected to decrease at any of the receptors analyzed due to the project. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated changes in the total chronic hazard index are expected to decrease at any of the receptors analyzed due to the project. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions, are less than existing risks in most cases.

Table 7.2-107. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 8 Apra Harbor

Analysis Site	*Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)*		*Cancer Risk Threshold*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard Index*
	2014	2030		2014	2030	
Route 1/2A	-0.82	-0.06	10	-0.09	0.00	1

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 8 are provided in Table 7.2-108.

The largest increase in AADT for the roadways presented in Table 7.2-108 is predicted to occur under Route 1 near Route 18 in 2030. By applying a 2% truck percentage, the largest daily increase of 7,458 vehicles would result in a daily increase of 149 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Table 7.2-108. Average Daily Traffic for Major Roadways in Apra Harbor Project Section under Alternative 8

Roadway	*2014*			*2030*		
	No Build	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 1 near Route 18	46,407	49,800	7	41,142	48,600	18

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in Volume 9, Appendix I, Section 3.3.7.5, three locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. One of these locations failed the screening criteria. The Route 1/2A intersection has the highest overall volume and highest delay of all the signalized intersections that failed the screening. This site was chosen for detailed analysis. This intersection represents the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from this site represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-109 and Table 7.2-110 and are presented in Volume 9, Appendix I, Section 3.3.7.5. The values in these tables, using the same analysis techniques and parameters as those applied for the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in Table 7.2-109 and Table 7.2-110, no violations of the applicable NAAQS are predicted.

Table 7.2-109. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – Apra Harbor, Alternative 8

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 1/2A	4.7	4.3	5.3	5.1	4.3	3.9

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-110. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – Apra Harbor, Alternative 8

Analysis Site	*Existing*	*2014*	*2030*
Route 1/2A	3.3	3.7	3.0

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed construction emissions analysis was conducted using the same method as described for the North Region (Alternative 1). The highest predicted construction emissions per year, per month, and the year that these emissions are predicted to occur are shown in Table 7.2-111 and Volume 9, Appendix I, Section 3.4.

Table 7.2-111. Estimated Construction Emission Burden – Apra Harbor, Alternative 8

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	13.5	20.9	5.0	3.7	1.2	15.4	4,199
Highest Monthly Emission Burden (Tons)	1.6	2.5	0.59	0.44	0.34	1.82	494
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.08	0.12	0.03	0.02	0.02	0.0.9	24.7
Year Highest Monthly Emission Burden Predicted to Occur	2011	2011	2011	2011	2011	2011	2011

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

South

MSATs and PM

The screening-level MSAT dispersion modeling analysis was conducted using both sidewalk and actual receptors. The results of this analysis are shown in Table 7.2-112. Based on these results, the following conclusions can be made:

- Maximum estimated increases in cancer risk at any of the receptors due to the project are all less than threshold criteria of 10 in a million. Therefore, the project impacts of all carcinogenic MSATs are considered acceptable;
- Applying a more conservative exposure duration of 70 years, rather than 30 years, would not cause the maximum estimated changes in cancer risk at any of the receptors to increase over the threshold of 10 in a million; and
- Maximum estimated increases in the total chronic hazard index at any of the receptors due to the project are all less than the threshold limit of 1. Therefore, the project impacts of all non-carcinogenic MSATs are considered acceptable.

In addition, based on proposed USEPA regulations to reduce air toxics, future cancer and non-cancer risks, under both No Build and Build conditions, are less than existing risks in most cases.

Table 7.2-112. Estimated Project Related Impacts Compared to Cancer Risk Threshold and Hazard Index, Alternative 8, South Region

	Estimated Cancer Risk Increase or Decrease at Sidewalk Receptors/Actual Receptors ($x10^{-6}$)		*Cancer Risk*	*Estimated Non-Cancer Chronic Hazard Index Increase or Decrease at Sidewalk Receptors/Actual Receptors*		*USEPA Hazard*
Analysis Site	2014	2030	*Threshold*	2014	2030	*Index*
Route 5/2A	0.50	0.09	10	0.06	0.01	1

PM impacts would be the same as those for the North Region, Alternative 1. The ADT on the highest volume roadways under the No Build and Build Alternative 8 are provided in Table 7.2-113. As detailed in the traffic analysis for the project, truck percentages on all roadways have been estimated to be approximately 2% for both the No Build and Build options. As shown in this table, the largest increase in AADT for the roadways presented is predicted to occur at Route 4 in 2014. By applying a 2% truck percentage, the largest daily increase of 1,767 vehicles would result in a daily increase of 35 trucks. This is substantially below the FHWA example for a new highway project of 125,000 AADT with 8% trucks, which would translate to an increase of 10,000 trucks. Thus, the project is not considered to be a project of air quality concern (i.e., an expanded highway with a significant number of or significant increase in diesel vehicles).

Based on this and the discussion in the North Region Alternative 1, the project does not qualify as a project of air quality concern with respect to $PM_{2.5}$.

Table 7.2-113. Average Daily Traffic for Major Roadways in South Project Section under Alternative 8

	2014			*2030*		
Roadway	*No Build*	*Build*	*% Change*	*No Build*	*Build*	*% Change*
Route 4	15,833	17,600	11	21,504	19,900	-1.0

Microscale CO Analysis

A screening analysis was performed to determine which intersections could potentially degrade air quality levels due to increased delay, volume, or worsening LOS due to the project. As detailed in and Volume 9, Appendix I, Section 3.3.7.5, four locations were screened based on changes in intersection volumes, delay, and LOS between the no-action and build alternatives. One of these locations failed the screening criteria. The Route 5/2A intersection has the highest overall volume of all the signalized intersections that failed the screening. This site was chosen for detailed analysis. This intersection represents the worst-case combination of volumes, LOS, and delay of the intersections screened. As such, the predicted CO levels from this site represent the worst-case microscale CO impacts expected from the project.

The results of the microscale analysis are shown in Table 7.2-114 and Table 7.2-115 and are presented in Volume 9, Appendix I, Section 3.3.7.5. The values in these tables, using the same analysis techniques and parameters as those applied for the North Region (Alternative 1), represent the predicted worst-case CO concentrations. As shown in Table 7.2-114 and Table 7.2-115 no violations of the applicable NAAQS are predicted.

Table 7.2-114. Predicted Worst-Case 1-Hour CO Concentrations (ppm) – South Region, Alternative 8

	Existing		*2014*		*2030*	
Analysis Site	*a.m.*	*p.m.*	*a.m.*	*p.m.*	*a.m.*	*p.m.*
Route 5/2A	4.2	3.9	4.5	4.0	3.9	3.7

Notes: 1-hour CO NAAQS = 35 ppm. Includes a background concentration of 2 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Table 7.2-115. Predicted Worst-Case 8-Hour CO Concentrations (ppm) – South Region, Alternative 8

Analysis Site	*Existing*	*2014*	*2030*
Route 5/2A	2.9	3.2	2.7

Notes: 8-hour CO NAAQS = 9 ppm. Includes a background concentration of 1.4 ppm.
Legend: AFB = Air Force Base; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards, ppm = parts per million.

Construction Emissions Analysis

To determine the temporary air quality impacts arising from construction of the project, a detailed emission construction analysis was conducted using the same method as described for the North Region (Alternative 1). As shown in Table 7.2-116 and Volume 9, Appendix I, Section 3.4, construction emissions are negligible.

Table 7.2-116. Estimated Construction Emission Burden – South, Alternative 8

	CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*VOC*	*SO_2*	*CO_2*
Maximum Yearly Value (Tons)	11.1	17.3	2.9	2.8	1.2	12.9	3310
Highest Monthly Emission Burden (Tons)	3.1	4.9	0.83	0.81	0.34	3.7	957
Average Daily Emission Burden (Based on Highest Month) (Tons)	0.16	0.25	0.04	0.04	0.02	0.18	47.8
Year Highest Monthly Emission Burden Predicted to Occur	2012	2013	2012 & 2013	2012 & 2013	2013	2013	2013

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound.

Proposed Mitigation Measures

Because the alternative is not predicted to cause a significant impact on air quality levels, no mitigation is proposed.

7.2.6.6 Summary of Impacts

Table 7.2-117 summarizes the potential air quality impacts associated with each of the roadway project alternatives.

Table 7.2-117. Summary of Potential Impacts to Air Quality -Roadway Projects

Potentially Impacted Resource	*Alternative 1*	*Alternative 2*	*Alternative 2 Constrained*	*Alternative 3*	*Alternative 8*
Regional Air Quality	LSI	LSI	LSI	LSI	LSI
Mobile Source Air Toxics	LSI	LSI	LSI	PI	LSI
Local Carbon Monoxide Levels	LSI	LSI	LSI	LSI	LSI
Air Quality during Construction	LSI	LSI	LSI	LSI	LSI

Legend: LSI = Less than significant impact. PI = Potential impact.

Construction activities for all alternatives would result in less than a significant impact to air quality resources because the roadway construction associated emissions were predicted to be below the significance criterion of 250 TPY.

The proposed project would increase regional operation VMT by approximately 18% to 20%, compared to the no-action alternative. This would increase regional pollutant levels (i.e., CO, HC, PM_{10}, $PM_{2.5}$, NO_x) under the build alternatives by approximately 18% to 23%. However, the predicted operational emissions would be below the significance criteria of 250 TPY with an exception of CO under each alternative. However, since the 250 TPY threshold is selected in the context of the *de minimis* threshold established in the CAA GCR providing only an indication of potential significant impact, a formal impact analysis was conducted with respect to potential CO impact. Based on a refined CO concentration modeling analysis for on road vehicle operational impact described in this Volume, no exceedances of the CO NAAQS were predicted at the location of anticipated highest emissions. Therefore, each proposed alternative would not result in a significant CO impact even though the regional emissions would exceed 250 TPY. Consequently, the proposed alternatives would result in a less than significant impact on air quality.

- MSAT levels are predicted to increase under the build alternatives at specific locations and decrease at others, as compared to the no-action alternative. Applying a 30-year exposure duration to the predicted MSAT levels results in no significant carcinogenic or noncarcinogenic impacts at any of the locations analyzed. Applying a more conservative 70-year exposure duration to the predicted MSAT levels results in a potential increase over the threshold of 10 in a million in cancer risk at one location, the intersection of Route 16 and Route 17. This increase over the threshold level is predicted to occur in 2014 under Alternative 3. Given the projected decrease in emission rates of MSAT, this increase is not expected to occur in 2030 and the MSAT emissions at this site are predicted to be below the threshold criteria. As Alternative 3 is not the preferred alternative, further refined modeling has not been conducted at this location. It is anticipated that applying refined modeling procedures, as suggested by USEPA, would result in levels below the threshold criteria. If this alternative becomes the preferred alternative, further analysis of this site would be conducted. All other locations analyzed are predicted to have no significant carcinogenic or noncarcinogenic impacts due to the project alternatives when applying the 70-year exposure duration.

7.2.6.7 Summary of Proposed Mitigation Measures

No mitigation measures are required for impacts to air quality from roadway improvement projects. It is anticipated that the predicted increase in cancer risk at the location of Route 16 and Route 27 under Alternative 3, using screening level analysis methodology and an exposure duration of 70 years, would be negated with the use of refined analysis procedures.

Implementation of the adaptive program management and force flow mitigation measures could further reduce impacts to air quality by lowering peak population levels during construction. See Volume 7 for a full description of these two mitigation measures.

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