Appendix C Air Quality Technical Report

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Draft
Air Quality Technical Report

US 60 (Grand Avenue)/35th Avenue/Indian School Road Traffic Intersection Improvements

Maricopa County, Arizona

October 2023

Federal Aid No. 060-B(227)T

ADOT Project No. F0272 01L

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Arizona Department of Transportation pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated April 16, 2019, and executed by the Federal Highway Administration and the Arizona Department of Transportation.

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for

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October 2023

Arizona Department of Transportation
205 South 17th Avenue
Phoenix, AZ 85007

Newton Environmental Consulting, LLC
9859 East Winchcomb Drive
Scottsdale, AZ 85260
602.332.9642

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Acronyms and Abbreviations

°F ..... degrees Fahrenheit
AADT ..... Average Annual Daily Traffic
ADEQ ..... Arizona Department of Environmental Quality
ADOT ..... Arizona Department of Administration
BNSF ..... Burlington Northern Santa Fe
CAA ..... Clean Air Act
CFR ..... Code of Federal Regulations
CO ..... Carbon Monoxide
EA ..... Environmental Assessment
EPA ..... U.S. Environmental Protection Agency
FHWA ..... Federal Highway Administration
FY ..... Fiscal Year
LOS ..... Level of Service
MAG ..... Maricopa Association of Governments
MCAQD ..... Maricopa County Air Quality Division
MPO ..... Metropolitan Planning Organization
MSAT ..... Mobile Source Air Toxics
NAAQS ..... National Ambient Air Quality Standards
NO_x ..... Nitrogen Oxides
O_3 ..... Ozone
PAH ..... Polycyclic Aromatic Hydrocarbon
PM ..... Particulate Matter
PM_{10} ..... Particulate Matter with a diameter of 10 microns or less
$PM_{2.5}$ ..... Particulate Matter with a diameter of 2.5 microns or less
POAQC ..... Projects of Air Quality Concern
POM ..... Polycyclic Organic Matter
ppm ..... parts per million
RTP ..... Regional Transportation Plan
SIP ..... State Implementation Plan
SO_2 ..... Sulfur Dioxide
TIP ..... Transportation Improvement Program
VOC ..... Volatile Organic Compound

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1. PROJECT DESCRIPTION

1.1 Introduction

This Air Quality Technical Report has been prepared in support of the Environmental Assessment (EA) for the US 60 (Grand Avenue), 35th Avenue, and Indian School Road Intersection project.

Potential air quality impacts were modeled and evaluated based on traffic data included in the *Initial Design Concept Report for US 60, Grand Avenue, 35th Avenue/Indian School Road Traffic Interchange* (ADOT 2023) and consistent with the most recent regional air quality conformity analysis conducted by the Maricopa Association of Governments (MAG) (MAG 2021a). Additional information sources included guidance from the U.S. Environmental Protection Agency (EPA) (EPA 1992, 1995, 2021) and from the Federal Highway Administration (FHWA) (FHWA 2023).

1.2 Purpose and Need

The purpose of the proposed project is to improve traffic operations, reduce congestion, and address safety concerns with the at-grade railway crossing at the intersection of US 60 (Grand Avenue), 35th Avenue, and Indian School Road while maintaining regional mobility, systems linkages, and access to economic centers.

Specific problems in the vicinity of the project are the result of an intricate intersection configuration created when three major roadways intersect. While Indian School Road and 35th Avenue are oriented according to the grid network that comprises the arterial street system in the Phoenix metropolitan area, US 60 (Grand Avenue) runs at a diagonal to the grid network. All three roads are important, heavily-traveled corridors. The intersection is made more complicated by the Burlington Northern Santa Fe (BNSF) railway corridor paralleling US 60 (Grand Avenue) to the south. The configuration of the three intersecting roadways and BNSF Railway creates problems with traffic operations, and the at-grade railway crossing presents safety concerns.

1.3 Project Description

The Arizona Department of Transportation (ADOT), in coordination with the City of Phoenix and MAG, is preparing an EA evaluating potential impacts associated with transportation improvements at the intersection of US 60 (Grand Avenue), 35th Avenue, Indian School Road, and the BNSF railroad crossing. The proposed improvements will reduce traffic congestion, enhance safety, and improve pedestrian and bicycle facilities.

The project will raise 35th Avenue and Indian School Road to create a new raised intersection over US 60 (Grand Avenue) and the BNSF railroad, eliminating the existing at-grade railroad crossings.

The project consists of the following major elements:

- Removing the existing Indian School Road bridge structure over US 60 (Grand Avenue) and the BNSF Railway

- Constructing new bridges for 35th Avenue and Indian School Road to pass over the railroad and US 60 (Grand Avenue), shifting 35th Avenue to the west and Indian School Road to the north
- Along both Indian School Road and 35th Avenue:
  - Removing portions of the existing 35th Avenue and Indian School Road roads
  - Constructing a new ramp connecting westbound Indian School Road and northwest-bound US 60 (Grand Avenue), and a ramp connecting US 60 (Grand Avenue) to eastbound Indian School Road
  - Reconstructing intersecting public roads and driveways along 35th Avenue and Indian School Road to match the new alignment and roadway elevation
  - Widening shoulders on 35th Avenue and Indian School Road to better accommodate bicycles
  - Reconstructing widened sidewalks along 35th Avenue and Indian School Road to maintain pedestrian connectivity
- Along Indian School Road:
  - Widening Indian School Road along its new alignment to meet current City of Phoenix standards and accommodate potential future transit projects
  - Extending 33rd Avenue north of Indian School Road to restore access to properties north of Indian School Road
  - Adding turn lanes at the 33rd Avenue intersection to address re-routing of traffic between US 60 (Grand Avenue) and Indian School Road
- Along 35th Avenue:
  - Realigning portions of Clarendon Avenue and reconstructing the 35th Avenue/Clarendon Avenue intersection to create a single, signalized intersection that serves areas located east and west of 35th Avenue by eliminating the offset intersections
- Along US 60 (Grand Avenue):
  - Restriping US 60 (Grand Avenue) to provide three through lanes in each direction with one turn-only lane in the southbound direction to improve traffic flow at the new intersection
  - Adding turn lanes at 33rd Avenue to address re-routing of traffic between US 60 (Grand Avenue) and Indian School Road
- Extending Glenrosa Avenue to the west to connect 35th Avenue and US 60 (Grand Avenue), creating a new intersection on US 60 (Grand Avenue) to restore traffic movements between 35th Avenue and US 60 (Grand Avenue)
- Constructing a cul-de-sac on 37th Avenue north of US 60 (Grand Avenue), eliminating the intersection of 37th Avenue and US 60 (Grand Avenue), which has been identified by ADOT as a high crash location
- Relocating utilities, as needed
- Regrading two existing drainage detention basins where new roadway fill encroaches into the basin
- Constructing six new drainage detention basins to provide lost storage volume at the existing basins and capture increased onsite runoff
- Conducting the following field investigations prior to construction to inform detailed design:

- Drilling geotechnical test drilling to inform design of new bridge structural elements
- Excavating small potholes to locate utilities within the existing roadway

According to the Fiscal Year (FY) 2022–2025 Transportation Improvement Program (TIP), the project is expected to open for traffic in 2027 (MAG 2023).

The project location is shown on Figure 1, and the project improvements are shown on Figure 2.

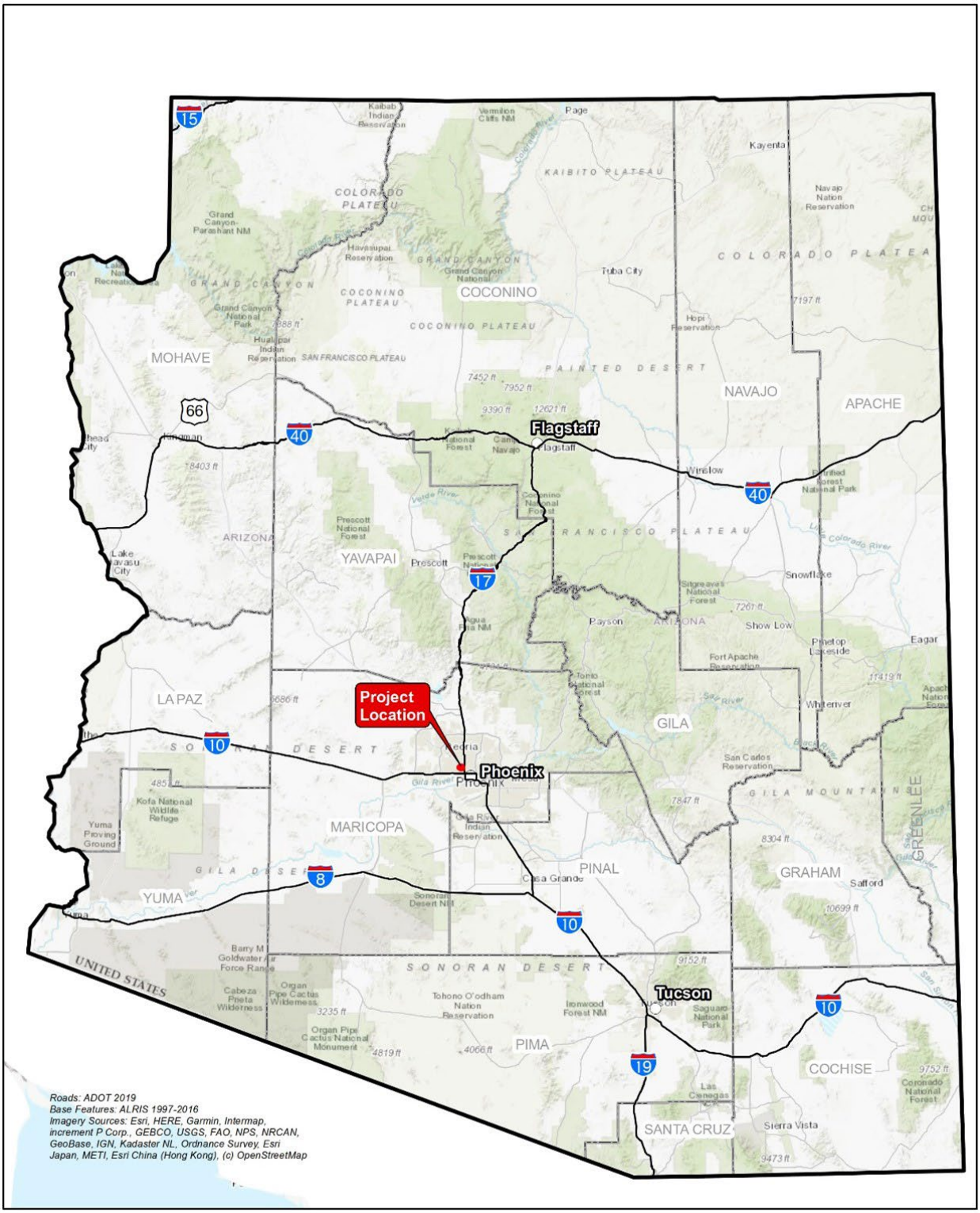

Figure 1. Project Location Map

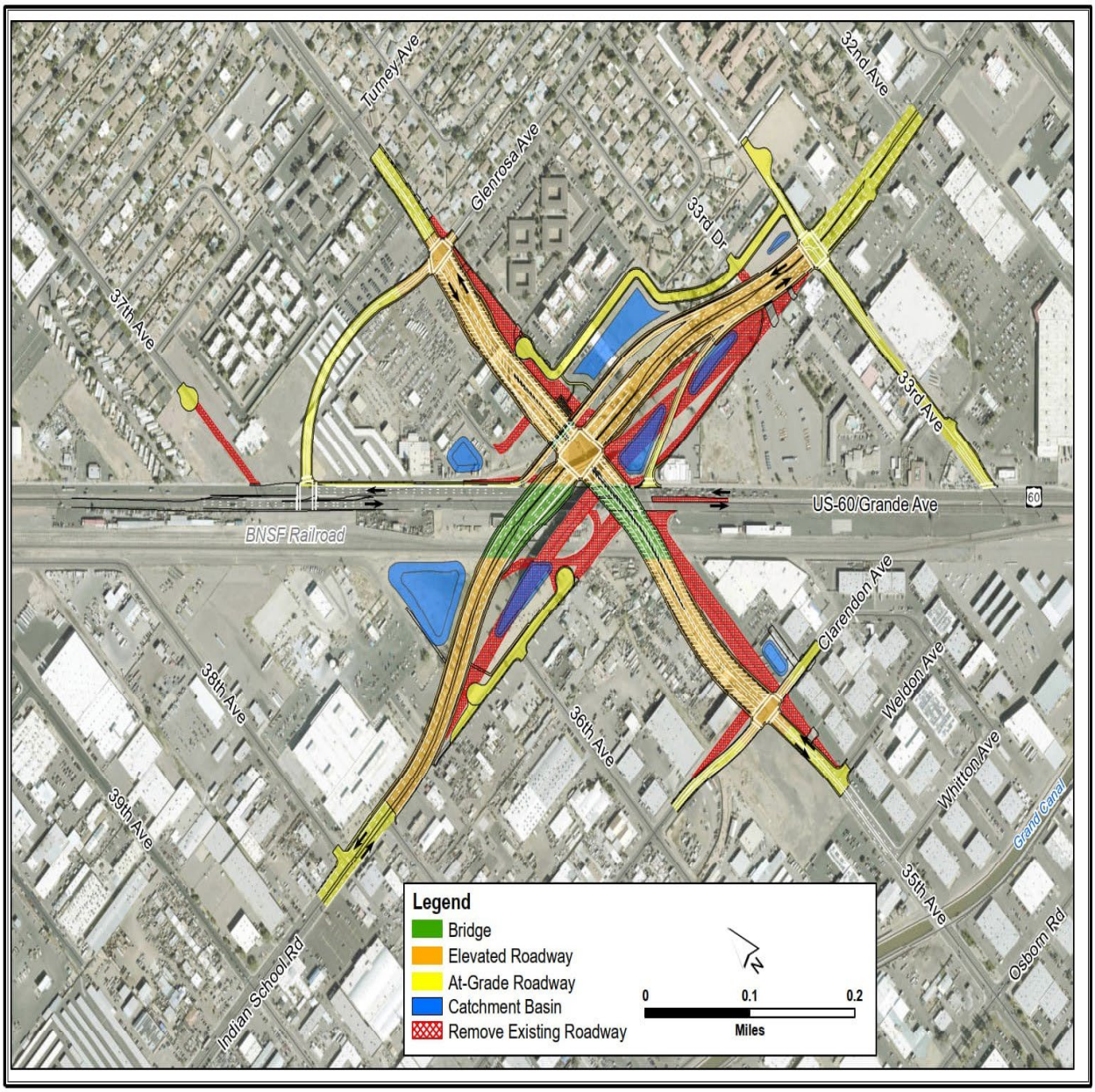

Figure 2. Traffic Interchange Improvements

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2. REGULATORY FRAMEWORK

2.1 Pollutant Overview

2.1.1 Criteria Air Pollutants

EPA has established National Ambient Air Quality Standards (NAAQS) to protect the public from air pollution. These standards include both primary and secondary standards. Primary standards protect public health, while secondary standards protect public welfare (such as protecting property and vegetation from the effects of a particular pollutant). The NAAQS (primary standards) are listed in Table 1 and have been adopted by the state of Arizona as the ambient air quality standards for the state.

Table 1. National Ambient Air Quality Standards

Pollutant	Average Time	Primary/Secondary Standard	Form
Carbon monoxide (CO)	1-hour	35 ppm (primary)	Not to be exceeded more than once per year
	8-hour	9 ppm (primary)	
Nitrogen dioxide (NO_2)	1-hour	100 ppb (primary)	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Annual	53 ppb (primary and secondary)	Annual mean
Ozone (O_3)	8-hour	0.070 ppm (primary and secondary)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particulate matter (PM_{10})	24-hour	150 µg/m^3 (primary and secondary)	Not to be exceeded more than once per year on average over 3 years
Fine particulate matter ($PM_{2.5}$)	24-hour	35 µg/m^3 (primary and secondary)	98th percentile, averaged over 3 years
Sulfur dioxide (SO_2)	1-hour	75 ppb (primary)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	3-hour	0.5 ppm (secondary)	Not to be exceeded more than once per year
Lead	Rolling 3-month average	0.15 µg/m^3 (primary and secondary)	Not to be exceeded

µg/m^3 – micrograms per cubic meter; ppm – parts per million; ppb – parts per billion
Source: Adapted from U.S EPA, NAAQS Table (https://www.epa.gov/criteria-air-pollutants/naaqs-table), accessed July 10, 2023

The major criteria air pollutants of concern for transportation projects are carbon monoxide (CO), particulate matter (PM), and ozone (O_3).

- **CO** is a colorless, odorless, and poisonous gas that interferes with the transfer of oxygen to the brain and can cause headaches, drowsiness, and loss of equilibrium, among other effects. Nearly all CO emissions result from mobile sources (on-road motor vehicle exhaust) from the incomplete combustion of carbon-based fuels. The highest CO

emissions are generally associated with vehicles operating at slow speeds, in congested, stop-and-go traffic, and at colder temperatures.

- **Particulate matter** falls into one of two categories: particulate matter with a diameter of 10 microns or less (PM_{10}) or particulate matter with a diameter of 2.5 microns or less ($PM_{2.5}$). The primary sources of particulate matter are vehicle emissions but can also include dust, soot, and smoke. The principal health effects of airborne particulate matter are to the respiratory system.
- **O_3** is a secondary pollutant formed when precursor emissions, nitrogen oxides (NO_x) and volatile organic compounds (VOCs), react in the presence of sunlight. O_3 is a major component of photochemical smog. O_3 irritates the eyes and respiratory tract and increases the risk of respiratory and heart diseases.

2.1.2 Mobile Source Air Toxics

In addition to the criteria air pollutants for which there are NAAQS, EPA also regulates mobile source air toxics (MSATs). Most MSAT emissions originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), and stationary sources (e.g., factories or refineries). A subset of the 21 MSATs have been labeled by FHWA as the priority MSATs and include:

- benzene
- 1,3-butadiene
- diesel particulate matter
- formaldehyde
- naphthalene
- acrolein
- acetaldehyde
- ethylbenzene
- polycyclic organic matter

Benzene is found in emissions from burning coal and oil, evaporative emissions from gasoline service stations, motor vehicle exhaust, and tobacco smoke. Short-term inhalation exposure to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and, at high levels, unconsciousness. Chronic (long-term) inhalation exposure has caused various disorders, including reduced red blood cell counts and anemia when exposure occurs in occupational settings. Reproductive effects have been reported for women exposed by inhalation to high levels of benzene, and adverse effects on the developing fetus have been observed in animal tests. An increased incidence of leukemia (cancer of the tissues that form white blood cells) has been observed in humans occupationally exposed to benzene. EPA has classified benzene as a known human carcinogen for all routes of exposure).

Motor vehicle exhaust is the primary source of **1,3-butadiene**. Although 1,3-butadiene breaks down quickly in the atmosphere, it is usually found in ambient air at low levels in urban and suburban areas. Short-term exposure to 1,3-butadiene by inhalation in humans results in irritation of the eyes, nasal passages, throat, and lungs. Epidemiological studies have reported a possible association between 1,3-butadiene exposure and cardiovascular diseases. Epidemiological studies of workers in rubber plants have shown an association between 1,3-butadiene exposure and increased incidence of leukemia. Animal studies have reported tumors at various sites from 1,3-butadiene exposure. EPA has classified 1,3-butadiene as carcinogenic to humans by inhalation.

Diesel particulate matter is a collection of various-sized particles emitted from diesel-powered vehicles, including elemental carbon, organic carbon, and sulfate particles, with trace amounts of nitrate, metals, and other particles. Diesel particulate matter of concern for MSAT analyses are those particles sized 10 microns or smaller. Although particulate matter may come from several sources, diesel particulate matter is derived exclusively from diesel vehicle exhaust. Exposure to diesel particulate matter results in irritation to the eyes, nose, throat, and lungs, and may exacerbate asthma. Diesel particulate matter is considered a probable human carcinogen.

Formaldehyde is used primarily to produce resins used in particleboard products and as an intermediate in the synthesis of other chemicals. Exposure to formaldehyde may occur by breathing contaminated indoor air, tobacco smoke, or ambient urban air. Short-term and chronic (long-term) inhalation exposure to formaldehyde in humans can result in respiratory symptoms, and eye, nose, and throat irritation. Limited human studies have reported an association between formaldehyde exposure and lung and nasopharyngeal cancer. Animal inhalation studies have reported an increased incidence of nasal squamous cell cancer. EPA considers formaldehyde a probable human carcinogen.

Naphthalene is used in the production of phthalic anhydride; it is also used in mothballs and for large-scale production of plasticizers for plastics. Short-term exposure of humans to naphthalene by inhalation, ingestion, and dermal contact is associated with anemia, damage to the liver, and neurological damage. Cataracts have also been reported in workers acutely exposed to naphthalene by inhalation and ingestion. Chronic (long-term) exposure of workers and rodents to naphthalene has been reported to cause cataracts and damage to the retina. Hemolytic anemia has been reported in infants born to mothers who sniffed or ingested naphthalene (as mothballs) during pregnancy. Available data are inadequate to establish a causal relationship between exposure to naphthalene and cancer in humans. EPA has classified naphthalene as a possible human carcinogen.

Acrolein is primarily used as an intermediate in the synthesis of acrylic acid and as a biocide. It may be formed from the breakdown of certain pollutants in outdoor air or from the burning of organic matter including tobacco, or fuels such as gasoline or oil. It is toxic to humans following inhalation, oral or dermal exposures. Short-term inhalation exposure may result in upper respiratory tract irritation and congestion. No information is available on its reproductive, developmental, or carcinogenic effects in humans, and the existing animal cancer data are considered inadequate to determine its carcinogenicity.

Acetaldehyde is mainly used as an intermediate in the synthesis of other chemicals. It is ubiquitous in the environment and may be formed in the body from the breakdown of ethanol. Short-term exposure to acetaldehyde results in several effects including irritation of the eyes, skin, and respiratory tract. Symptoms of chronic (long-term) intoxication of acetaldehyde resemble those of alcoholism. Acetaldehyde is considered a probable human carcinogen based on limited human cancer studies and animal studies that have shown nasal tumors in laboratory animals.

Ethylbenzene is mainly used in the manufacture of styrene, which is used to make latex, synthetic rubber, plastic packaging, disposable cups and containers, and insulation, among others. Short-term exposure to ethylbenzene in humans results in respiratory effects, such as throat irritation and chest constriction, irritation of the eyes, and neurological effects such as dizziness. Chronic (long-term) exposure to ethylbenzene by inhalation in humans has shown

conflicting results regarding its effects on the blood. Animal studies have reported effects on the blood, liver, and kidneys from chronic inhalation exposure to ethylbenzene. Limited information is available on the carcinogenic effects of ethylbenzene in humans. In a study by the National Toxicology Program, exposure to ethylbenzene by inhalation resulted in an increased incidence of kidney and testicular tumors in rats, and lung and liver tumors in mice. The carcinogenicity of ethylbenzene in humans has not been firmly established.

The term **polycyclic organic matter** (POM) includes a broad class of compounds that includes polycyclic aromatic hydrocarbons (PAHs), of which benzo[a]pyrene is a member. POM compounds are formed primarily from combustion and are present in the atmosphere in particulate form. Sources of POM air emissions are diverse and include tobacco smoke, vehicle exhaust, home heating systems, laying tar, and grilling meat. Cancer is the major concern from exposure to POM. Epidemiologic studies have reported an increase in lung cancer in humans exposed to coke oven emissions, roofing tar emissions, and cigarette smoke; all of which contain POM compounds. Animal studies have reported respiratory tract tumors from inhalation exposure to benzo[a]pyrene and stomach tumors, leukemia, and lung tumors from oral exposure to benzo[a]pyrene. EPA has classified seven PAHs (benzo[a]pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3- cd]pyrene) as probable human carcinogens .

Unlike the NAAQS for criteria pollutants, there are no standard for MSATs.

2.2 Regulations

2.2.1 Federal

The Clean Air Act (CAA) and its amendments direct EPA to implement policies, procedures, and regulations that will ensure acceptable levels of pollutants in the ambient environment. Under the CAA, a project cannot:

- Cause or contribute to any new violation of any NAAQS (see Table 1) in any area
- Increase the frequency or severity of any existing violation of any NAAQS in any area
- Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area

2.2.1.1 Arizona Nonattainment and Maintenance Areas

Geographic areas in which the ambient concentrations of a pollutant exceed the NAAQS are classified as nonattainment areas. Federal regulations require states to prepare State Implementation Plans (SIPs) that establish methods to bring air quality in nonattainment areas into compliance with the NAAQS and to maintain compliance. Nonattainment areas that return to compliance are classified as maintenance areas and may be redesignated as attainment areas after 20 years of demonstrating continuing compliance with no further NAAQS exceedances.

As shown in Table 2 and on Figure 3, Maricopa County is currently designated as a nonattainment area for O_3 and PM_{10}, and a maintenance area for CO (EPA 2023).

Table 2. Maricopa County Air Quality Attainment Status

Pollutant	Designation	Current Standard (year established)	Applicable State Implementation Plan
Ozone (O_3)	Nonattainment (moderate)	0.070 (2015)	MAG 2017 Eight-Hour Ozone Moderate Area Plan for the Maricopa Nonattainment Area (2016)
Fine Particulate Matter ($PM_{2.5}$)	Attainment	24-hour: 35 µg/m^3 Annual: 12 µg/m^3 (2015)	Not Applicable
Coarse Particulate Matter (PM_{10})	Nonattainment (serious)	150 µg/m^3 (2015)	MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area (2012)
Carbon Monoxide (CO)	Attainment/Maintenance	1-hour: 35 ppm 8-hour: 9 ppm (1971)	MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area (2013)

Source: EPA "Green Book" https://www.epa.gov/green-book, accessed August 15, 2023.

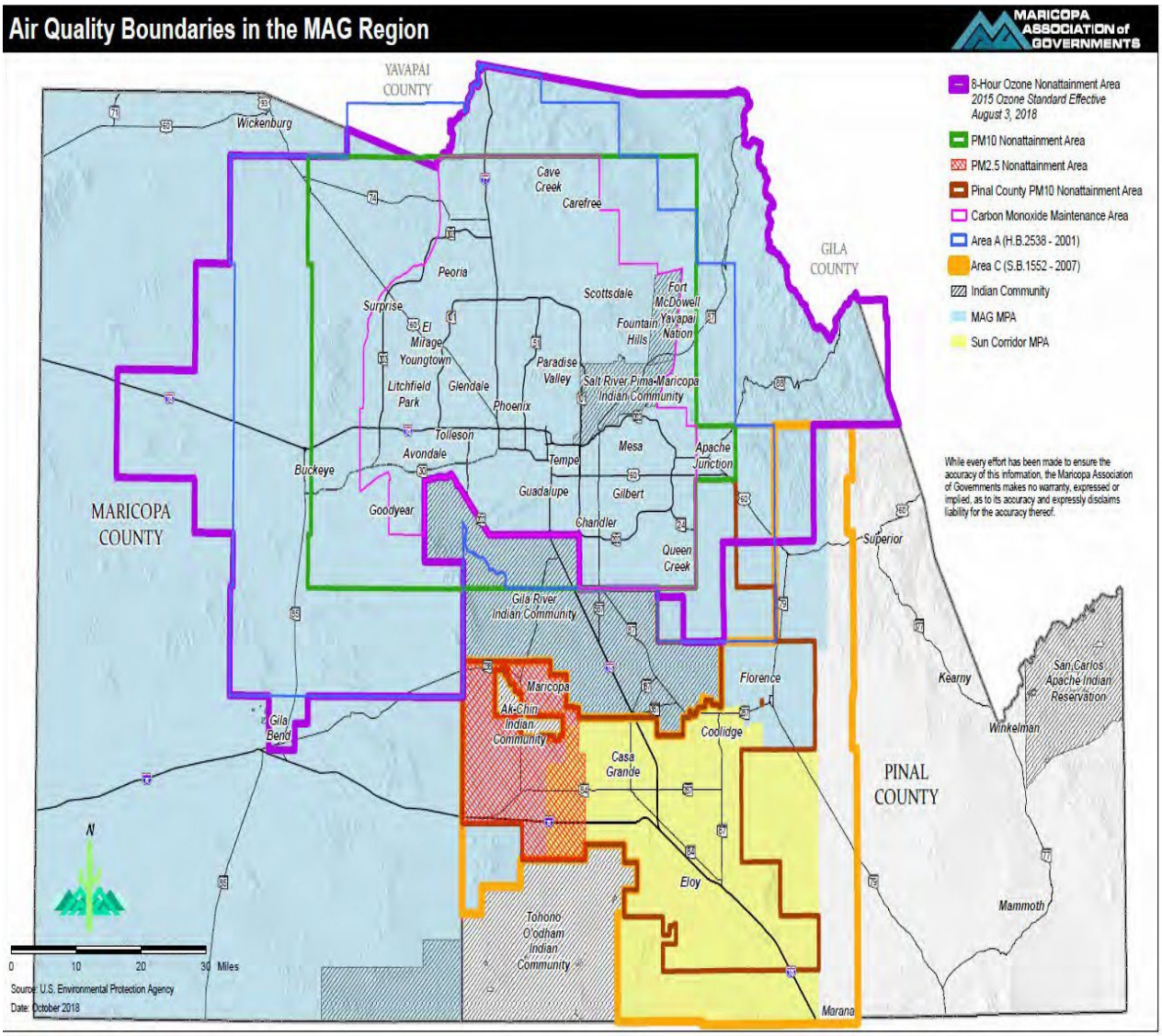

Figure 3. Arizona Nonattainment and Maintenance Areas

2.2.1.2 Regional Transportation Conformity

Transportation projects in nonattainment and/or maintenance areas must be included in a regional transportation plan (RTP) or TIP that conforms with the state air quality plans as outlined in the applicable SIP.

The TIP includes a list of highway and transit projects selected as priorities for funding by cities, state transportation departments, county road commissions, and transit agencies. Federally funded projects to be completed in the near-term must be included in the regional conformity analysis completed by the metropolitan planning organization (MPO); such projects are also usually included in the region's TIP, and therefore conform with the SIP.

The proposed project improvements for the US 60 (Grand Avenue)/Indian School Road interchange project are included in the Maricopa Association of Governments *Regional*

Transportation Plan: Momentum 2050 (MAG 2021b) and the Fiscal Year 2022-2025 TIP (ID 42572 – 60 (Grand Ave): 35th Avenue/Indian School Road Intersection).

The conformity rule also establishes the process by which FHWA, the Federal Transit Administration, and local MPOs determine conformance of transportation plans and TIPs and federally funded highway and transit projects. As part of that process, local MPOs are required to undertake conformity determinations on transportation plans and TIPs before they are adopted, approved, or accepted.

For PM, the MAG Conformity Analysis for the FY 2022–2025 MAG TIP and the MOMENTUM 2050 RTP (MAG 2021b) and its amendments concluded that vehicle-related emissions associated with the FY 2022–2025 TIP and the 2050 RTP for the analysis years of 2025, 2030, 2040, and 2050 are projected to be less than the approved 2012 emissions budget and the approved 2006 emissions budget. Therefore, regional air quality conformity for PM has been demonstrated.

For CO, the MAG Conformity Analysis for the FY 2022–2025 MAG TIP and the MOMENTUM 2050 RTP (MAG 2021b) and its amendments concluded that vehicle-related emissions associated with the FY 2022–2025 TIP and the 2050 MOMENTUM RTP for the analysis years of 2025, 2030, 2040, and 2050 are projected to be less than the approved 2025 CO emissions budget. As a result, the applicable conformity test for CO has been demonstrated.

For 8-hour O_3, the total vehicle-related VOC and NO_x emissions associated with implementation of the FY 2022-2025 TIP and 2050 RTP for the analysis year of 2023 are projected to be less than the approved 2017 emissions budgets and the VOC and NO_x emissions for the analysis years of 2025, 2030, 2040, and 2050 are projected to be less than the approved 2017 emissions budgets. The applicable conformity test for 8-hour O_3 has been demonstrated.

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3. AFFECTED ENVIRONMENT

3.1 Project Setting

The project is in the urban area of Phoenix, Arizona. The topography in the project area is relatively flat. Land uses in the project area are mostly commercial with some light-industrial, multi-family residential, and single-family residential scattered throughout. Land uses east of US 60 (Grand Avenue) are primarily light-industrial and commercial. Land uses west of US 60 (Grand Avenue) are primarily commercial with some single- and multi-family residences north of Indian School Road. Local air quality is primarily affected by traffic on major arterials including Indian School Road, US 60 (Grand Avenue), 33rd Avenue, and 35th Avenue.

The project is in the Salt River Valley at an elevation of about 1,200 feet. Temperatures range from very hot during summer months to mild during winter months. In the winter many days are over 70 degrees Fahrenheit (°F). The normal high temperature is over 90°F from early May through late September, and over 100°F from early June through late August. Annual precipitation averages about 6.5 inches per year (National Weather Service 2023). A summary of average monthly temperatures and precipitation is shown in Table 3.

Table 3. Climate Data for Phoenix, Arizona (2000-2023)

Month	Temperature (°F)			Precipitation (inches)
	Average Daily	Average Daily Maximum	Average Daily Minimum	Average
January	56.9	68.0	45.8	0.72
February	59.7	71.1	48.4	0.75
March	66.5	78.6	54.5	0.68
April	74.1	86.8	61.4	0.17
May	82.6	95.3	69.8	0.09
June	92.5	105.5	79.6	0.05
July	96.3	107.2	85.3	0.82
August	94.4	105.2	83.6	0.92
September	89.7	101.0	78.4	0.53
October	77.5	89.3	65.7	0.58
November	65.6	77.2	54.1	0.44
December	56.1	66.7	45.5	0.71
Annual	76.0	87.6	64.3	6.47

Source: National Weather Service, 2023

3.2 NAAQS Pollutant Monitoring Data

The Arizona Department of Environmental Quality (ADEQ) and the Maricopa County Air Quality Division (MCAQD) maintain a network of air monitoring stations throughout the county. These monitoring stations provide ambient air quality information in the vicinity in which they are located.

The nearest monitoring site to the project area is the West Phoenix Station (located at 847 West Earll Drive), about 1 mile southwest of the project area as shown on Figure 4. This site collects data on ambient concentrations of CO, O_3, $PM_{2.5}$, and PM_{10}. Table 4 shows the last three years (2020 to 2022) of available monitor data for O_3, $PM_{2.5}$, PM_{10}, and CO at the West Phoenix monitoring station.

The West Phoenix monitor recorded the highest ambient CO concentrations in Maricopa County from 2020 through 2022 and was determined to be the site most representative of ambient CO concentrations used for CO hot-spot modeling (discussed in Section 3.3). There were no exceedances of the CO standard during this period. The monitor recorded exceedances of the O_3 standard in 2020 through 2022, and PM_{10} in 2020 and 2021.

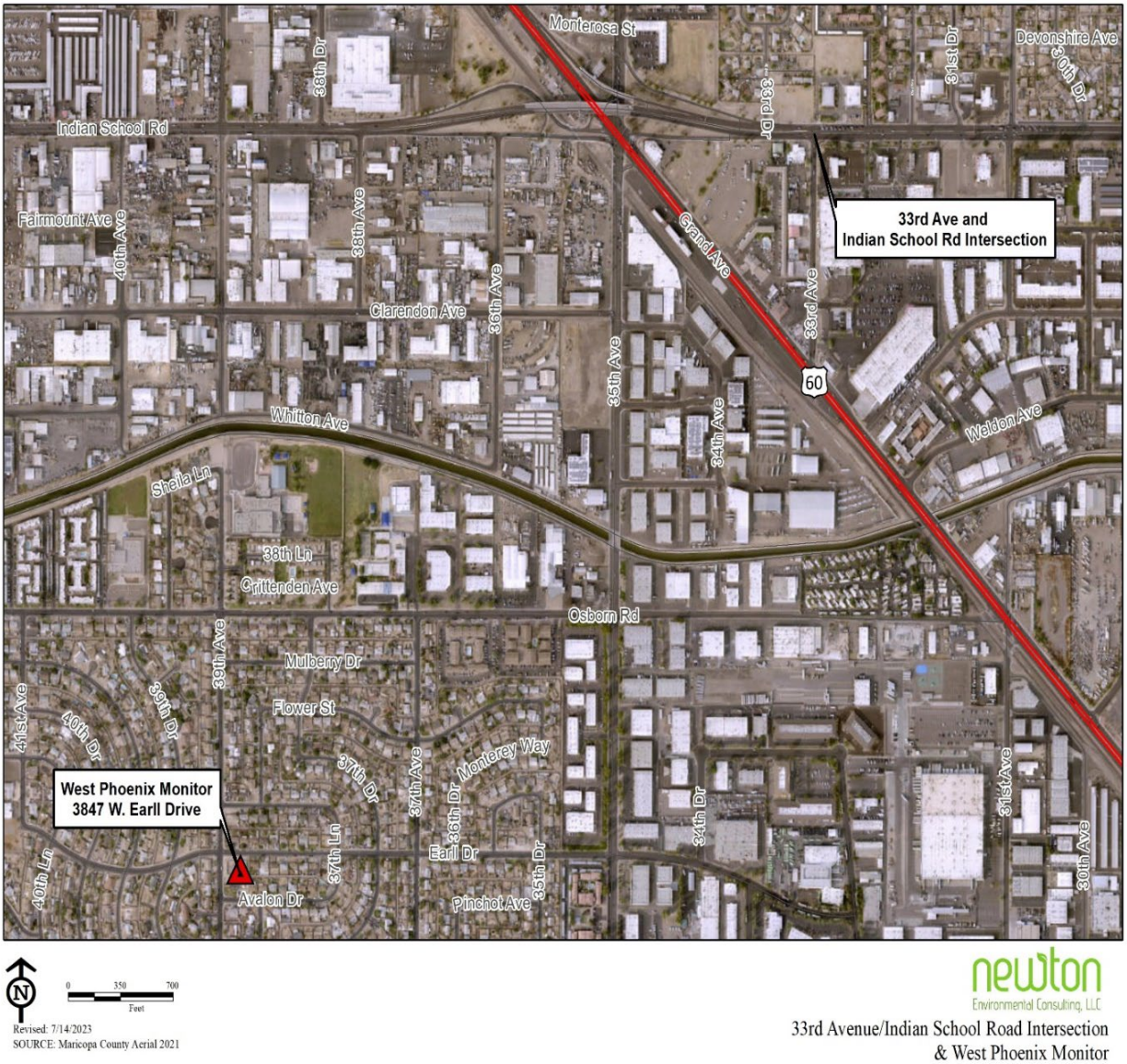

Figure 4. West Phoenix Monitor Location

Table 4. Air Quality Data – West Phoenix Station (2020 – 2022)

Pollutant		Monitor Value	2020	2021	2022
Carbon Monoxide (CO) [ppm]	1-hour	Maximum	3.8	3.7	2.7
		2nd Maximum	3.4	3.6	2.6
		Number of Exceedances	0	0	0
	8-hour	Maximum	3.0	3.5	2.2
		2nd Maximum	2.8	3.4	2.1
		Number of Exceedances	0	0	0
Particulate Matter [µg/m^3]	PM_{10}	Maximum 24-hour	159	250	127
		Second Maximum	120	141	81
		Number of Exceedances	1	1	0
	$PM_{2.5}$	24-hour 98th Percentile	31	27	67
		Annual Mean	9.7	9.5	10.3
Ozone (O_3) [ppm]	8-hour	First Highest	0.091	0.081	0.081
		Second Highest	0.089	0.078	0.080
		Third Highest	0.081	0.078	0.079
		Fourth Highest	0.079	0.078	0.076
		Number of Days Standard Exceeded	10	11	17

Sources: EPA AirData, https://www.epa.gov/outdoor-air-quality-data, accessed July 12, 2023

3.3 Sensitive Receptors

The project was modeled for CO hot spots at one intersection, Indian School Road/33rd Avenue. Sensitive receptors (i.e., locations where people would reasonably have access for extended periods of time) within about 0.25 mile of the Indian School Road/33rd Avenue intersection include the following:

- South of Indian School Road/33rd Avenue – Predominantly commercial establishments (banks, stores, warehouses, and auto sales, among others). Not considered sensitive.
- North of Indian School Road/33rd Avenue – Commercial establishments immediately adjacent to Indian School Road; single- and multi-family residences on North 32nd Avenue and North 33rd Drive. Outdoor locations at residences are considered sensitive.
- East of Indian School Road/33rd Avenue – Commercial establishments immediately adjacent to Indian School Road. Not considered sensitive.
- West of Indian School Road/33rd Avenue – Commercial establishments on the south side of Indian School Road; single-family residences on North 33rd Drive. Outdoor locations at residences are considered sensitive.

For CO hot-spot modeling, receptors are generally located near the right-of-way line at public locations where people would have access for extended periods of time. Receptors include crosswalk locations nearest the intersection and on sidewalk locations adjacent to the roadway. Existing sidewalks on Indian School Road and 33rd Avenue will be retained as part of the

project. Receptors were placed on the sidewalks at the intersection crosswalk, extending to more than 400 feet from each leg of the intersection.

Receptors were spaced at 25-meter (82 feet) intervals on sidewalks and modeled at a height of 6 feet above the ground to approximate an average breathing height. Forty-four receptors were modeled around the Indian School Road/33rd Avenue intersection. Modeled receptor locations and intersection configurations are shown on Figure 5 (No-Build Alternative) and Figure 6 (Build Alternative).

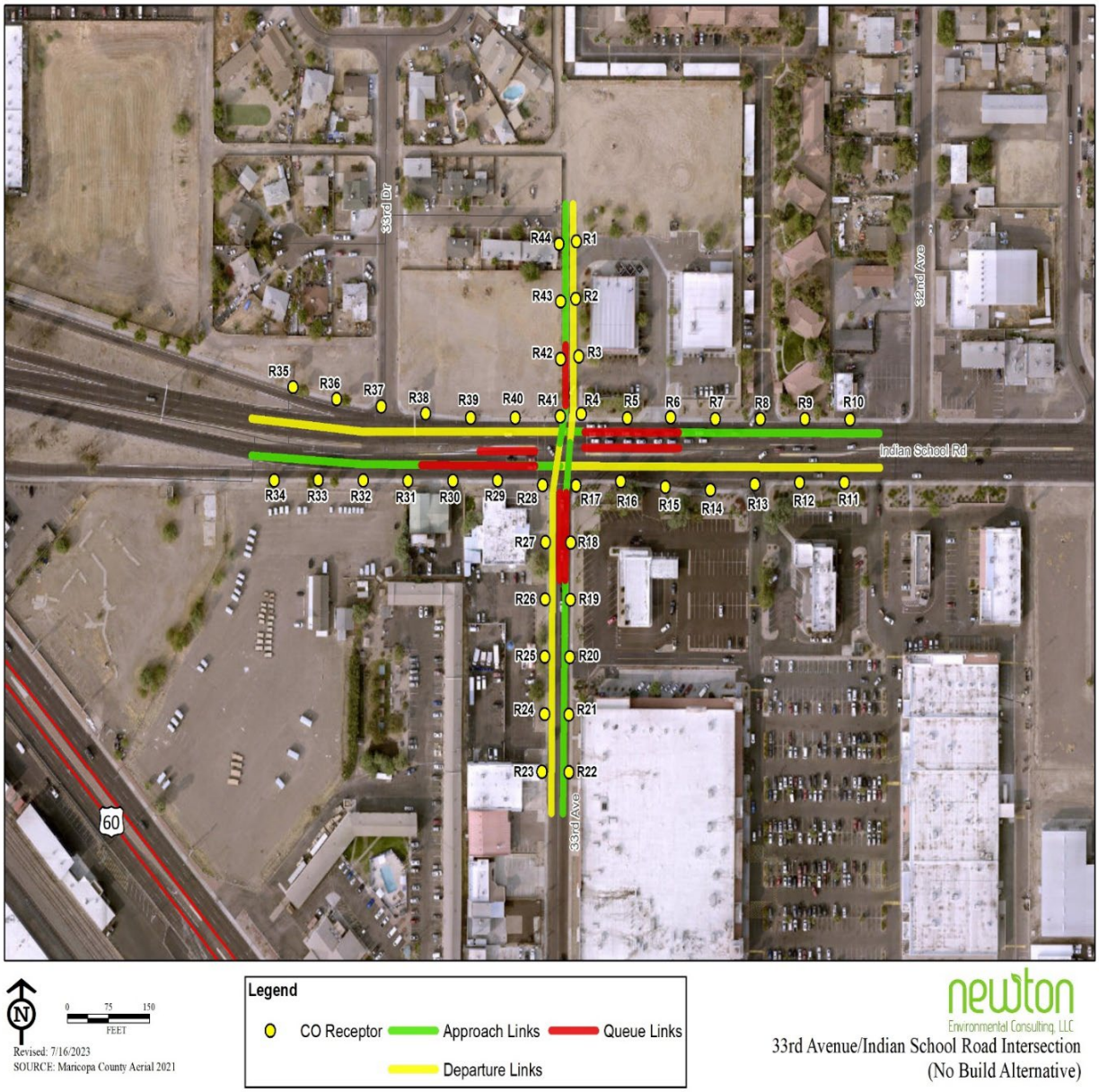

Figure 5. Indian School Road/33rd Avenue Intersection Configuration – 2050 No-Build Alternative

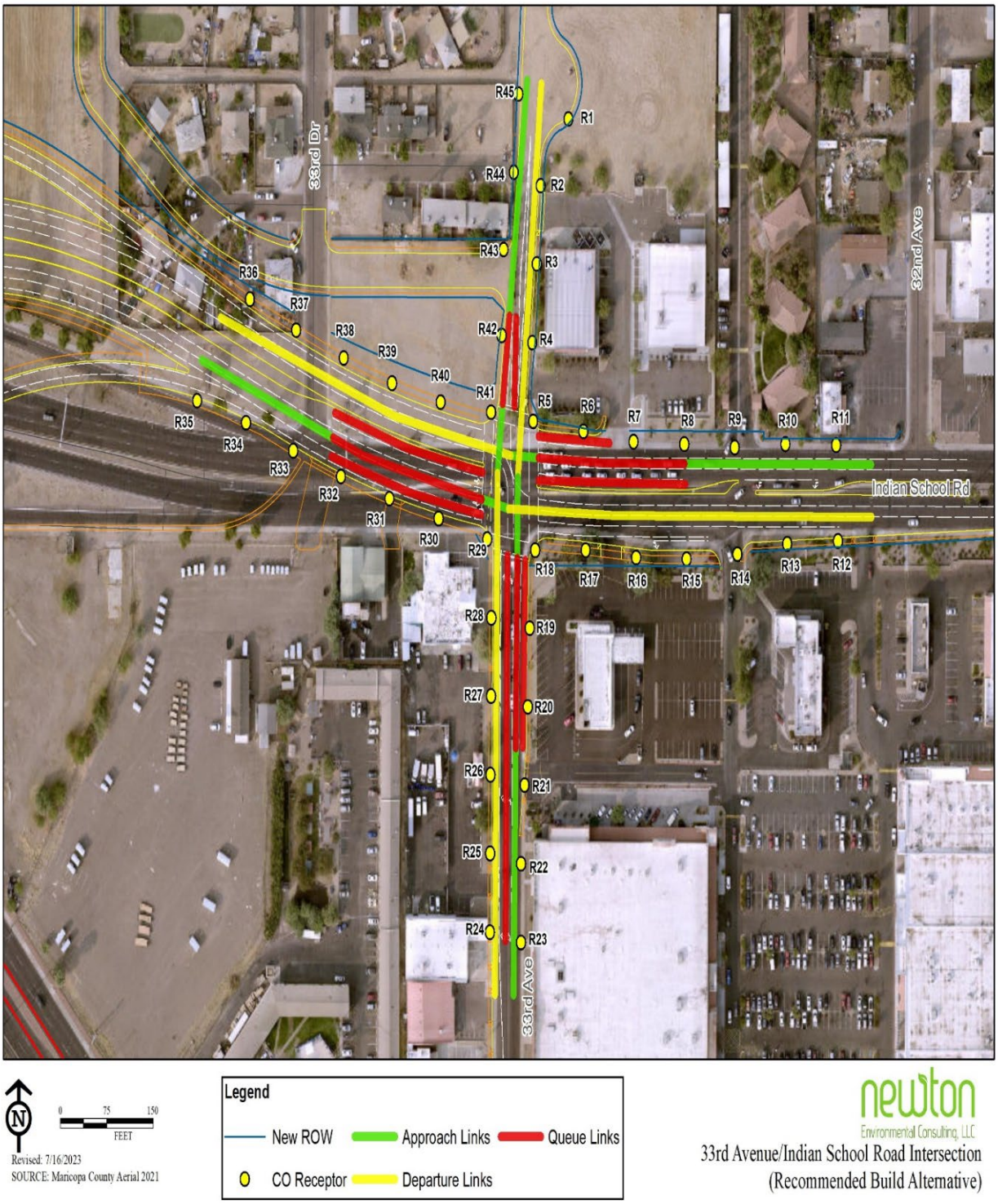

Figure 6. Indian School Road/33rd Avenue Intersection Configuration – 2050 Build Alternative

4. CONFORMITY DETERMINATION

4.1 CO Conformity Determination

4.1.1 Geographic Applicability

Transportation conformity is applicable because the project is in a CO maintenance area, and one intersection (Indian School Road/33rd Avenue) operates at Level of Service (LOS) D under the 2050 Build Alternative because of increased traffic volumes related to the project (40 Code of Federal Regulations [CFR] 93.123(a)(ii)). In addition, the project is not exempt under 40 CFR 93,126 or under 40 CFR 93.126 as a signal synchronization project. Therefore, a quantitative hot-spot evaluation for potential CO impacts is required.

4.1.2 Methodology

Air quality modeling was conducted using EPA guidance as described below (EPA 1992, 1995, 2021).

To determine potential CO impacts, a detailed hot-spot analysis was conducted at the Indian School Road/33rd Avenue intersection. The Indian School Road/33rd Avenue intersection was selected for quantitative hot-spot modeling in the PM peak-hour because it was the only intersection in the project area that would operate at LOS D under the 2050 Build Alternative. As discussed in the Project-Level Carbon Monoxide (CO) and Particulate Matter (PM_{10}) Consultation Document (included as Attachment A to this report) and during interagency consultation, no intersections operate at LOS D in the AM peak-hour. This intersection underwent detailed microscale modeling with emission factors developed using the EPA MOVES3.1 emission factor program and dispersion modeling using the EPA CAL3QHC program.

Quantitative hot-spot modeling was performed for the following alternatives and analysis years:

- 2050 No Build Alternative (PM peak-hour)
- 2050 Build Alternative (PM peak-hour)

4.1.2.1 MOVES3.1 Emissions Model and CAL3QHC Inputs

The most recent version of EPA's MOVES model (MOVES3.1) was used to estimate CO emission rates from vehicles traveling on roadways at free flow speeds and while idling during the red phase at signalized intersections. To make the emission rates overly conservative, MOVES links assumed a maximum 4 percent grade on all links. Signal timing data for the Indian School Road/33rd Avenue intersection were provided by project engineers.

Each dedicated travel lane (e.g., through lanes and dedicated left- or right-turn lanes) was modeled as an individual link with traffic volumes derived from the traffic report (ADOT 2023). Queue links (i.e., locations where vehicles are stopped and idling during the red phase of a traffic signal) were included with the queue link beginning at the intersection stop bar (see discussion in Section 4.1.2.2). Other input files required for MOVES3.1 (for example, age distribution, inspection/maintenance programs, and average speed distributions, among others) were derived from the most recent MAG conformity determinations (the Fall 2022 conformity evaluations were used in the analysis) and reflect the local conditions used in regional transportation conformity evaluations.

Traffic volumes on individual links (approach, departure, and queue) at the Indian School Road/33rd Avenue intersection were obtained from data included in the traffic report (ADOT 2023). Link coordinates (northings and eastings) were derived from a project design file provided by the project engineers. The Indian School Road/33rd Avenue intersection configuration showing approach, departure, and queue links, as well as CAL3QHC receptor locations at the intersection, are shown on Figure 5 and Figure 6.

Link-specific traffic data were used to develop project-specific input files for each modeled link with that link's average speed and vehicle mix for each scenario analyzed; the 2050 No-Build Alternative, and the 2050 Build Alternative.

4.1.2.2 CAL3QHC Dispersion Model

EPA's CAL3QHC dispersion model was used to estimate peak 1-hour CO concentrations at receptors around the Indian School Road/33rd Avenue intersection. Eight-hour CO concentrations were estimated by multiplying the highest peak 1-hour CO concentrations by a calculated persistence factor of 0.86. The persistence factor was developed by the MCAQD using 1-hour and 8-hour monitor values from the West Phoenix monitor over a 3-year period (2020 to 2022). The calculated persistence factor followed procedures outlined in EPA guidance for estimating 8-hour concentrations from 1-hour concentrations (EPA 1992). The persistence factor accounts for fluctuating traffic volumes, vehicle speeds, and meteorological conditions over 8 hours (as distinct from a single hour). Table 5 shows the 10 highest non-overlapping 8-hour and 1-hour CO concentrations used in deriving the 0.86 persistence factor.

Table 5. West Phoenix Monitor – Persistence Factor Ranking

Rank of Highest Non-Overlapping Average	Date	Time	8-hour Average	Maximum 1-hour Within the 8-hour period	Ratio (8-hour/1-hour)
1	1/1/2021	8:00:00 AM	3.45	3.7	0.93
2	12/5/2021	4:00:00 AM	2.64	3.1	0.85
3	12/25/2020	2:00:00 AM	2.46	2.9	0.85
4	1/18/2021	2:00:00 AM	2.25	2.7	0.83
5	1/16/2021	2:00:00 AM	2.23	2.5	0.89
6	12/21/2020	2:00:00 AM	2.21	2.6	0.85
7	11/6/2021	2:00:00 AM	2.20	2.6	0.85
8	11/18/2020	2:00:00 AM	2.19	2.6	0.84
9	12/6/2020	2:00:00 AM	2.19	2.6	0.84
10	11/14/2021	3:00:00 AM	2.16	2.5	0.87
				Average	0.86

Source: Ron Pope (MCAQD) email to Beverly Chenausky (ADOT) and Curt Overcast (NEC), September 8, 2023

Different emission rates occur when vehicles are stopped (i.e., idling) at signalized intersections during the red phase of the signal, accelerating away from the intersection, decelerating when approaching a signalized intersection, and moving at different average speeds.

Figure 5 and Figure 6 show the link configurations and receptor locations for the Indian School Road/33rd Avenue intersection under the 2050 No-Build and 2050 Build Alternatives.

Inputs to the CAL3QHC dispersion analysis included:

- Free-flow links extending 750 feet from the center of the signalized intersection
- Queue links beginning at the intersection stop bar
- Traffic activity within 750 feet of the intersection included
- Receptors placed at crosswalk locations nearest the intersection and spaced at approximately 25-meter intervals outside of the mixing zone on sidewalk locations as determined from aerial imagery and the project design file

Other variables included in the CAL3QHC model were based on recommended values from EPA guidance (EPA 1992) and included:

- Wind Speed – 1 meter per second
- Wind Direction Increment – Every 10 degrees of wind direction from 0 degrees to 350 degrees (36 directions)
- Stability Class – D (4) for urban areas
- Mixing Height – 1,000 meters
- Source Height – 0 meters
- Surface Roughness – City land use – office environment (175 cm)

Background Concentrations

Background CO concentrations were obtained from EPA's Monitor Values Report for all CO monitors in the greater Phoenix metropolitan area for the years 2020 to 2022. Table 6 shows the maximum 1-hour and 8-hour CO concentration recorded at each monitor during that period.

As shown in Table 6, the highest CO concentrations in Maricopa County over the 3-year period were recorded at the West Phoenix Station located at 3847 West Earll Drive, about 1 mile southwest of the Indian School Road/33rd Avenue intersection (3.8 parts per million [ppm] and 3.5 ppm for the 1-hour and 8-hour concentrations, respectively).

Because this monitor is the closest monitor to the Indian School Road/33rd Avenue intersection and had the highest 1-hour and 8-hour CO concentrations recorded at all CO monitors in Maricopa County, it was used as the background concentration in CAL3QHC modeling to produce the maximum (i.e., worst-case) CO emission estimates at receptor locations around the intersection.

- 1-hour CO background concentration: 3.8 ppm
- 8-hour CO background concentration: 3.5 ppm

Table 6. Carbon Monoxide Monitors in the Phoenix, Arizona Metropolitan Area

Monitor	Approximate Distance to Indian School Road/33rd Avenue (miles)	2020 Maximum Concentration (1-hour/8-hour)	2021 Maximum Concentration (1-hour/8-hour)	2022 Maximum Concentration (1-hour/8-hour)
West Phoenix Station (3847 West Earll Drive)	1.0 mile southwest	3.8/3.0	3.7/3.5	2.7/2.2
JGL Supersite (4530 North 17th Avenue)	2.1 miles northeast	2.1/1.7	1.9/1.9	2.0/1.6
3248 West Moreland Street	2.3 miles south	3.7/2.9	2.7/2.3	Monitor discontinued in 2022
Central Phoenix Station (1645 East Roosevelt Street)	5.6 miles southeast	2.4/1.9	2.8/2.0	2.7/1.7
South Phoenix Station (33 West Tamarisk Avenue)	7.1 miles south	2.7/2.2	2.5/1.7	2.9/2.4
4135 South 36th Street	9.5 miles southeast	Monitor not operational in 2020	1.4/1.0	1.6/0.9
Mesa Station (310 South Brooks Circle)	16.5 miles southeast	3.2/1.6	1.7/1.1	2.1/1.3

Source: US EPA AirData (https://www.epa.gov/outdoor-air-quality-data/monitor-values-report, accessed July 2, 2023)
Values in Red – highest 1-hour and 8-hour CO concentrations over the 2020 to 2022 timeframe
Concentrations shown in parts per million (ppm)

Comparison to NAAQS

CAL3QHC model results for the 2050 No-Build Alternative and the 2050 Build Alternative were compared to the CO NAAQS to determine whether there would be an exceedance of the standard resulting from the proposed project.

The CO NAAQS are 35 ppm and 9 ppm for the 1-hour and 8-hour periods, respectively.

CAL3QHC Impact Assessment

Maximum CO concentrations under the 2050 No-Build Alternative and the 2050 Build Alternative at the Indian School Road/33rd Avenue intersection were estimated with the CAL3QHC model. At each receptor, the maximum 1-hour CO concentrations were determined. The 8-hour CO concentrations were estimated by applying a persistence factor of 0.86 to the 1-hour concentrations, as discussed in Section 4.1.2.2.

As shown in Table 7, the total maximum 1-hour CO concentrations (including a 3.8 ppm background concentration) under the 2050 No-Build Alternative and 2050 Build Alternative were 4.8 ppm and 4.9 ppm, respectively.

The total maximum 8-hour CO concentrations (including a 3.5 ppm background concentration) under the 2050 No-Build Alternative and 2050 Build Alternative were 4.36 ppm and 4.45 ppm, respectively.

Modeled concentrations were below the NAAQS for both the 1-hour and 8-hour CO standard.

Table 7. Total Predicted 1-Hour (8-Hour) CO Concentrations

Intersection	2050 No-Build 1-hour (8-hour)	2050 Build 1-hour (8-hour)	NAAQS (ppm)
Indian School Road & 33rd Avenue	4.8 (4.36)	4.9 (4.45)	35.0 (9.0)

Concentrations shown in parts per million (ppm)
1-hour results include maximum background CO concentration of 3.8 ppm from the West Phoenix monitor
8-hour concentration calculated with 0.86 ppm persistence factor and 8-hour background concentration of 3.5 ppm from the West Phoenix monitor.

Interagency Consultation for Carbon Monoxide

On August 17, 2023, ADOT provided the Project-Level Carbon Monoxide (CO) and Particulate Matter (PM_{10}) Consultation Document to the following interagency consulting parties for a 30-day review: EPA, FHWA, MAG, ADEQ, and MCAQD.

On September 7, 2023, an interagency consultation meeting was held to discuss the methodology and modeling assumptions used in the CO hot-spot evaluation. Written comments concerning various aspects of the modeling procedures, including meteorological data, consideration of vehicle source and fuel types, and the persistence factor used in estimating 8-hour CO concentrations from 1-hour concentrations, were provided by EPA and discussed at the September 7 meeting. Revisions to the model were made based on the comments provided and are incorporated in this report.

The 30-day interagency comment period closed on September 18, 2023. All the interagency comments received during this 30-day review period and the response to agency comments can be found in Attachment 1.

Conclusion and Conformity Determination

The project has been included in the MAG RTP: Momentum 2050 (MAG 2021b) and its amendments, and the FY 2022-2025 TIP, as approved by FHWA on September 25, 2023.

The MAG Conformity Analysis for the FY 2022–2025 MAG TIP and the MOMENTUM 2050 RTP (MAG 2021b) and its amendments concluded that for CO vehicle-related emissions associated with the FY 2022–2025 TIP and the 2050 MOMENTUM RTP for the analysis years of 2025, 2030, 2040, and 2050 are projected to be less than the approved 2025 emissions budgets.

CO hot-spot modeling was conducted at the Indian School Road/33rd Avenue intersection to evaluate the potential for CO hot spots due to poor LOS under the 2050 No-Build Alternative

and the 2050 Build Alternative. CAL3QHC modeling results were below the NAAQS for CO for both the 1-hour and 8-hour NAAQS.

The analysis concluded that the proposed project would not:

- Cause or contribute to any new violation of any NAAQS in the CO maintenance area
- Increase the frequency or severity of any existing violation of any NAAQS in the CO maintenance area
- Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in the CO maintenance area

Project-level transportation conformity for the proposed project has been demonstrated.

4.2 PM_{10} Conformity Determination

4.2.1 Geographic Applicability

Transportation conformity is applicable to the project because the project is in a PM_{10} nonattainment area. In addition, the project is not exempt under 40 CFR 93.126 or under 40 CFR 93.126 as a signal synchronization project.

Projects in PM_{10} nonattainment areas requiring a quantitative hot spot of local particulate emissions include:

- New highway projects that have a significant number of diesel-fueled vehicles, and expanded highway projects that have a significant increase in the number of diesel-fueled vehicles
- Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel-fueled vehicles, or those that would change to LOS D, E, of R because of an increase in traffic volumes from a significant number of diesel-fueled 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
- 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 that are identified in the PM_{10} applicable implementation plan as sites of possible violation

4.2.2 Consistency with PM_{10} Regional Analysis

The project is included in the MAG RTP: Momentum 2050 (MAG 2021b) and the FY 2022-2025 TIP (ID 42572 – 60 (Grand Ave): 35th Avenue/Indian School Road Intersection, as approved by FHWA on September 25, 2023.

For PM_{10}, the MAG Conformity Analysis for the FY 2022–2025 MAG TIP and the MOMENTUM 2050 RTP (MAG 2021b) and its amendments concluded that vehicle-related emissions associated with the FY 2022–2025 TIP and the 2050 RTP for the analysis years of 2025, 2030, 2040, and 2050 are projected to be less than the approved 2012 emissions budget and the approved 2006 emissions budget.

Regional air quality conformity for PM_{10} has been satisfied.

4.2.3 Basis for Qualitative Particulate Matter Determination

As discussed in the Project-Level Carbon Monoxide (CO) and Particulate Matter (PM_{10}) Consultation Document, particulate matter hot-spot analyses are required only for Projects of Air Quality Concern (POAQC). The project does not meet any of the screening criteria used to define a POAQC as described below:

- The 2050 Build Alternative is not a new highway project, nor does it expand an existing highway.
- The Indian School Road/33rd Avenue intersection does not experience a significant number of diesel vehicles or result in increased traffic volumes from a significant number of diesel vehicles related to the project.
- The project is not a new bus or rail terminal that has a significant number of diesel vehicles congregating at a single location.
- The project is not an expanded bus or rail terminal and will not have a significant number of diesel vehicles congregating at a single location.
- The project is not in or affecting locations, areas, or categories of sites that are identified in the PM_{10} implementation plan as sites of violation or possible PM_{10} violations.

4.2.4 Interagency Consultation for Particulate Matter

On August 17, 2023, ADOT provided the Project-Level Carbon Monoxide (CO) and Particulate Matter (PM_{10}) Consultation Document to the following consulting parties for a 30-day review: EPA, FHWA, MAG, ADEQ, and MCAQD. The project was presented as a project that would not be considered a POAQC and would not require hot-spot modeling.

On September 7, 2023, an interagency consultation meeting was held to discuss the project. There were no substantive discussions concerning PM and the potential for the project to be considered a POAQC. The 30-day interagency comment period closed on September 18, 2023. The responses to agency comments are included in Attachment 1.

4.2.5 Conclusion and Conformity Determination

As discussed above, the project is not a new or expanded highway capacity project that has a significant increase in the number of diesel-fueled vehicles related to the project.

As shown in Table 8, under the 2050 Build Alternative, traffic volumes on US 60 (Grand Avenue), Indian School Road, and 35th Avenue range from about 27,500 average annual daily traffic (AADT) to about 66,300 AADT and would be less than the 125,000 AADT threshold at which point EPA guidance suggests a project could potentially be a project of air quality concern for PM.

Table 8. Indian School Road AADT and Truck Volumes

Roadway Segment	2020 Existing				2050 No-Build				2050 Build				Total Truck AADT Difference (Build - No-Build)
	AADT	Total Truck AADT	MT Volume	HT Volume	AADT	Total Truck AADT	MT Volume	HT Volume	AADT	Total Truck AADT	MT Volume	HT Volume	
Grand Avenue North of Indian School Road	47,600	4,284	476	3,808	57,400	5,166	574	4,592	56,700	5,103	567	4,536	−63
Grand Avenue South of Indian School Road	45,000	4,050	450	3,600	61,000	5,490	610	4,880	60,800	5,472	608	4,864	−18
Indian School Road East of Grand Avenue	48,800	6,344	2,928	3,416	65,000	8,450	3,900	4,550	66,300	8,619	3,978	4,641	169
Indian School Road West of Grand Avenue	46,200	6,006	2,772	3,234	59,200	7,696	3,552	4,144	59,300	7,709	3,558	4,151	13
35th Avenue North of Indian School Road	23,600	944	236	708	30,000	1,200	300	900	30,400	1,216	304	912	16
35th Avenue South of Indian School Road	20,800	832	208	624	28,200	1,128	282	846	27,500	1,100	275	825	−28
Clarendon Avenue, east of 35th Avenue	1,600	64	16	48	2,950	118	30	88	5,100	204	51	153	
Clarendon Avenue, west of 35th Avenue	6,800	272	68	204	8,900	356	89	267	10,100	404	101	303	
33rd Avenue, south of Indian School Road	5,780	752	347	405	14,100	1,833	846	987	21,300	2,769	1,278	1,491	
Glenrosa Avenue extension, west of 35th Avenue	No roadway under Existing conditions & No Build Alternative (new roadway added by the project).								9,300	372	93	279	

Notes: AADT – Average annual daily traffic
MT – Medium Trucks (vehicles with 2 axles and 6 wheels; gross vehicle weight – 10,000 to 26,400 pounds).
HT – Heavy Trucks (vehicles with 3 or more axles; gross vehicle weight greater than 26,400 pounds).

In addition, total truck volumes on those same roads range from about 200 AADT to about 8,600 AADT in the 2050 Build Alternative and include both medium trucks and heavy trucks, not all of which would be diesel-fueled. The total truck volumes are less than the 10,000 AADT, which EPA guidance suggests could warrant a PM hot-spot evaluation.

As none of the screening criteria discussed above were met that would suggest the proposed project is one of air quality concern, the 2050 Build Alternative has been determined not to be a project of air quality concern for PM and as such does not require a quantitative analysis. The proposed project would not be expected to cause a violation of the PM_{10} NAAQS.

Project-level transportation conformity for PM has been demonstrated.

4.3 MSAT Evaluation

The most recent FHWA MSAT guidance (FHWA 2023) incorporates emission estimates that include the effect of recent EPA rulemakings that will further control motor vehicle emissions in the future. These regulations will result in a substantial decline in MSAT emissions over the next several decades.

Based on an FHWA analysis using the MOVES3 model, FHWA estimates that even if vehicle miles traveled increase by 31 percent from 2020 to 2060, there will be an estimated 76 percent reduction in the total annual emissions for the priority MSATs over the same period (Figure 7).

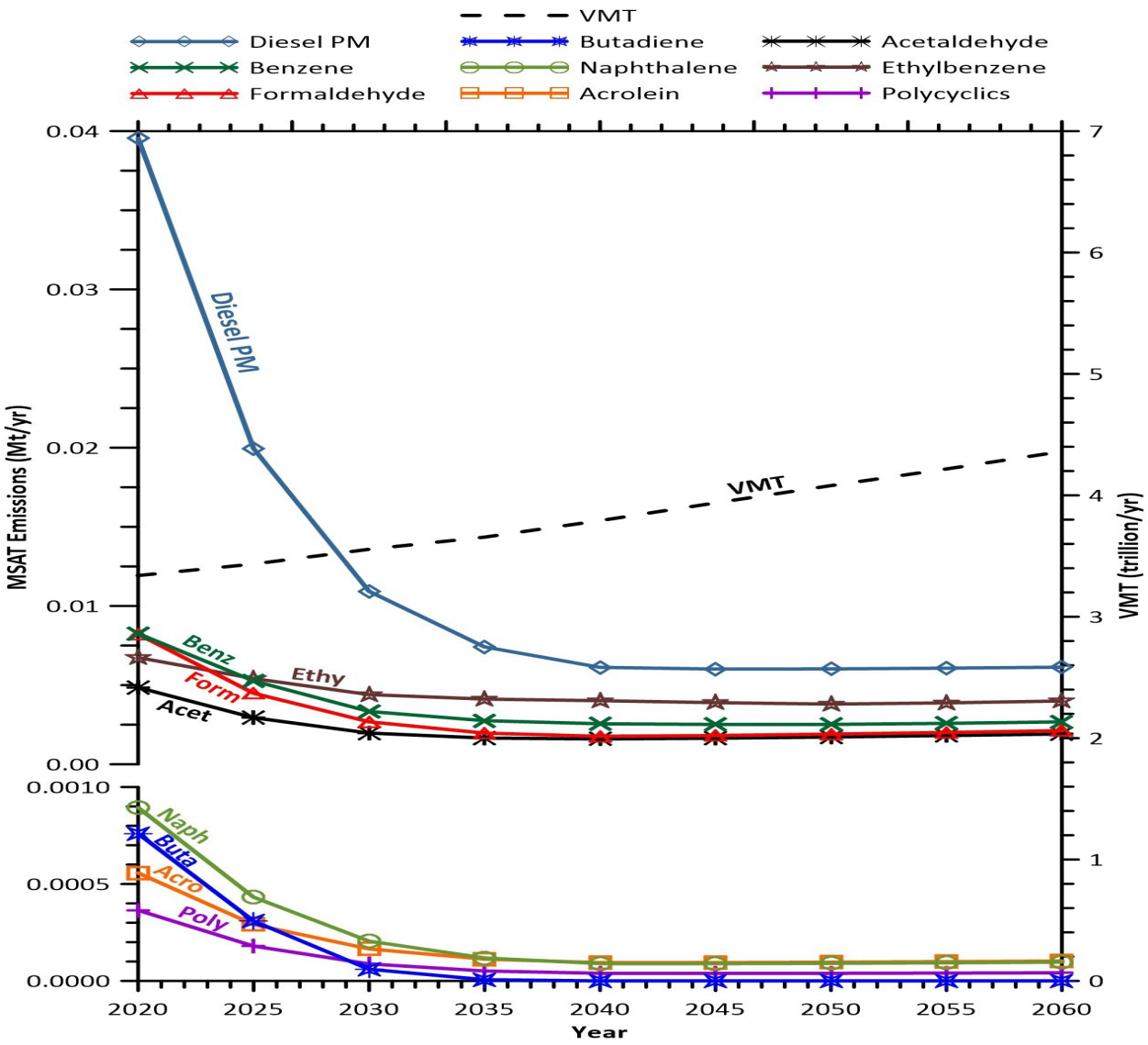

Figure 7. FHWA Projected National MSAT Emission Trends 2020-2060

FHWA's guidance groups projects into three categories for considering potential MSAT effects:

- No analysis for projects without the potential for meaningful MSAT effects
- Qualitative analysis for projects with a low potential for MSAT effects
- Quantitative analysis to differentiate alternatives for projects with a higher potential for MSAT effects

The project is considered to have a low potential for MSAT effects for the following reasons:

- The project would construct new bridges for 35th Avenue and Indian School Road to pass over the BNSF railroad tracks, creating a grade-separated interchange that improves operational efficiency in the vicinity of 35th Avenue, Indian School Road, and Grand Avenue without adding substantial new capacity.

- Under the 2050 Build Alternative, annual traffic volumes in the area range from about 27,500 AADT to 66,300 AADT and are less than the 140,000 to 150,000 AADT where a quantitative MSAT analysis could be warranted.
- As discussed above and shown on Figure 7, MSAT emissions are expected to decrease substantially in the future as a result of new engine and fuel standards.

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5. MITIGATION STRATEGIES

5.1 Operation

There were no project-related air quality impacts due to the project; therefore, operational mitigation measures are not required.

5.2 Construction

Short-term air quality impacts may be experienced during construction of the project because of the operation of construction equipment and the slow traffic speeds and idling associated with a construction zone. This would be a localized condition that would end with the completion of construction activities.

The construction contractor would be required to maintain construction equipment in proper working order to minimize exhaust emissions. Contractors would also be required to comply with local air quality and dust control rules, regulations, permits, and ordinances that apply to any work performed and use the most current ADOT best management practices to reduce short-term adverse construction impacts related to air quality (from dust and exhaust).

Fugitive dust generated from construction activities would be controlled in accordance with Maricopa County Rule 310 (Fugitive Dust from Dust-Generating Activities) and ADOT's *Standard Specifications for Road and Bridge Construction*, Section 104.08 (Prevention of Air and Noise Pollution), as well as other local rules and ordinances.

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6. REFERENCES

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Attachment 1 Project – Level Carbon Monoxide (CO) and Particulate Matter (PM10) Consultation Document

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Arizona Department of Transportation

Environmental Planning

Project - Level Carbon Monoxide (CO) and Particulate Matter (PM10) Consultation Document

US60 Grand Avenue/Indian School Road Traffic Interchange Federal Project No. 060-B(227)T

ADOT Project No. 060 MA 159 F0272 01C

September 22, 2023

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by ADOT pursuant to 23 U.S.C. 326 [23 U.S.C. 327] and a Memorandum of Understanding dated January 4, 2021 [April 16, 2019], and executed by FHWA and ADOT.

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Project Level CO Hot-Spot Analysis

Project Setting and Description

The Arizona Department of Transportation (ADOT), in coordination with the City of Phoenix and Maricopa Association of Governments (MAG), has initiated an Environmental Assessment (EA) and Design Concept Report (DCR) for the US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersections. The study will evaluate potential transportation improvements at the intersection of Grand Avenue, 35th Avenue, Indian School Road and the BNSF railroad crossing to reduce traffic congestion, enhance safety and improve pedestrian and bicycle facilities.

The Build Alternative would raise 35th Avenue and Indian School Road to create a new raised intersection over Grand Avenue and the BNSF railroad, eliminating the existing at-grade railroad crossings. The Build Alternative would result in access changes for some properties along 35th Avenue closest to the intersection because of new elevated roadways and bridges. New connecting roadways would be needed to restore access to some of those properties.

The Build Alternative consists of the following major elements:

- Removing the existing Indian School Road bridge structure over Grand Avenue and the BNSF Railway
- Constructing new bridges for 35th Avenue and Indian School Road to pass over the railroad and Grand Avenue, shifting 35th Avenue to the west and Indian School Road to the north
- Along both Indian School Road and 35th Avenue:
    - Removing portions of the existing 35th Avenue and Indian School Road roadways
    - Constructing a new ramp connecting westbound Indian School Road and northwest-bound US 60 (Grand Avenue), and a ramp connecting US 60 (Grand Avenue) to eastbound Indian School Road
    - Reconstructing intersecting public roadways and driveways along 35th Avenue and Indian School Road to match the new alignment and roadway elevation
    - Widening shoulders on 35th Avenue and Indian School Road to better accommodate bicycles
    - Reconstructing widened sidewalks along 35th Avenue and Indian School Road to maintain pedestrian connectivity
- Along Indian School Road:
    - Widening Indian School Road along its new alignment to meet current City of Phoenix standards and accommodate potential future transit projects
    - Extending 33rd Avenue north of Indian School Road to restore access to properties north of Indian School Road
    - Adding turn lanes at the 33rd Avenue intersection to address re-routing of traffic between US 60 (Grand Avenue) and Indian School Road

- Along 35th Avenue:
    - Realigning portions of Clarendon Avenue and reconstructing the 35th Avenue/Clarendon Avenue intersection to create a single, signalized intersection that serves areas located east and west of 35th Avenue by eliminating the offset intersections
- Along Grand Avenue:
    - Restriping Grand Avenue to provide three through lanes in each direction and only one turn-only lane in the southbound direction to improve traffic flow at the new intersection
    - Adding turn lanes at 33rd Avenue to address re-routing of traffic between US 60 (Grand Avenue) and Indian School Road
- Extending Glenrosa Avenue to the west to connect 35th Avenue and US 60 (Grand Avenue), creating a new intersection on US 60 (Grand Avenue) to restore traffic movements between 35th Avenue and US 60 (Grand Avenue)
- Constructing a cul-de-sac on 37th Avenue north of US 60 (Grand Avenue), eliminating the intersection of 37th Avenue and US 60 (Grand Avenue), which has been identified by ADOT as a high crash location
- Relocating utilities, as needed
- Regrading two existing drainage detention basins where new roadway fill encroaches into the basin
- Constructing six new drainage detention basins to provide lost storage volume at the existing basins and capture increased onsite runoff
- Conducting the following field investigations prior to construction to inform detailed design:
    - Drilling geotechnical test drilling to inform design of new bridge structural elements
    - Excavating small potholes to locate utilities within the existing roadway

The proposed project is in Maricopa County, portions of which are currently designated as nonattainment or maintenance for the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), eight-hour ozone (O_3), and particulate matter less than or equal to ten microns (PM_{10}).

The CO Maintenance Plan currently in effect is the "MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area" (MAG, March 2013). As discussed in that plan, there have been no violations of the 1-hour National Ambient Air Quality Standard (NAAQS) for CO (35 parts per million [ppm] since 1984 and no violations of the 8-hour NAAQS (9 ppm) since 1996. There has also been a continuous downward trend in monitored CO concentrations over time and the maintenance demonstration summary described in the 2013 Maintenance Plan details continuing compliance with the CO standard through 2025.

The PM10 Nonattainment Plan currently in effect is the "The MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area", the effective date of this plan as approved by Environmental Protection Agency (EPA) is July 10, 2014. The MAG 2020 Eight-Hour Ozone Plan – Submittal of Marginal Area Requirements for the Maricopa

Nonattainment Area was submitted to EPA on June 29, 2020.

This project is included in the in the Maricopa Association of Governments Regional Transportation Plan: Momentum 2050 (MAG, 2021) and the Fiscal Year 2022-2025 Transportation Improvement Program (ID 42572 – 60 (Grand Ave): 35th Ave/Indian School Road Intersection.

The current conformity determination of the TIP and MOMENTUM 2050 MAG Regional Transportation Plan for the Maricopa nonattainment and maintenance areas and the Pinal County nonattainment areas was made by the Federal Highway Administration and Federal Transit Administration on February 14, 2023.

The project vicinity is shown in Figure 1 below and the proposed alignment improvements are shown in Figure 2.

Figure 1. Project Location Map

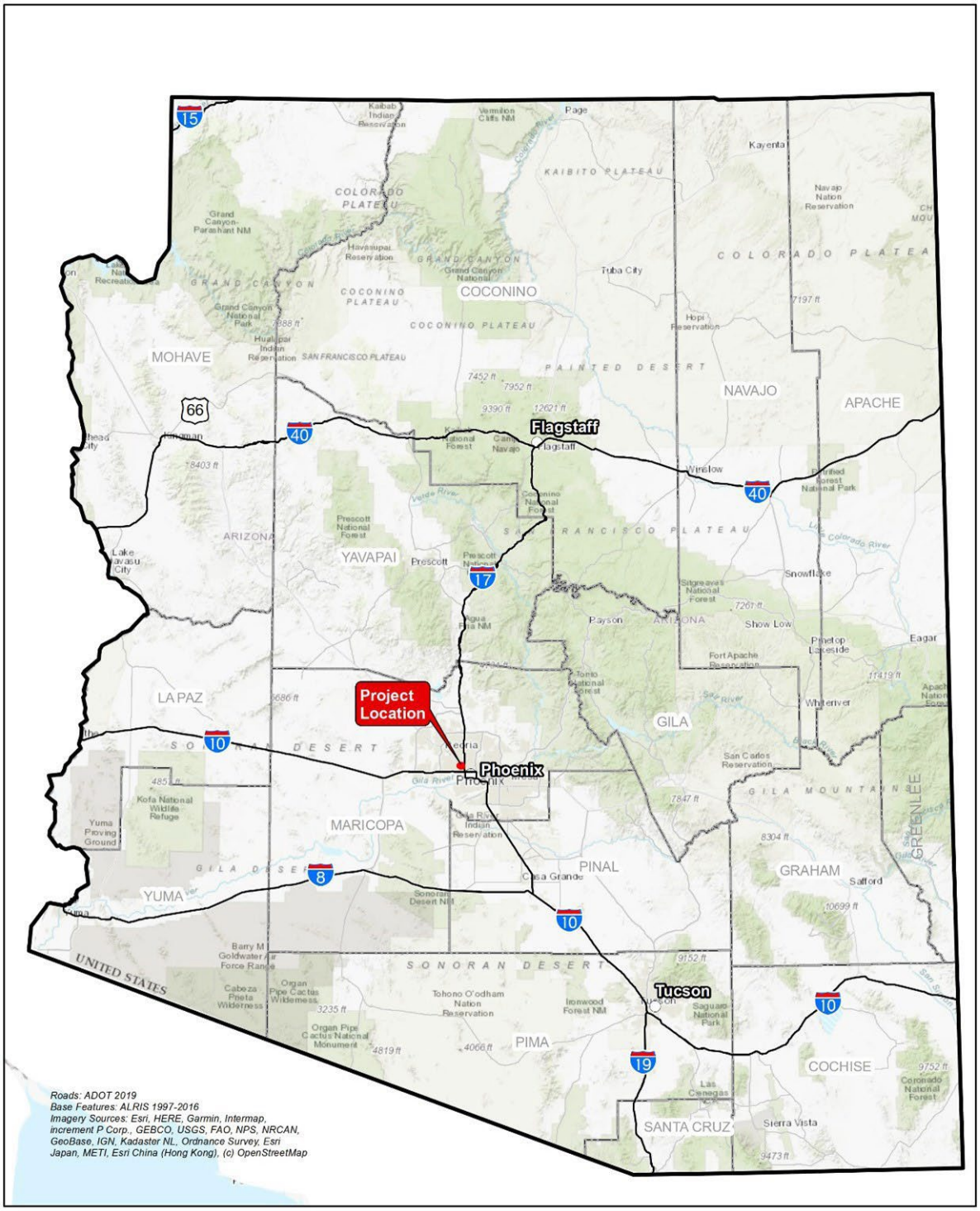
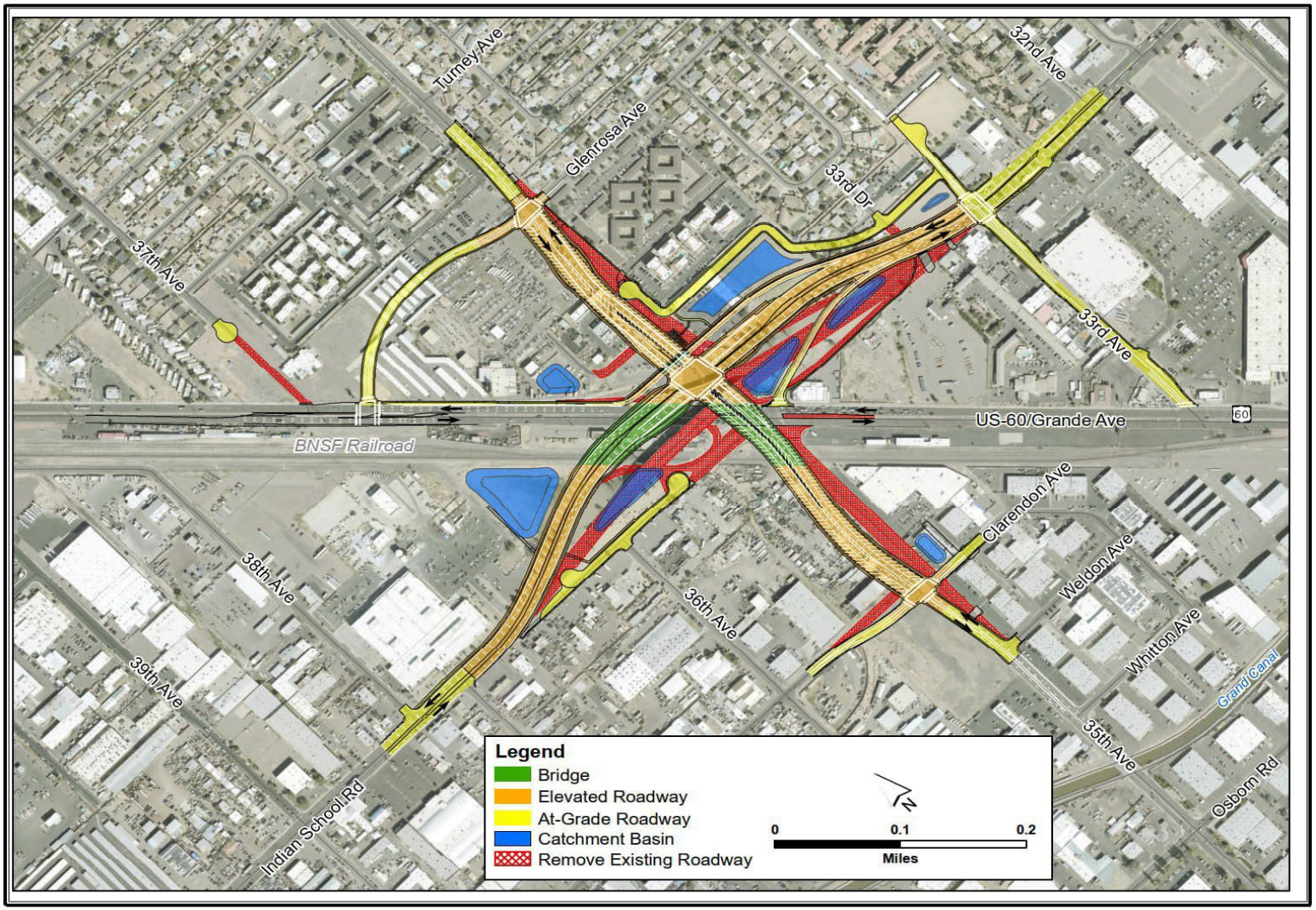


Figure 2. Traffic Interchange Improvements



Project Assessment – Part A

The following questionnaire is used to compare the proposed project to a list of project types in 40 CFR 93.123(a) requiring a quantitative analysis of local CO emissions (Hot-spots) in nonattainment or maintenance areas, which include:

i. Projects in or affecting locations, area, or categories of sites which are identified in the applicable implementation plan as sites of violation or possible violation;
ii. Projects affecting intersections that are at Level-of-Service D, E, or F, or those that will change to Level-of-Service D, E, or F because of increased traffic volumes related to the project;
iii. Any project affecting one or more of the top three intersections in the nonattainment area or maintenance area with highest traffic volumes, as identified in the applicable implementation plan; and
iv. Any project affecting one or more of the top three intersections in the nonattainment or maintenance area with the worst level of service, as identified in the applicable implementation plan.

If the project matches one of the listed project types in 40 CFR 93 123(a)(1) above, it is considered a project of local air quality concern and the hot-spot demonstration must be based on quantitative analysis methods in accordance with 40 CFR 93.116(a) and the consultation requirements of 40 CFR 93.105(c)(1)(i).

Projects Affecting CO Sites of Violation or Possible Violation

Does the project affect locations, areas, or categories of sites that are identified in the CO applicable plan or implementation plan submissions, as appropriate, as sites of violation or potential violation?).

NO - The MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area (MAG, March 2013) does not identify sites or categories of potential violation for CO.

Projects with Congested Intersections

Is this a project that affects a congested intersection (LOS D or greater) will change LOS to D or greater because of increased traffic volumes related to the project?

YES – As shown in Table 1, under the 2050 No-Build, and 2050 Build alternatives, there is one intersection that operates at LOS D in the PM peak-hour (no intersections operate at LOS D or worse in the AM peak-hour). The intersection that operates at LOS D in the PM peak hour under the 2050 Build Alternative is:

- Indian School Road/33rd Avenue (vehicle delay - 43 seconds; peak hour volume – 6,225 vph)

As noted above, there have been no violations of the 1-hour or 8-hour CO standard since 1984 and 1996, respectively, even as the region has grown substantially, adding more traffic to local roads. In addition, there has been a continuous downward trend in measured CO concentrations over time and the region continues to meet CO emission standards.

Table 1. Intersection Level of Service and PM Peak Hour Volume Summary

Intersection	2020 Existing Conditions				2050 No-Build				2050 Build				Truck Difference (Build - No-Build, vph)[1]
	LOS (delay, sec.)	Volumes (vph)	Medium Truck Volumes (vph)	Heavy Truck Volumes (vph)	LOS (delay, sec.)	Volumes (vph)	Medium Truck Volumes (vph)	Heavy Truck Volumes (vph)	LOS (delay, sec.)	Volumes (vph)	Medium Truck Volumes (vph)	Heavy Truck Volumes (vph)	
Indian School Road/33rd Avenue	D (45)	4,424	265	310	E (58)	5,520	331	386	D (43)	**6,225**	374	436	93
Indian School Road/39th Avenue	B (14)	3,569	214	250	B (18)	4,385	263	307	B (15)	4,485	269	314	13
US 60/ 33rd Avenue	E (79)	3,300	33	264	C (30)	4,280	43	342	C (26)	4,305	43	344	2
35th Avenue/ Clarendon Avenue	A (8)	2,324	23	70	F (105)	2,920	29	88	C (27)	3,190	32	96	11
35th Ave./US 60/Indian School Rd	F (110)	5,311	319	372	F (145)	6,315	379	442	Existing signal at 35th Ave/US 60/Indian School Rd would be removed by the project and replaced with a signal on the new elevated intersection of 35th Avenue/Indian School Road (see below).				
35th Avenue/Indian School Road	Existing signal at 35th Ave/US 60/Indian School Rd (see above) would be removed by the project and replaced with a signal on the new elevated 35th Avenue/Indian School Road intersection.								C (26)	6,935	416	485	N/A
35th Avenue/ Monterosa Street	A (9)	2,047	20	61	A(5)[2]	2,580	26	77	The existing pedestrian-activated crosswalk signal at 35th Avenue/Monterosa Street would be removed by the project.				
35th Avenue/Glenrosa Avenue	No signal under Existing Conditions				A(7)	2,560	26	77	C(22)	3,080	31	92	20
US 60/EB Indian School Road Entrance Ramp	No separate signal under existing and no-build conditions, traffic from this ramp goes through the existing 35th Ave/US 60/Indian School Road signal.								A (5)	3,175	43	342	N/A
US 60/ Glenrosa Avenue	No signal under Existing conditions & No Build Alternative (new signal added by the project).								A(22)	4,270	32	254	N/A

1 Truck AADT Difference includes both MT and HT

2 – A pedestrian hybrid beacon will be added at the 35th Ave/Glenrosa Ave intersection by the City of Phoenix 35th Avenue Safety Corridor Improvement Project.

Source: AECOM. 2023. *Initial Design Concept Report for US 60, Grand Avenue, 35th Avenue/Indian School Road Traffic Interchange.*

Values in Red – greater than acceptable LOS C

Highest PM peak-hour traffic volumes in 2050 Build Alternative in **bold**

MT – Medium Trucks (vehicles with 2 axles & 6 wheels; gross vehicle weight – 10,000 to 26,400 pounds)

HT – Heavy Trucks (vehicles with 3 or more axles; gross vehicle weight greater than 26,400 pounds).

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There are two existing at-grade BNSF Railway crossings within the project limits: one on 35th Avenue and one on the eastbound and westbound Indian School Road ramps/frontage roads west of 35th Avenue. The railroad crossings are not signalized and are not shown in Table 1. Under the 2050 Build Alternative Table 2 shows travel time savings for travelers passing through the study area when compared to Existing Conditions and the 2050 No-Build Alternative. Existing Conditions and 2050 No-Build information reflect delays associated with the trains and the 2050 Build Alternative removes the crossings and associated delays.

Table 2. Travel Time Savings for High-Volume Trips

Alternative	AM Peak Hour Travel Time (seconds)			PM Peak Hour Travel Time (seconds)		
	Existing	2050 No-Build	2050 Build	Existing	2050 No-Build	2050 Build
EB Indian School Rd	151.1	232.3	191.0	146.6	241.8	164.3
WB Indian School Rd	99.6	103.5	110.6	158.8	240.2	252.9
SB/EB US 60	632.9	496.7	89.1	143.1	206.1	72.5
NB/WB US 60	148.1	145.4	71.6	463.5	236.4	73.2
NB 35th Ave	125.3	552.6	129.7	232.9	437.8	174.1
SB 35th Ave	231.7	568.3	99.7	141.3	173.9	107.5
Total	1,388.6	2,098.8	691.7	1,286.2	1,536.5	844.5

Source: AECOM. Initial Design Concept Report US 60, GRAND AVENUE 35th Avenue/Indian School Road Traffic Interchange.

Table 3 shows the Annual Average Daily Traffic (AADT) volumes at various locations in the project area. Under the 2050 Build Alternative, AADT volumes range from about 30,400 vehicles per day (vpd) on 35th Avenue north of Indian School Road to about 66,300 vpd on Indian School Road east of US 60 (Grand Avenue).

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Table 3. Indian School Road AADT and Truck Volumes

RoadwaySegment	2020 Existing				2050 No-Build				2050 Build				Total Truck AADT Difference (Build - No-Build)
	AADT	Total Truck AADT	MT Volume	HT Volume	AADT	Total Truck AADT	MT Volume	HT Volume	AADT	Total Truck AADT	MT Volume	HT Volume	
Grand Avenue North of Indian School Road	47,600	4,284	476	3,808	57,400	5,166	574	4,592	56,700	5,103	567	4,536	-63
Grand Avenue South of Indian School Road	45,000	4,050	450	3,600	61,000	5,490	610	4,880	60,800	5,472	608	4,864	-18
Indian School Road East of Grand Avenue	48,800	6,344	2,928	3,416	65,000	8,450	3,900	4,550	66,300	8,619	3,978	4,641	169
Indian School Road West of Grand Avenue	46,200	6,006	2,772	3,234	59,200	7,696	3,552	4,144	59,300	7,709	3,558	4,151	13
35th Avenue North of Indian School Road	23,600	944	236	708	30,000	1,200	300	900	30,400	1,216	304	912	16
35th Avenue South of Indian School Road	20,800	832	208	624	28,200	1,128	282	846	27,500	1,100	275	825	-28
Clarendon Ave, east of 35th Ave	1,600	64	16	48	2,950	118	30	88	5,100	204	51	153	
Clarendon Ave, west of 35th Ave	6,800	272	68	204	8,900	356	89	267	10,100	404	101	303	
33rd Ave, south of Indian School Road	5,780	752	347	405	14,100	1,833	846	987	21,300	2,769	1,278	1,491	
Glenrosa Ave extension, west of 35th Avenue	No roadway under Existing Conditions & 2050 No-Build Alternative (new road added by the project).								9,300	372	93	279	

Notes: AADT – Average annual daily traffic

MT – Medium Trucks (vehicles with 2 axles & 6 wheels; gross vehicle weight – 10,000 to 26,400 pounds).

HT – Heavy Trucks (vehicles with 3 or more axles; gross vehicle weight greater than 26,400 pounds).

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Projects Affecting Intersections with Highest Traffic Volumes

Does the project affect one or more of the top three intersections in the CO maintenance area with the highest traffic volumes identified in the CO applicable implementation plan?

NO - There are 10 intersections within the project limits as shown in Table 1. The 3 intersections with the highest traffic volumes in the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area, March 2013 are located outside the project limits:

- Priest Drive & Southern Avenue
- 16th Street & Camelback Road
- 107th Avenue & Grand Avenue

Projects Affecting Intersections with the Worst Level of Service

Does the project affect one or more of the top three intersections in the CO maintenance area with the worst level of services identified in the CO applicable maintenance plan?

NO - There are 10 intersections within the project limits as shown in Table 1. The 3 intersections with worst level of service in the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area, March 2013 are located outside the project limits:

- 7th Avenue & Van Buren Street
- German Road & Gilbert Road
- Thomas Road & 27th Avenue

The modeling conducted for the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area, approved by EPA effective April 4, 2016, demonstrates continuing maintenance of the CO standard through 2025.

The modeling in that plan used 2025 in the future-year evaluation (MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area – Appendices, page 180ff, March 2013). Based on the Motor Vehicle Emissions Simulator (MOVES) model used at that time (MOVES2010b), the highest 1-hour modeled CO concentration at the six highest intersections identified in the maintenance plan was 0.5 ppm. The highest 8-hour modeled CO concentration at the six intersections was 1.7 ppm which included a background CO concentration of 1.3 ppm.

Based on improved fuel standards and other technological improvements in vehicle operating efficiencies since 2013, including revisions to the MOVES model, it is reasonable to assume that the intersections associated with the proposed project would not exceed the CO NAAQS of 35 ppm (1-hour) or 9 ppm (8-hour) under the 2050 Recommended Build alternative.

Conclusion

Under the 2050 No-Build, and 2050 Build alternatives, the intersection that operates at LOS D in the PM peak-hour is Indian School Road/33rd Avenue (vehicle delay - 44 43 seconds; peak hour volume – 6,225 vph). Therefore, the intersection is to be evaluated for an appropriate hot-spot analysis requirement, as provided in Part B of the Project Assessment.

Project Assessment – Part B

Decide which type of hot-spot analysis is required for the project by choosing a category below.

Hot-Spot Determination

Decide which type of hot-spot analysis is required for the project by choosing a category below.

☒ **If answered "Yes" to any of the questions in the Project Assessment – Part A**

A quantitative CO hot-spot analysis is required under 40 CFR 93.123(a)(1).

☒ Check If a formal air quality report for conformity is required for this project.

The applicable air quality models, data bases, and other requirements specified in 40 CFR part 51, Appendix W (Guideline on Air Quality Models) should be completed using **"Project Level CO Quantitative Hot-Spot Analysis – Consultation Document"** circulated through interagency consultation for review and comments for 30 days prior to commencing any modeling activities.

Under the 2050 Build Alternative, one intersection would operate at LOS D and is proposed for quantitative CO hot-spot modeling:

- Indian School Road/33rd Avenue (vehicle delay - 43 seconds; PM peak-hour volume – 6,225 vph)

The potential for CO exceedances are most closely associated with congested, poorly operating intersections (LOS D or worse). The Indian School Road/33rd Avenue intersection represents the combination of the highest traffic volumes and vehicle delay that will result in maximum CO emissions when modeled under 2050 conditions and is appropriate for demonstrating air quality conformity associated with the proposed project. Methodologies of the CO hot-spot modeling are provided in the attached "Project Level CO Quantitative Hot-Spot Analysis – Consultation Document."

- Or

☐ Check If the project fits the condition of the "CO Categorical Hot-Spot Finding".

In the January 24, 2008, Transportation Conformity Rule Amendments, EPA included a provision at 40 CFR 93.123(a)(3) to allow the U.S. DOT, in consultation with EPA, to make categorical hot-spot findings in CO nonattainment and maintenance areas if appropriate modeling showed that a type of highway or transit project would not cause or contribute to a new or worsened air quality violation of the CO NAAQS or delay timely attainment of the NAAQS or required interim milestone(s), as required under 40 CFR 93.116(a).

Projects Fitting the Condition of the CO Categorical Hot-Spot Finding (Updated 2/1/23)

If the project's parameters fall within the acceptable range of modeled parameters, use FHWA 2023 CO Categorical Hot-Spot Finding Spreadsheet Tool: https://www.fhwa.dot.gov/environment/air_quality/conformity/policy_and_guidance/cmcf_2023/index.cfm

NO – The project intersection does not fit the conditions of the CO Categorical Hot-Spot Finding. The Indian School Road/33rd Avenue intersection exceeds the maximum approach volume threshold of 2,640 vehicles per hour allowed by the tool.

☐ **If answered "No" to all of the questions in the Project Assessment – Part A**

A qualitative CO analysis is required under 40 CFR 93.123(a)(2). The demonstrations required by 40 CFR 93.116 Localized CO, PM10, and PM2.5 violations (hot-spots) may be based on either:

(i) **Quantitative methods that represent reasonable and common professional practice;**

☐ Check If an Air Quality Report includes CO modeling for NEPA EA/EIS use this report to satisfy option (i)

- Or

(ii) **A qualitative consideration of local factors if this can provide a clear demonstration that the requirements of 40 CFR 93.116 are met**.

☐ Check If there is an Air Quality Report that does not include CO modeling for NEPA EA/EIS use this report to satisfy (ii)

☐ Check If the project is a CE under NEPA that does not require Air Quality Report for NEPA EA/EIS use this Questionnaire to add additional justification to satisfy (ii)

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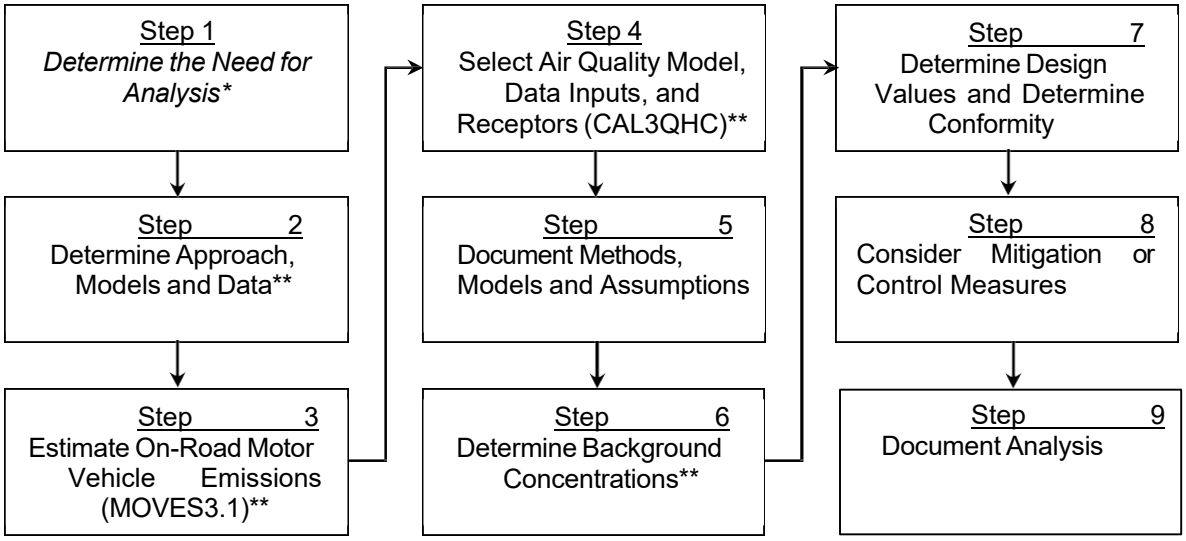
Project Level CO Quantitative Hot-Spot Analysis – Modeling Assumptions

The Arizona Department of Transportation (ADOT) developed the following consultation document for the projects of air quality concern that are funded by Federal Highway Administration (FHWA) and Federal Transit Administration (FTA). The Purpose of this document is to describe the methods, models and assumptions used for a CO quantitative Hot-spot analysis as required in 40 CFR 93.105(c)(1)(a), 93.123, 93.116.

Completing a Carbon Monoxide (CO) Hot-Spot Analysis

The general steps required to complete a quantitative CO hot-spot analysis are outlined below and described in detail in the EPA guidance document "Using MOVES3 in Project-Level Carbon Monoxide Analyses" EPA-420-B-21-047, December 2021, and "Guideline for Modeling Carbon Monoxide from Roadway Intersections" EPA-454/R-92-005, November 1992.



* Described in the previous section.

** How these Steps/Assumptions are planned are described in this document below.

Methods, Models and Assumptions for CO

Table 4. Methods, Models and Assumptions		
MOVES3.1	**Description**	**Data Source**
Estimate On-Road Motor Vehicle Emissions (Step 3)		
Scale	On road, Project, Inventory	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.2
Time Span	The EPA 1992 Guideline conservatively uses a typical peak-hour traffic activity in one MOVES run to generate emission rates. The worst-case modeling scenario using January when CO emissions are typically greater due to colder temperatures and during the PM peak-hour will be selected. As shown in the Appendix, "Figure 20 - 2050 Build Alternative AM Peak Hour Levels of Service," there are no intersections in the project study area that would operate at LOS D or worse in 2050. The FY 2022–2025 TIP indicates that the project will be open to traffic in 2027; therefore, 2027 MOVES emission rates will be used to represent the Year of Opening emission rates and will be used with 2050 traffic volumes (the year with maximum traffic volumes) to model worst-case emissions associated with the project.	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.3
Geographic Bounds	Maricopa County	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.4
Onroad Vehicles	All Fuels and Source Use Types	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.5
Road Type	Urban Unrestricted	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.6
Pollutants and Processes	CO Running Exhaust, CO Crankcase Running Exhaust	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.7
Output	Database will be created, Grams, Miles, Distance Traveled, and Population will be selected. Emissions process will be selected in the Output Emissions Detail. Emission rates for each process can be appropriately summed to calculate aggregate CO emission rates for each MOVES link.	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Sections 2.3.8 and 2.3.9

Table 4. Methods, Models and Assumptions		
MOVES3.1	**Description**	**Data Source**
Project Data Manager	Database and MOVES3.1 templates will be created to include local project data and information included in MAG's Fall_2022 Conformity evaluation for I/M programs and Age Distribution which are consistent with the regional models. For meteorology data, the average temperature and humidity in January will be derived from National Weather Service data for a 5-year period (2018 to 2022) and the default MOVES fuel data will be used as strongly recommended by the EPA (Using MOVES3 in Project-level Carbon Monoxide Analyses (2021), page 24). Links and Link Source Type will be specific to the project as provided in the traffic analysis; any missing information will use default MOVES3.1 data. After running MOVES, the MOVES CO_CAL3QHC_EF post-processing script is run.	EPA 1992 Guideline, Section 4.7.1., Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.1, 2.4 for Links; the required data necessary to be consistent with regional emissions analysis (40 CFR 3.123(c)(3)). See Table 5 below for details.
Select Air Quality Model, Data Inputs, and Receptors (Step 4)		
Emissions Sources	Emissions Rates in grams/mile and grams/hour will be developed using the inputs described in MOVES3.1 section above. The free flow and queue links defined for modeling with MOVES3.1 will be used as inputs to CAL3QHC.	1992 Guideline for Modeling Carbon Monoxide from Roadway Intersections, EPA-454/R-92-005, November 1992. Section 4.2.3.1 (Models for Carbon Monoxide) of Appendix W to 40 CFR Part 51, refers to the November 1992 guidance above as appropriate for CO screening analyses of intersection projects.
Receptor Locations	At least 3m from the roadways at an average breathing height of 1.8m, nearby occupied lots, vacant lots, sidewalks, and any locations near where the general public has continuous access. Receptors are located along the right-of-way line (where, and if, appropriate) and at sidewalk locations (as determined from aerial imagery and a project design file), including the four corners of the Indian School Road/33rd Avenue intersection (see following figures for graphical representation of model setup including receptor locations and links).	1992 Guideline for Modeling Carbon Monoxide from Roadway Intersections, Section 2.2

Table 4. Methods, Models and Assumptions		
MOVES3.1	**Description**	**Data Source**
Traffic and Geometric Design	Lane Configuration, Lane Width, Signalization, Turning Movements, Median Width, Traffic Volume, Level of Service, Grade, % of Heavy- Duty Trucks, and Peak Hour Average Approach Speed. Data will be derived from the traffic analysis, design files, and signal timing analyses.	1992 Guideline for Modeling Carbon Monoxide from Roadway Intersections, Section 4.7.4
Meteorology	The following meteorology options will be used as recommended in the CO Guideline: a worst-case wind speed of 1 m/s, 10-degree wind intervals from 0 to 355 degrees, a mixing height of 1,000 m, and stability class D. A surface roughness of 175 cm will be used as representative of an urban environment.	1992 Guideline for Modeling Carbon Monoxide from Roadway Intersections, Section 4.7.1
Persistence Factor	A persistence factor of 0.86 will be used to estimate 8-hour CO concentrations from 1-hour concentrations. Persistence factor derived by the Maricopa County Air Quality Department using 1-hour and 8-hour CO monitor data from the West Phoenix monitor (2020 to 2022).	1992 Guideline for Modeling Carbon Monoxide from Roadway Intersections, Section 4.7.2

Table 4. Methods, Models and Assumptions		
MOVES3.1	**Description**	**Data Source**
Determine Background Concentrations (Step 6)		
Background Monitor	As discussed below, the West Phoenix CO monitor located at 3847 West Earll Drive is about 1 mile southwest of the Indian School Road/33rd Avenue intersection and is the nearest active CO monitor to that intersection. As shown in Table 10, for three years of available monitoring data (2020 to 2022), the West Phoenix CO monitor had the highest 1-hour concentration of 3.8 ppm and the highest 8-hour concentration of 3.5 ppm of all active CO monitors in Maricopa County. In addition, the West Phoenix Monitor meets all requirements of 40 CFR Part 58 Subpart G – Appendices A, C, D, and E related to QA requirements for monitors, monitoring methodology, and network design). 3.8 ppm will be added to the maximum modeled hourly concentration and compared to the NAAQS. 3.5 ppm will be added to the maximum 8-hour modeled concentration.	1992 Guideline for Modeling Carbon Monoxide from Roadway Intersections, Section 4.7.3

Table 5. Project Data Manager Inputs		
Input	**Level of Detail/notes**	**Possible Data Source**
Meteorology	Same for build and no-build scenarios. The average temperature and humidity were determined by averaging all hourly temperatures for January (2018 to 2022) from the National Weather Service. The average temperature of 57.6 degrees F and the average relative humidity of 50.0% will be used in all MOVES runs.	ADEQ, MPO EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.1
Age Distribution	Same for Build and No-Build scenarios using data from the latest regional conformity analysis provided by MAG in the Fall 2022 conformity evaluation.	ADOT, MPO EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.2
Fuel	MOVES default fuel supply and fuel formulations as recommended by the EPA.	MPO, MOVES defaults EPA Using MOVES2014 in Project-Level Carbon Monoxide Analyses, Section 2.4.3
I/M Programs	Same for Build and No-Build scenarios using data from the latest regional CO conformity analysis provided by MAG in the Fall 2022 conformity evaluations.	MPO, MOVES defaults EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.4
Retrofit Data	Not applicable for the proposed project.	Project specific modeling EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.5
Links	The Indian School Road/33rd Avenue intersection will be divided into links for the No-Build and Build Alternative. Each link's length (in miles), traffic volume (vehicles per hour), average speed (miles per hour) and road grade (percent) will be specified. Roadway segments within 750 feet of the intersection will be included (see the following figures for representations of intersection configurations including receptor locations and links).	Project specific modeling, ADOT, MPO EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.6
Link Source Types	Source type distribution will be represented by the regional fleet for each road type and analysis year, based on data from the latest regional Fall 2022 CO conformity analysis provided by MAG.	Project specific modeling, ADOT, MPO EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.7
Link Drive Schedules, Operating Mode Distribution	Average speed and road type will be used in the Links Importer based on project-specific modeling.	Project specific modeling, ADOT, MPO EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.8, 2.4.9
Off-Network, Hotelling	Not applicable for the proposed project as no project elements involve off network or hotelling activities (park & ride facilities, for example).	EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.4.10

Table 6. Construction Emissions *(Only if Applicable)*		
Construction Emissions	Construction Emissions will be addressed qualitatively as construction is not expected to last longer than 5 years at any individual site. In the context of CO, this is usually excess CO emissions due to traffic delay and/or detours.	40CFR93.123(c)(5)"Each site which is affected by construction-related activities shall be considered separately, using established "Guideline" methods." If applicable, include analysis as an Appendix to the Air Quality Report.

Project Level CO Hot-Spot Analysis Methodologies

Determine the Approach, Models, and Data

The project is in the Maricopa County CO maintenance area; therefore, it is subject to project level CO conformity requirements. To demonstrate project conformity, the CO concentrations near the affected intersections of the project cannot exceed the national ambient air quality standards (NAAQS) shown below:

- 1-hour CO standard: 35 ppm
- 8-hour CO standard: 9 ppm

The quantitative CO hot-spot analysis will be performed for the following alternatives and analysis years:

- 2050 No Build
- 2050 Build Alternative

The CO hot-spot analysis will follow the steps outlined above in the "Completing a Carbon Monoxide (CO) Hot-Spot Analysis" as appropriate for the proposed project. CO hot-spot modeling will be performed using the most recent version of EPA's Motor Vehicle Emission Simulator (MOVES3.1) model and the CAL3QHC air quality dispersion model. The analysis will follow EPA's Guideline for Modeling Carbon Monoxide from Roadway Intersections (EPA 1992), User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections (Revised) (EPA 1995) and Using MOVES3 in Project-Level Carbon Monoxide Analyses (EPA, 2021).

As discussed above in the "Project Level CO Hot-Spot Questionnaire," the intersection of Indian School Road/33rd Avenue is proposed for quantitative CO hot-spot modeling in the PM peak-hour because it represents the combination of traffic volumes and intersection delay that will result in maximum CO emissions when modeled and is appropriate for demonstrating air quality conformity associated with the proposed project.

The Indian School Road/33rd Avenue intersection will be modeled for the following alternatives and time periods:

- 2050 No Build Alternative (PM peak-hour)
- 2050 Build Alternative (PM peak-hour) (2027 input data and emission rates will be used to provide a conservative estimate of 2050 emissions)

Estimate On-Road Motor Vehicle Emissions with MOVES3.1

Vehicle emissions will be estimated using emission factors derived from the most recent version of EPA's MOVES3 model (MOVES3.1). MOVES3 emission modeling will follow the guidelines, methods, and assumptions shown above in Tables 4 and 5. MOVES3 input files for regional fuel specifications, fleet age distribution, speed distributions, and source use types will be obtained from MAG's Fall 2022 Conformity evaluations to reflect the most recent local conditions used in regional transportation emissions analyses (note: all references below referring to MAG-supplied data will refer to data from the Fall 2022 conformity evaluations). CO modeling will be conducted under wintertime conditions (January) when CO emissions are likely to be the highest due to colder weather.

As discussed in the MOVES3 Guidance, free-flow emission rates will be used for approach and departure links in the dispersion model and idle emission rates (0 mph) rates will be used for queue links (that is, traffic stopped at signalized intersections).

Traffic volumes on individual intersection links (approach, departure, and queue) will be obtained from data included in the traffic report. Link coordinates (northings and eastings) will be derived from a project design file provided by the traffic engineers.

Running exhaust and crankcase running exhaust emissions processes will be included in the modeling. To make the emissions evaluation conservative, the evaluation will use higher emission rates from 2027 when, according to the FY 2022 – 2025 TIP, the project is expected to be open to traffic and the traffic volumes from 2050 to estimate the vehicle emissions in 2050.

A summary of the MOVES3 inputs for the CO emission analysis are shown in Tables 4,5, and 7. Electronic MOVES files will be available as an appendix to the final air quality technical report.

Table 7. MOVES Inputs for the CO Hotspot Analysis

MOVES Analysis Input Selection	Data Source
Scale	Project level Inventory
Time Span	Years: 2050 (2027 input data will be used for a conservative estimate of 2050 emissions) Hours: PM Peak-Hour Month: January Weekdays
Geographic Bounds	AZ/Maricopa County
Vehicles and Equipment	All fuels and source-use type combinations
Road Type	Urban unrestricted
Pollutants and Processes	CO (Running Exhaust and Crankcase running exhaust)
Project Data Manager Inputs	**Data Source**
I/M Programs	MAG Supplied Data
Age Distribution	MAG Supplied Data
Fuel	MAG Supplied Data
Meteorology Data	Average January temperatures derived from National Weather Service for 5-year period (2018 to 2022)
Links	Link Length: 1 Link Volume: 1 Link Speed: Idle, and 5-70 mph in 5 mph increments Link Average Grade: maximum 4% (to generate worst-case emission rates)
Link Source Types	Derived MAG Supplied Data

Select Air Quality Model, Data Inputs, and Receptors Using CAL3QHC

The CAL3QHC dispersion model will be used to estimate peak 1-hour CO concentrations near the selected intersection. Eight-hour CO concentrations will be obtained by multiplying the highest peak-hour CO estimates by a calculated persistence factor of 0.86 calculated according to EPA guidance. The calculated persistence factor of was derived by the Maricopa County Air Quality Division from monitor values at the West Phoenix station using 1-hour and 8-hour data from 2020 to 2022. The persistence factor accounts for fluctuating traffic volumes, vehicle speeds, and meteorological conditions over 8 hours (as distinct from a single hour). Table 8 shows 10 highest non-overlapping 8-hour and 1-hour CO concentrations used in deriving the 0.86 persistence factor. Raw data used in making the persistence factor calculation are included in Appendix B.

Table 8. West Phoenix Monitor – Persistence Factor Ranking					
Rank of Highest Non-Overlapping Average	**Date**	**Time**	**8-hr Average**	**Maximum 1-hr Within the 8-hr period**	**Ratio (8-hr/1-hr)**
1	1/1/2021	8:00:00 AM	3.45	3.7	0.93
2	12/5/2021	4:00:00 AM	2.64	3.1	0.85
3	12/25/2020	2:00:00 AM	2.46	2.9	0.85
4	1/18/2021	2:00:00 AM	2.25	2.7	0.83
5	1/16/2021	2:00:00 AM	2.23	2.5	0.89
6	12/21/2020	2:00:00 AM	2.21	2.6	0.85
7	11/6/2021	2:00:00 AM	2.20	2.6	0.85
8	11/18/2020	2:00:00 AM	2.19	2.6	0.84
9	12/6/2020	2:00:00 AM	2.19	2.6	0.84
10	11/14/2021	3:00:00 AM	2.16	2.5	0.87
				Average	**0.86**

Source: Ron Pope (MCAQD) email to Beverly Chenausky (ADOT) and Curt Overcast (NEC), September 8, 2023

Figure 3 and Figure 4 show the preliminary link configurations and receptor locations for the Indian School Road/33rd Avenue intersection under the 2050 No-Build and 2050 Build Alternatives.

The CAL3QHC modeling inputs to be used in the dispersion analysis include:

- Free flow links to extend 750 feet from the center of the signalized intersection
- Queue links to begin at the intersection stop bar
- Traffic activity within 750 feet of the intersection to be included

Receptors placed at crosswalk locations nearest the intersection and spaced at approximately 25-meter intervals outside of the mixing zone at locations where the general public would have continuous access. There are existing sidewalks which will be retained under the 2050 Build Alternative and receptors were placed on the sidewalks at the intersection crosswalk, extending to more than 400 feet from each leg of the intersection. Receptors were located based on the project design file provided by project engineers..

Figure 3. Indian School Road/33rd Avenue Intersection Configuration – No Build Alternative

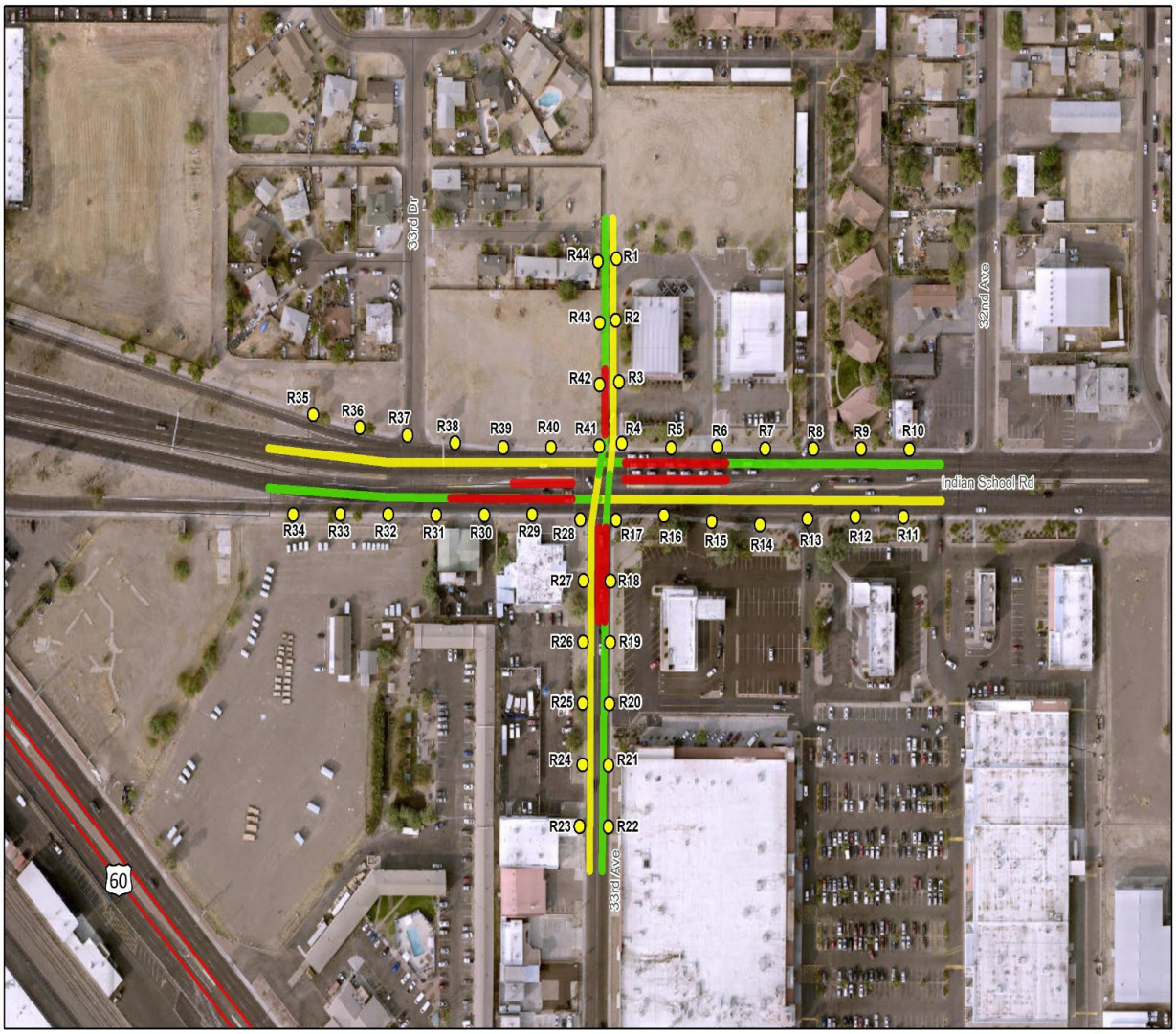
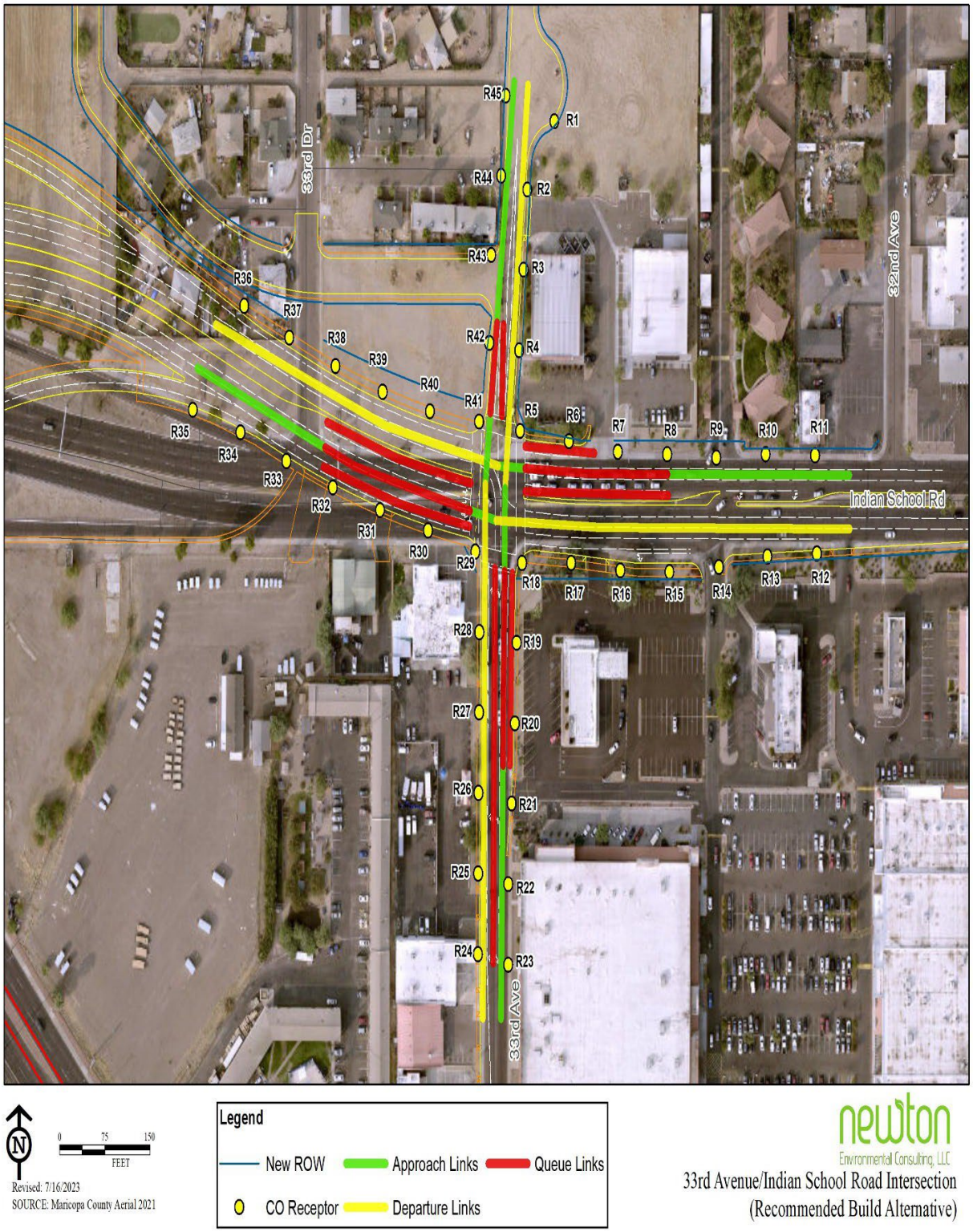


Figure 4. Indian School Road/33rd Avenue Intersection Configuration – Recommended Build Alternative



CAL3QHC input parameters appropriate for the selected intersection (using recommendations suggested in the 1992 Guidance are shown in Table 9. CAL3QHC modeling files will be available as an appendix to the final air quality technical report.

Table 9. CAL3QHC Inputs

Parameter	Description
Surface roughness	175 cm (representative of city land use – office environment)
Wind speed	1 m/s
Stability class	D (representative of urban environment)
Mixing height	1,000 m
Wind direction increment	10 degrees
Receptor height	1.8 m
Source height	0 m
Signal type	Actuated
Intersection arrival rate	Average progression

Traffic data will be derived from the traffic analysis prepared for the proposed project. Output of intersection turning movements and signal timing provided from the project engineers will be used in the CAL3QHC modeling for the proposed intersection under the No Build and Build Alternatives.

Background CO Concentrations

Microscale modeling is used to predict CO concentrations resulting from emissions from motor vehicles, using roadways immediately adjacent to the locations at which predictions are being made. A CO background level will be added to the CAL3QHC modeling results to account for background CO concentrations of the area from other sources.

Background CO concentrations were obtained from EPA's Monitor Values Report for all CO monitors in Maricopa County for the years 2020 to 2022. Table 10 shows the maximum 1-hour and 8-hour CO concentration recorded at each monitoring site during that period. Also included in the table is the approximate distance of the monitor to the Indian School Road/33rd Avenue intersection.

As shown in Table 10, the highest CO concentrations over the 3-year period were recorded at the West Phoenix Station located at 3847 W. Earll Drive, about 1 mile southwest of the Indian School Road/33rd Avenue intersection (3.8 ppm and 3.5 ppm for the 1-hour and 8-hour concentrations, respectively). The West Phoenix monitor is in an area of stable, high-density, residential properties and in addition to CO monitors for NO2, O3, PM10, and PM2.5. Because this monitor recorded the highest CO concentrations in Maricopa County and is in a residential location, it is appropriate for using as a background concentration for assessing potential CO impacts to individuals.

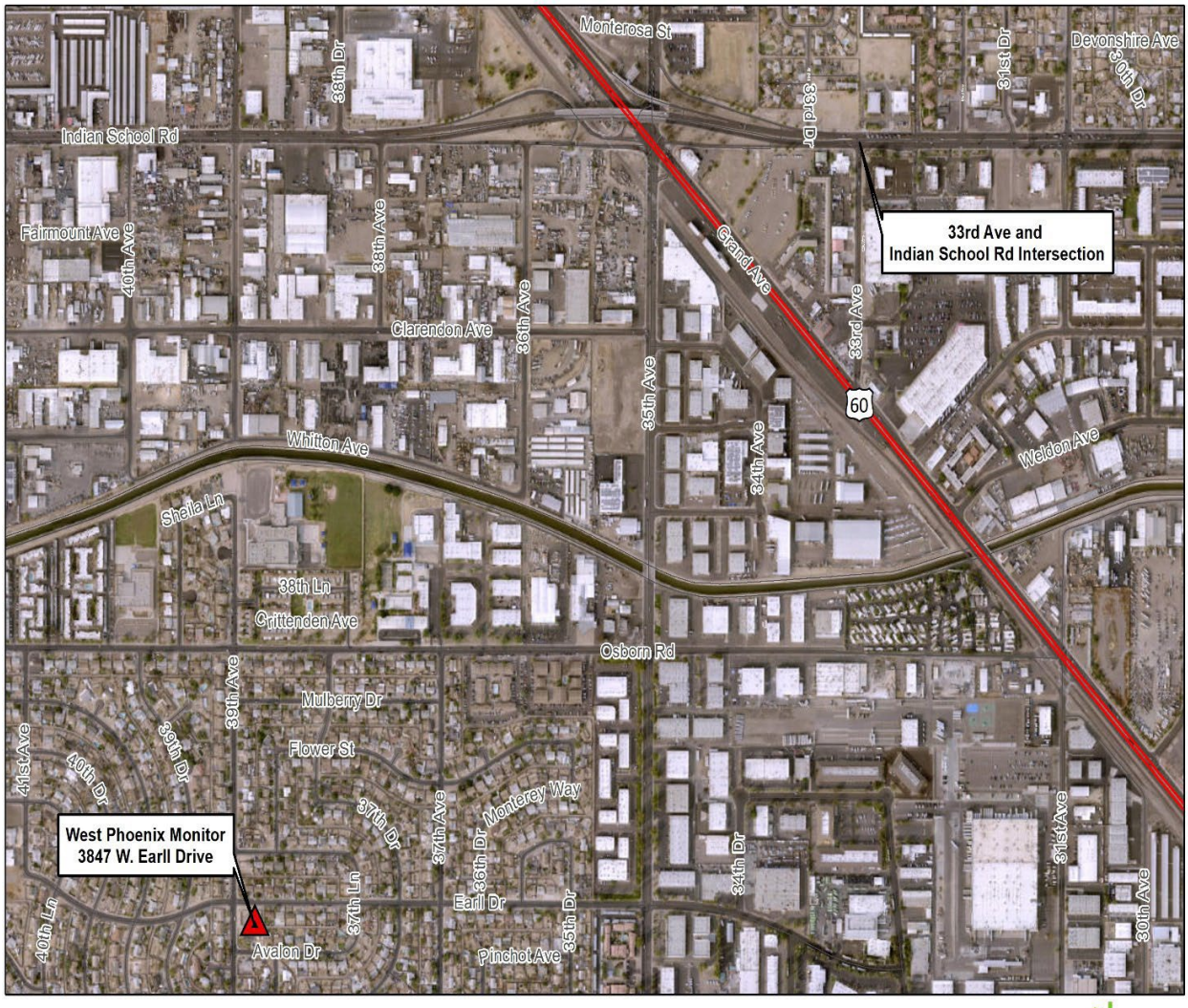
Figure 5 shows the location of the West Phoenix CO monitor in relation to the Indian School Road/33rd Avenue intersection. Figure 6 shows a wind rose associated with the West Phoenix monitor. As shown in Figure 6, prevailing winds are generally from the west/southwest (about 27% of the time during the year) at wind speeds of less than 10 miles per hour.

The West Phoenix Station is the closest monitoring site to the Indian School Road/33rd Avenue intersection. Because this site is the closest monitor to the intersection and has the highest 1-hour and 8-hour CO concentrations, it will be used as the background concentrations in CAL3QHC modeling to produce the maximum (that is, worst-case) CO emission estimates.

- 1-hour CO background concentration: 3.8 ppm
- 8-hour CO background concentration: 3.5 ppm

The CAL3QHC modeling results will be added to the background concentrations to obtain the design values for the selected intersection. The design values will then be compared to the NAAQS to determine if the project would cause an exceedance of the CO air quality standards. If the design values are less than the NAAQS, the project will not cause new violations of CO in the project area.

Figure 5. West Phoenix CO Monitor Location



Revised: 7/14/2023
SOURCE: Maricopa County Aerial 2021

newton Environmental Consulting, LLC

33rd Avenue/Indian School Road Intersection
& West Phoenix Monitor

Figure 6. West Phoenix Wind Rose

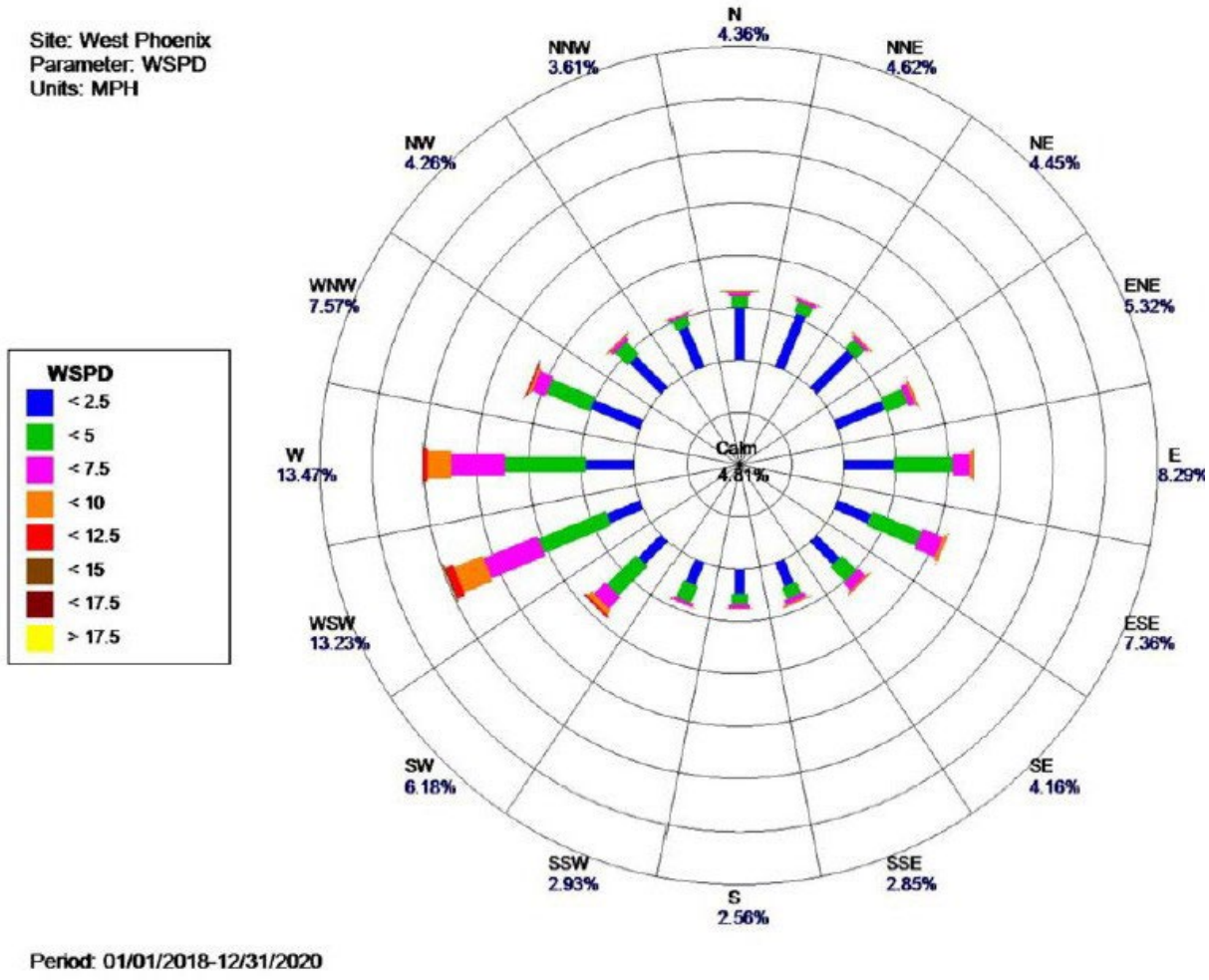


Table 10. Carbon Monoxide Monitors in Maricopa County, Arizona				
Monitor	**Distance to Indian School Road/33rd Avenue (miles)**	**2020 Maximum CO Concentration (1-hour/8-hour)**	**2021 Maximum CO Concentration (1-hour/8-hour)**	**2022 Maximum CO Concentration (1-hour/8-hour)**
West Phoenix Station (3847 W. Earll Drive)	1.0 mile SW	3.8/3.0	3.7/3.5	2.7/2.2
JGL Supersite (4530 N. 17th Avenue)	2.1 miles NE	2.1/1.7	1.9/1.9	2.0/1.6
3248 West Moreland	2.3 miles S	3.7/2.9	2.7/2.3	Monitor Discontinued in 2022
Central Phoenix Station (1645 E. Roosevelt Street)	5.6 miles SE	2.4/1.9	2.8/2.0	2.7/1.7
South Phoenix Station (33 W. Tamarisk Avenue)	7.1 miles S	2.7/2.2	2.5/1.7	2.9/2.4
4135 S. 36th Street	9.5 miles SE	Monitor not operational in 2020	1.4/1.0	1.6/0.9
Mesa Station (310 S. Brooks)	16.5 miles SE	3.2/1.6	1.7/1.1	2.1/1.3
Chandler Station (275 S. Ellis)	19.0 miles SE	1.5/1.3	1.4/1.2	1.3/1.1
Buckeye Station (26453 W. Mc85)	29.5 miles SW	1.0/0.7	1.8/0.6	1.0/0.7

Source: US EPA AirData (https://www.epa.gov/outdoor-air-quality-data/monitor-values-report, accessed July 2, 2023)
Values in Red – highest 1-hour and 8-hour CO concentrations over the 2020 to 2022 timeframe

Concentrations shown in parts per million (ppm)

Project Level PM Quantitative Hot-Spot Analysis - Project of Air Quality Concern Questionnaire

PM10 Project Assessment

The following questionnaire is used to compare the proposed project to a list of project types in 40 CFR 93.123(b) requiring a quantitative analysis of local particulate emissions (Hot-spots) in nonattainment or maintenance areas, which include:

i. New highway projects that have a significant number of diesel vehicles, and expanded highway projects that have a significant increase in the number of diesel vehicles;
ii. Projects affecting intersections that are at Level-of-Service D, E, or F with a significant number of diesel vehicles, or those that will change to Level-of-Service D, E, or F because of an increase in traffic volumes from a significant number of diesel vehicles related to the project;
iii. New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location;
iv. Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location; and
v. Projects in or affecting locations, areas, or categories of sites which are identified in the PM10 or PM2.5 applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

If the project matches one of the listed project types in 40 CFR 123(b)(1) above, it is considered a project of local air quality concern and the hot-spot demonstration must be based on quantitative analysis methods in accordance with 40 CFR 93.116(a) and the consultation requirements of 40 CFR 93.105(c)(1)(i). If the project does not require a PM hot-spot analysis, a qualitative assessment will be developed that demonstrates that the project will not contribute to any new localized violations, increase the frequency of severity of any existing violations, or delay the timely attainment of any NAAQS or any required emission reductions or milestones in any nonattainment or maintenance area.

On March 10, 2006, EPA published PM2.5 and PM10 Hot-Spot Analyses in Project-Level Transportation Conformity Determinations for the New PM2.5 and Existing PM10 National Ambient Air Quality Standards; Final Rule describing the types of projects that would be considered a project of air quality concern and that require a hot-spot analysis (71 FR 12468-12511). Specifically on page 12491, EPA provides the following clarification: “Some examples of projects of air quality concern that would be covered by § 93.123(b)(1)(i) and (ii) are: A project on a new highway or expressway that serves a significant volume of diesel truck traffic, such as facilities with greater than 125,000 annual average daily traffic (AADT) and 8% or more of such AADT is diesel truck traffic;” ..” Expansion of an existing highway or other facility that affects a congested intersection (operated at Level-of-Service D, E, or F) that has a significant increase in the number of diesel trucks;” While these examples were

provided in the rulemaking, interagency consultation will be used to determine if the project is a project of air quality concern.

New Highway Capacity

Is this a new highway project that has a significant number of diesel vehicles?

NO - The proposed project is not a new highway project.

Expanded Highway Capacity

Is this an expanded highway projects that have a significant increase in the number of diesel vehicles?

NO - The proposed project is not an expanded highway capacity project that has a significant increase in the number of diesel-fueled vehicles related to the project. As shown in Table 3 (page 9), the average annual daily traffic (AADT) volumes in the vicinity of the project range from about 23,600 to 48,800 vehicles per day (vpd) in 2020 to about 27,500 to 66,300 vpd under the 2050 Build Alternative. Compared to the 2050 No-Build Alternative, the total truck AADT would change slightly between a decrease of 63 vpd and an increase of 169 vpd depending on location in the project area. In addition, the truck volumes shown in Table 3 (page 9), include both medium- and heavy-duty trucks, not all of which would be diesel-fueled. The combined medium- and heavy-duty truck AADT represents a worst-case assumption.

Projects with Congested Intersections

Is this a project that affects a congested intersection (LOS D or greater) that has a significant number of diesel trucks, OR will change LOS to D or greater because of an increase in traffic volumes from a significant number of diesel trucks related to the project?

NO – This is not a project that affects a congested intersection of LOS D or will change to LOS D (or greater) because of a significant increase in the number of diesel-fueled trucks resulting from the project (see discussion above and Table 1 (page 7).

Table 11 summarizes the LOS at major intersections in the project area. One intersection would operate at LOS D in the PM peak-hour under the 2050 Build Alternative (there were no LOS D intersections in the AM peak-hour). The intersection operating at LOS D under the 2050 Build Alternative (Indian School Road/33rd Avenue) in the PM peak- hour is not deemed to have a significant number of diesel-fueled vehicles or a significant increase in traffic volumes for diesel-fueled vehicles related to the project.

There are two existing at-grade BNSF Railway crossings within the project limits: one on 35th Avenue and one on the eastbound and westbound Indian School Road ramps/frontage roads west of 35th Avenue. The railroad crossings are not signalized and are not shown in Table 11. Table 12 shows travel time savings for travelers passing through the study area when compared to the Existing Conditions and 2050 No-Build Alternative. Existing and 2050 No-Build information reflect delays associated with the trains and the 2050 Build Alternative removes the crossings and associated delays.

Table 11. Intersection Level of Service and PM Peak Hour Volume Summary

Intersection	2020 Existing Conditions				2050 No-Build				2050 Build				Truck Difference (Build - No-Build, vph)[1]
	LOS (delay, sec.)	Volumes (vph)	Medium Truck Volumes (vph)	Heavy Truck Volumes (vph)	LOS (delay, sec.)	Volumes (vph)	Medium Truck Volumes (vph)	Heavy Truck Volumes (vph)	LOS (delay, sec.)	Volumes (vph)	Medium Truck Volumes (vph)	Heavy Truck Volumes (vph)	
Indian School Road/33rd Avenue	D (45)	4,424	265	310	E (58)	5,520	331	386	D (43)	6,225	374	436	93
Indian School Road/39th Avenue	B (14)	3,569	214	250	B (18)	4,385	263	307	B (15)	4,485	269	314	13
US 60/ 33rd Avenue	E (79)	3,300	33	264	C (30)	4,280	43	342	C (26)	4,305	43	344	2
35th Avenue/ Clarendon Avenue	A (8)	2,324	23	70	F (105)	2,920	29	88	C (27)	3,190	32	96	11
35th Ave./US 60/Indian School Rd	F (110)	5,311	319	372	F (145)	6,315	379	442	Existing signal at 35th Ave/US 60/Indian School Rd would be removed by the project and replaced with a signal on the new elevated intersection of 35th Avenue/Indian School Road (see below).				
35th Avenue/Indian School Road	Existing signal at 35th Ave/US 60/Indian School Rd (see above) would be removed by the project and replaced with a signal on the new elevated 35th Avenue/Indian School Road intersection.								C (26)	6,935	416	485	N/A
35th Avenue/ Monterosa Street	A (9)	2,047	20	61	A(5)[2]	2,580	26	77	The existing pedestrian-activated crosswalk signal at 35th Avenue/Monterosa Street would be removed by the project.				
35th Avenue/Glenrosa Avenue	No signal under Existing Conditions				A(7)	2,560	26	77	C(22)	3,080	31	92	20
US 60/EB Indian School Road Entrance Ramp	No separate signal under existing and no-build conditions, traffic from this ramp goes through the existing 35th Ave/US 60/Indian School Road signal.								A (5)	3,175	43	342	N/A
US 60/ Glenrosa Avenue	No signal under Existing conditions & No Build Alternative (new signal added by the project).								A(22)	4,270	32	254	N/A

1 Truck AADT Difference includes both MT and HT

2 – A pedestrian hybrid beacon will be added at the 35th Ave/Glenrosa Ave intersection by the City of Phoenix 35th Avenue Safety Corridor Improvement Project.

Source: AECOM. 2023. *Initial Design Concept Report for US 60, Grand Avenue, 35th Avenue/Indian School Road Traffic Interchange*.

Values in Red – greater than acceptable LOS C

Highest PM peak-hour traffic volumes in 2050 Build Alternative in **bold**

MT – Medium Trucks (vehicles with 2 axles & 6 wheels; gross vehicle weight – 10,000 to 26,400 pounds)

HT – Heavy Trucks (vehicles with 3 or more axles; gross vehicle weight greater than 26,400 pounds).

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Table 12. Travel Time Savings for High-Volume Trips						
Alternative	**AM Peak Hour Travel Time (seconds)**			**PM Peak Hour Travel Time (seconds)**		
	Existing	**2050 No-Build**	**2050 Build**	**Existing**	**2050 No-Build**	**2050 Build**
EB Indian School Rd	151.1	232.3	191.0	146.6	241.8	164.3
WB Indian School Rd	99.6	103.5	110.6	158.8	240.2	252.9
SB/EB US 60	632.9	496.7	89.1	143.1	206.1	72.5
NB/WB US 60	148.1	145.4	71.6	463.5	236.4	73.2
NB 35th Ave	125.3	552.6	129.7	232.9	437.8	174.1
SB 35th Ave	231.7	568.3	99.7	141.3	173.9	107.5
Total	1,388.6	2,098.8	691.7	1,286.2	1,536.5	844.5

Source: AECOM. Initial Design Concept Report US 60, GRAND AVENUE 35th Avenue/Indian School Road Traffic Interchange, Chapter 2, Revised August 2023. (Figure 1)

New Bus and Rail Terminals

Does the project involve construction of a new bus or intermodal terminal that accommodates a significant number of diesel vehicles?

> **NO –** The proposed project does not involve construction of new bus or rail terminals; therefore, project types (iii) and (iv) above are not addressed in the project assessment.

Expanded Bus and Rail Terminals

Does the project involve an existing bus or intermodal terminal that has a large vehicle fleet where the number of diesel buses (or trains) increases by 50% or more, as measured by arrivals?

> **NO –** The proposed project does not involve an existing bus or intermodal terminal.

Project of Air Quality Concern Determination

Under the 2050 Build Alternative, traffic volumes on Grand Avenue, Indian School Road, and 35th Avenue are relatively low ranging from 37,500 to 66,300 AADT. The increase in diesel-fueled truck volumes due to this project are also low; less than 200 AADT compared to the 2050 No-Build Alternative and include both medium- and heavy-duty trucks, not all of which are diesel-fueled (that is, the truck volumes represent a worst-case condition and likely overstate the number of diesel-fueled trucks in the project area).

As shown in Table 11, under the 2050 Build Alternative the project improves LOS at most of the poorly operating intersections in the project area. Grade-separating 35th Avenue and Indian School Road from the BNSF and Grand Avenue improves operational efficiency, reduces congestion, and enhances safety. While overall traffic volumes are expected to increase, the project does not significantly increase the total truck volumes. The proposed improvements on Indian School Road are NOT of Air Quality Concern and therefore will not require a PM hot-spot analysis.

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References

AECOM. 2023. *Initial Design Concept Report for US 60, Grand Avenue, 35th Avenue/Indian School Road Traffic Interchange*.

Maricopa Association of Governments. 2012. *2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area*.

Maricopa Association of Governments. 2013. *2013 Carbon Monoxide Plan for the Maricopa County Area*.

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Maricopa Association of Governments. 2023. *Transportation Improvement Program FY 2022-2025*. https://azmag.gov/Programs/Transportation/Transportation-Improvement-Program-TIP.

National Weather Service. 2023. *Annual and Monthly Record Data for Phoenix, AZ: 2000-2023*. https://www.weather.gov/psr/PhoenixRecordData#.

U.S. Environmental Protection Agency (EPA). 1992. *Guideline for Modeling Carbon Monoxide from Roadway Intersections*. November.

U.S. Environmental Protection Agency (EPA). 1995. *User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections (Revised)*. September.

U.S. Environmental Protection Agency (EPA). 2021. *Using MOVES3 in Project-Level Carbon Monoxide Analyses*. December.

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ADOT Monthly Air Quality Coordination Meeting Agenda

Thursday, July 13th, 2023
10-11am
Google Meet

Google Meet joining info

Video call link: https://meet.google.com/kbp-jojp-cmk

Or dial: (US) +1 209-850-2317 PIN: 483 772 939#

More phone numbers: https://tel.meet/kbp-jojp-cmk?pin=8376833655633

Notes added within each agenda item.

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1. WELCOME

2. REVIEW PROJECTS

<u>Active Projects for Discussion</u>

- **F0124: SR 202L - Val Vista Drive to SR 101L -** ADOT will provide a summary of the ongoing atypical events discussion with EPA, Maricopa County Air Quality Department, and ADOT from a meeting held on 07/11/23.
    - *ADOT will be submitting meeting information and documentation on the 3 atypical events, and will need to meet again to confirm assumptions and information for modeling for the project. Will need to resubmit interagency consultation on this, so want to confirm assumptions and documentation before final consultation.*
    - *EPA said probably 2-3 months out in the best case scenario because there are documentation needs on their end for this type of atypical event memo.*
- **F0252: I-10, Loop 202 to SR 387 Wild Horse Pass Corridor -** ADOT will provide updates on TIP revisions in June 2023, *ADOT will be scheduling a breakout discussion with FHWA on conformity needs submittal.*
- **F0475: SR 101L System Interchange Improvements with I-10 -** ADOT concluded interagency consultation on this project 07/10/23 by providing final versions of

CO and PM10 consultation documents based on comments received. Discuss next steps for conformity submittal package.

- *FHWA suggested using the documentation on the FHWA website and printout for that when submitting conformity determination*

New Project Kickoff Discussion:

- **F0272: US60 Grand Avenue/Indian School Road Traffic Interchange -** ADOT and the project team will discuss initial consultation document and is seeking feedback from interagency consultation partners as part of consultation on the following:
  - Feedback on assumptions initially presented last meeting
    - Draft CO Recommendation - 1 intersection for modeling
    - Draft PM Consultation - No modeling
  - Need for project specific breakout meetings on this project
- *ADOT presented w/AECOM on the PM10 modeling*
  - *AECOM presented an overview of the project scope and purpose, provided an overview of roadway design/alternatives, provided an overview of the*
  - *Reviewed traffic information and AADT/truck percentage. Current ADOT traffic information showing not a significant increase in truck volumes between build and no build (<200 increase).*
  - *EPA asked if they could split between heavy and medium trucks. ADOT responded we could add a column to split out those numbers in various tables in the consultation documents and bring some of the CO information for side streets into the PM10 tables.*
  - *FHWA asked if the project included capacity additions, ADOT responded that the project would not be categorized as capacity improvements but a reconfiguration. Any improvements would be for reconfiguration and restoring access through road connections and not any new through lanes*
  - *ADOT restated ADOT assumption that project is not a POAQC for PM10*
- *AECOM presented w/ADOT on the CO modeling*
  - *3 intersections operating LOS D in build alternatives, compared peak hours and LOS.*

- *Indian School Road/33rd Avenue being recommended by ADOT/AECOM as the intersection for CO modeling*
- *FHWA asked to see intersection viewpoint of Indian School Road/33rd Avenue, AECOM showed initial receptor locations and overview of intersection assumptions for build and no build alternatives*
- *ADOT/AECOM went over background data CO monitors and presented information (page 24, table 9) on why monitor location was chosen as representative for analysis*
- *EPA suggested in the future provide details of characteristics of the background monitor shown and how it compares to the current project area, wind direction information. ADOT can update consultation to show visual map to show monitor location in relation to project area*
- *FHWA suggested the worst case scenario should be modeled and fit the other two intersections under the CO categorical finding. AECOM to evaluate if they can fit under the CO categorical finding, and update consultation documents if necessary*

3. OPEN DISCUSSION & NEXT STEPS
    a. Are there any project barriers and/or additional information needed from 327 MOU Monitoring Spreadsheet?
    b. Are there any other project specific breakout meetings that were not discussed?
    c. Review of any agency action items or follow up items for next monthly meeting

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Gmail

Curt Overcast <estreetcmo@gmail.com>

Fwd: Interagency Consultation: US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersection Improvements 060-B(227)T | 060 MA 159 F0272 01C

Curt Overcast <estreetcmo@gmail.com>
To: Curt Overcast <EStreetCMO@gmail.com>

Tue, Sep 19, 2023 at 10:36 AM

Hi Beverly,

Thank you again for the opportunity to review the US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersection Improvement Conformity Consultation document and the additional supporting information. We appreciate your cooperation in providing the additional material requested and your team's continued efforts to address our feedback. This email is to provide an update that we have reviewed the additional traffic data provided on 9/7 and have no additional comments or questions. With regards to the questions passed along at the project conformity coordination call on 9/14 we have prepared the following responses.

Persistence Factor:

1. A summary table would be sufficient to include in the report itself, but we would also ask that the full spreadsheet be provided as a separate attachment for further review.
ADOT Response: A summary table showing the 10 highest non-overlapping monitor values used in calculating the 0.86 persistence factor has been included in the Air Quality Technical Report.

2. With regards to usage of the newly calculated persistence factor for future projects in the county, we generally find this acceptable so long as monitoring values are periodically assessed to determine if they've exceeded the monitoring values used in the calculation to yield the 0.86 value, and if so a determination should be made if a new calculation could be reasonably performed on the basis it would appreciably alter the yielded persistence factor. Discussion outlining this evaluation should be included in future documentation as well as at least some discussion on the representativeness of the monitoring site with respect to the project location.
ADOT Response: The comment is noted.

Meteorology

1. We support FHWA's comment that the NWS meteorology data is acceptable in this case, but also ask that it be kept consistent with the regional conformity analysis.

ADOT Response: The comment is noted.

I believe this covers the lingering questions, but please let us know if additional feedback on road grade or other modeling factors/considerations is required and I will do my best to promptly answer. Other than that, we look forward to seeing the updated consultation document and other future documentation, and if possible, we request redline/strikeout versions (for revised documents) to facilitate the review process.

Thank you and have a great day.

-Michael

From:	bchenausky@azdot.gov on behalf of ADOTAirNoise - ADOT <adotairnoise@azdot.gov>
Sent:	Wednesday, October 4, 2023 10:21 AM
To:	ADOTAirNoise - ADOT; Angela Newton; Curt Overcast; Rietz, Jessica; Joonwon Joo
Subject:	Fwd: Interagency Consultation: US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersection Improvements 060-B(227)T | 060 MA 159 F0272 01C
Attachments:	image001.png

---------- Forwarded message ---------
From: Dorantes, Michael <Dorantes.Michael@epa.gov>
Date: Mon, Sep 18, 2023 at 3:41 PM
Subject: RE: Interagency Consultation: US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersection Improvements 060-B(227)T | 060 MA 159 F0272 01C
To: Beverly Chenausky <bchenausky@azdot.gov>
Cc: Dean Giles <dgiles@azmag.gov>, Johanna.Kuspert@maricopa.gov <Johanna.Kuspert@maricopa.gov>, Tim Franquist <tfranquist@azmag.gov>, Transportationconformity <transportationconformity@azdeq.gov>, Meek, Clifton <meek.clifton@epa.gov>, Olivier Mirza <omirza@azdot.gov>, Dena Whitaker <dwhitaker@azdot.gov>, ADOTAirNoise - ADOT <adotairnoise@azdot.gov>, Halle, Greta (FHWA) <greta.halle@dot.gov>, tshin@azmag.gov <tshin@azmag.gov>, Tsui, William <Tsui.William@epa.gov>, Perez, Idalia (she/her/hers) <Perez.Idalia@epa.gov>, rebecca.yedlin@dot.gov <rebecca.yedlin@dot.gov>, Wickersham, Lindsay (she/her/hers) <wickersham.lindsay@epa.gov>, Curt Overcast <estreetcmo@gmail.com>, Rietz, Jessica <jessica.rietz@aecom.com>

Hi Beverly,

Thank you again for the opportunity to review the US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersection Improvement Conformity Consultation document and the additional supporting information. We appreciate your cooperation in providing the additional material requested and your team's continued efforts to address our feedback. This email is to provide an update that we have reviewed the additional traffic data provided on 9/7 and have no additional comments or questions. With regards to the questions passed along at the project conformity coordination call on 9/14 we have prepared the following responses.

Persistence Factor:

1. A summary table would be sufficient to include in the report itself, but we would also ask that the full spreadsheet be provided as a separate attachment for further review.

2. With regards to usage of the newly calculated persistence factor for future projects in the county, we generally find this acceptable so long as monitoring values are periodically assessed to determine if they've exceeded the monitoring values used in the calculation to yield the 0.86 value, and if so a determination should be made if a new calculation could be reasonably performed on the basis it would appreciably alter the yielded persistence factor. Discussion outlining this evaluation should be included in future documentation as well as at least some discussion on the representativeness of the monitoring site with respect to the project location.

Meteorology

1. We support FHWA's comment that the NWS meteorology data is acceptable in this case, but also ask that it be kept consistent with the regional conformity analysis.

I believe this covers the lingering questions, but please let us know if additional feedback on road grade or other modeling factors/considerations is required and I will do my best to promptly answer. Other than that, we look forward to seeing the updated consultation document and other future documentation, and if possible, we request redline/strikeout versions (for revised documents) to facilitate the review process.

Thank you and have a great day.

-Michael

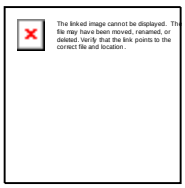
Michael Dorantes, Ph.D.

U.S. EPA Region IX: Air and Radiation Division

Geographic Strategies and Modeling Section | AIR 2-2

75 Hawthorne St. San Francisco, CA 94105

Desk #: (415)-972-3934 (he/him)



From: Beverly Chenausky <bchenausky@azdot.gov>
Sent: Thursday, September 7, 2023 12:02 PM
To: Dorantes, Michael <Dorantes.Michael@epa.gov>; Curt Overcast <estreetcmo@gmail.com>; Rietz, Jessica <jessica.rietz@aecom.com>
Cc: Dean Giles <dgiles@azmag.gov>; Johanna.Kuspert@maricopa.gov; Tim Franquist <tfranquist@azmag.gov>; Transportationconformity <transportationconformity@azdeq.gov>; Meek, Clifton <meek.clifton@epa.gov>; Olivier Mirza <omirza@azdot.gov>; Dena Whitaker <dwhitaker@azdot.gov>; ADOTAirNoise - ADOT <adotairnoise@azdot.gov>; Halle, Greta (FHWA) <greta.halle@dot.gov>; tshin@azmag.gov; Tsui, William <Tsui.William@epa.gov>; Perez, Idalia (she/her/hers) <Perez.Idalia@epa.gov>; rebecca.yedlin@dot.gov; Wickersham, Lindsay (she/her/hers) <wickersham.lindsay@epa.gov>
Subject: Re: Interagency Consultation: US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersection Improvements 060-B(227)T | 060 MA 159 F0272 01C

Michael - Attached are the revised tables that will be discussed in today's meeting, I have added Curt and Jessica to this email. If there are additional additions needed, please let them know so they can quickly look into it.

Thanks, Beverly

On Thu, Sep 7, 2023 at 11:27 AM Dorantes, Michael <Dorantes.Michael@epa.gov> wrote:

> Hi Beverly,
>
> Thank you for the opportunity to review the US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersection Improvement Conformity Consultation document and the extensive and hard work that your team put into preparing it. Ahead of our meeting today, I've attached a form that contains our comments and suggested typographical edits. Therein you will find several key comments requesting additional traffic data and justification for modeling parameters and data inputs.
>
> In summary, our current stance is that the additional traffic data/explanation of modeling parameters requested in our comment sheet are needed before the EPA can fully make a determination as to whether additional CO and/or PM hot-spot analyses may be required for the project, and to fully evaluate the CO hot-spot analysis provided. Until this data is provided and we've had the opportunity to evaluate and provide feedback, we can not determine the air quality concern status of this project nor recommend that this project go forward. That said, we are available to promptly answer any questions you may have on our comments and aim to continue to work with your team throughout this process.
>
> Thank you and we look forward to discussing this later today.
>
> -Michael
>
> Michael Dorantes, Ph.D.

U.S. EPA Region IX: Air and Radiation Division

Geographic Strategies and Modeling Section | AIR 2-2

75 Hawthorne St. San Francisco, CA 94105

Desk #: (415)-972-3934 (he/him)

From: Perez, Idalia (she/her/hers) <Perez.Idalia@epa.gov>
Sent: Friday, August 18, 2023 3:22 PM
To: Beverly Chenausky <bchenausky@azdot.gov>; rebecca.yedlin@dot.gov; Dorantes, Michael <Dorantes.Michael@epa.gov>
Cc: Dean Giles <dgiles@azmag.gov>; Johanna.Kuspert@maricopa.gov; Tim Franquist <tfranquist@azmag.gov>; Ledezma, Andrew (he/him/his) <Ledezma.Andrew@epa.gov>; Transportationconformity <transportationconformity@azdeq.gov>; Meek, Clifton <meek.clifton@epa.gov>; Oconnor, Karina (she/her/hers) <OConnor.Karina@epa.gov>; Olivier Mirza <omirza@azdot.gov>; Dena Whitaker <dwhitaker@azdot.gov>; ADOTAirNoise - ADOT <adotairnoise@azdot.gov>; Halle, Greta (FHWA) <greta.halle@dot.gov>; Tsui, William <Tsui.William@epa.gov>; tshin@azmag.gov; Wickersham, Lindsay (she/her/hers) <wickersham.lindsay@epa.gov>
Subject: RE: Interagency Consultation: US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersection Improvements 060-B(227)T | 060 MA 159 F0272 01C

Hi Beverly,

I wanted to confirm that we Michael Dorantes, Dorantes.Michael@epa.gov, will be the main point of contact on this project for EPA. I've added him to this thread and communicated that the project team will be available to answer any questions and walk through the modeling assumption on this project on Sept 7th.

-Idalia

Idalia M. Pérez, Ph.D. *(pronouns: she/her/hers)*

Section Manager, Air Planning Section

U.S. Environmental Protection Agency – Region 9

75 Hawthorne St. (AIR-2-1), San Francisco, CA 94105
P: 415.972.3248 | email: perez.idalia@epa.gov

From: Beverly Chenausky <bchenausky@azdot.gov>
Sent: Friday, August 18, 2023 1:21 PM
To: rebecca.yedlin@dot.gov
Cc: Dean Giles <dgiles@azmag.gov>; Johanna.Kuspert@maricopa.gov; Tim Franquist <tfranquist@azmag.gov>; Ledezma, Andrew (he/him/his) <Ledezma.Andrew@epa.gov>; Perez, Idalia (she/her/hers) <Perez.Idalia@epa.gov>; Transportationconformity <transportationconformity@azdeq.gov>; Meek, Clifton <meek.clifton@epa.gov>; Oconnor, Karina (she/her/hers) <OConnor.Karina@epa.gov>; Olivier Mirza <omirza@azdot.gov>; Dena Whitaker <dwhitaker@azdot.gov>; ADOTAirNoise - ADOT <adotairnoise@azdot.gov>; Halle, Greta (FHWA) <greta.halle@dot.gov>; Tsui, William <Tsui.William@epa.gov>; tshin@azmag.gov; Wickersham, Lindsay (she/her/hers) <wickersham.lindsay@epa.gov>
Subject: Re: Interagency Consultation: US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersection Improvements 060-B(227)T | 060 MA 159 F0272 01C

After discussions with the project team, we can move the meeting to the 7th of September. The google meet joining information linked below is still the same, look for a calendar invite with more details.

Beverly

On Thu, Aug 17, 2023 at 1:54 PM Yedlin, Rebecca (FHWA) <Rebecca.Yedlin@dot.gov> wrote:

> Good afternoon Beverly,
>
> In discussions with the FHWA Resource Center staff, we were informed that they are traveling over the next few weeks and as an example, the next time Leigh will be in the office is on August 30. Due to this reality, it is unlikely FHWA will have comments to discuss at the August 31 meeting on the document provided today. Would it be possible to delay the project-specific discussion until September 7? If not, we understand but again our active participation on the 31st will be minimal. Thanks, Rebecca
>
> From: Beverly Chenausky <bchenausky@azdot.gov>
> Sent: Thursday, August 17, 2023 1:37 PM
> To: Tim Franquist <tfranquist@azmag.gov>; Transportationconformity <transportationconformity@azdeq.gov>; Johanna Kuspert (AQD) <Johanna.Kuspert@maricopa.gov>; Ledezma, Ernesto (he/him/his) <Ledezma.Ernesto@epa.gov>; Yedlin, Rebecca (FHWA) <Rebecca.Yedlin@dot.gov>
> Cc: Dean Giles <dgiles@azmag.gov>; Perez, Idalia (she/her/hers) <Perez.Idalia@epa.gov>; Clifton Meek <meek.clifton@epa.gov>; Karina O'Conner <oconnor.karina@epa.gov>; Olivier Mirza <omirza@azdot.gov>; Dena Whitaker <dwhitaker@azdot.gov>; ADOTAirNoise - ADOT <adotairnoise@azdot.gov>; Halle, Greta (FHWA) <greta.halle@dot.gov>; Tsui, William <Tsui.William@epa.gov>; Taejoo Shin <TShin@azmag.gov>

Subject: Interagency Consultation: US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersection Improvements 060-B(227)T | 060 MA 159 F0272 01C

To All:

ADOT is presenting the following project, **US 60 (Grand Avenue), 35th Avenue and Indian School Road Intersection Improvements,** for interagency consultation, per 40 CFR 93.105, with the recommendation that this project is not a project of Air Quality Concern and thereby will not require a PM10 hot-spot analysis and as a project that will require a quantitative CO hot-spot analysis as described in the attached document *"F0272 Grand35 Project Level Conformity Consulation_081723.pdf"*.

The Purpose of this document is to describe the methods, models and assumptions used for a quantitative CO hot-spot analysis as required in 40 CFR 93.105(c)(1)(i), 93.123, 93.116. It is requested that the consulted parties provide comments or questions on the methods, models and assumptions within **30 days,** a non-response will be interpreted as concurrence with the planning assumptions as described in the attached document(s). A comment form has also been provided for any agency wishing to provide formal comments.

The project team will be made available to answer any questions and walk through the modeling assumption on this project **August 31, 2023 at 1pm**.

F0272 Interagency Consultation Modeling Meeting

Thursday, August 31 · 1:00 – 2:15pm

Time zone: America/Phoenix

Google Meet joining info

Video call link: https://meet.google.com/rmo-vqyx-ygv

Or dial: (US) +1 385-404-1105 PIN: 526 282 113#

More phone numbers: https://tel.meet/rmo-vqyx-ygv?pin=2450938936766

Due to email size limitations, ADOT will include modeling files in a zip file through Adobe WorkFront, additional information will be provided shortly in the meeting invitation for the modeling assumptions. Other publicly available information and to sign up to receive notifications about this project, can be found on the project website:

Grand-35 Study | Department of Transportation (azdot.gov)

If you have any additional questions or need additional information please let me know, thank you.

Beverly T. Chenausky

Assistant Environmental Administrator

Air & Noise, Hazmat and Standards & Training

205 South 17th Avenue, MD EM02
Phoenix, AZ 85007
C: 480.390.3417

azdot.gov

DESIGN CONCEPT REPORT AND ENVIRONMENTAL DOCUMENT FOR US 60 (GRAND AVE), 35TH AVENUE & INDIAN SCHOOL ROAD INTERSECTION (GRAND-35)
F0272 01L

INTERAGENCY CONSULTATION MODELING MEETING
September 7, 2023
1:00 P.M. – 2:00 P.M.

MEETING NOTES

I. Attendees
ADOT: Beverly Chenausky (bchenausky@azdot.gov), Joonwon Joo (jjoo@azdot.gov), Ivan Racic (iracic@azdot.gov), Katie Rodriguez (krodriguez@azdot.gov), Dena Whitaker (dwhitaker@azdot.gov), Olivier Mirza (omirza@azdot.gov), Paul O'brien (PObrien@azdot.gov)
FHWA: Christopher Dresser (christopher.dresser@dot.gov), Gretta Halle (greta.halle@dot.gov), George Noel (george.noel@dot.gov), Leigh Oesterling (leigh.oesterling@dot.gov), Rebecca Yedlin (rebecca.yedlin@dot.gov)
AZDEQ: Kamran Khan (khan.kamran@azdeq.gov)
U.S. EPA: Michael Dorantes (dorantes.michael@epa.gov), William Tsui (tsui.william@epa.gov), Lindsay Wickersham (wickersham.lindsay@epa.gov)
Maricopa County: Ron Pope (ron.pope@maricopa.gov)
Maricopa Association of Governments: Taejoo "RoboTJ" Shin (tshin@azmag.gov)
AECOM: Rodney Bragg (rodney.bragg@aecom.com), Jessica Rietz (jessica.rietz@aecom.com)
NEC: Angela Newton (angie@newtonec.com), Curt Overcast (estreetcmo@gmail.com)

II. Study Overview
- ADOT Consultant team provided an overview of the proposed project. The study area is the existing six-legged intersection of Indian School Road, 35th Avenue, and US 60 (Grand Avenue). The BNSF railway is parallel to US 60 (Grand Avenue). Currently, Indian School Road is elevated on a bridge over US 60 (Grand Avenue) and the BNSF Railway. This project proposes to reconstruct the intersection resulting in a new raised intersection with 35th Avenue and Indian School Road crossing over US 60 (Grand Avenue) and the BNSF railroad, eliminating the existing at-grade railroad crossings and creating a free-flow movement along US 60 (Grand Avenue). Access for some properties along 35th Avenue closest to the intersection would change as a result of new elevated roadways and bridges. New connecting roadways are proposed to restore access to some of these properties.
- US 60 (Grand Ave) operates as an arterial roadway with signals within the City of Phoenix.

III. Review of Consultation Document
- Updated Tables 1 and 3 in the consultation documents:
  - Revisions have been drafted in Tables 1 and 3 to address preliminary comments from the EPA (attached).
  - Existing condition data for 2020 was incorporated into Table 2. Existing condition data was collected in early 2020 when the project was initiated, with some 2019 data provided by the City of Phoenix. This data is consistent with the existing condition assumptions in the traffic analysis and other technical studies completed for the EA. It would take several months to updating the existing year data to 2023.
  - EPA advised the data requested in Tables 1 and 3 has been incorporated sufficiently. They requested a written response to their comment regarding the 2020 existing condition analysis year to provide additional justification.
- FHWA noted that comparing the 2050 No Build and 2050 Build volumes, there isn't a significant difference, especially in terms of truck volumes. FHWA does not see this as a project of air quality concern for particulate matter (PM).

IV. Review of Modeling Assumptions

- For CO modeling, the analysis relies on MAG conformity runs from the Fall 2022 conformity evaluations provided to the project team in mid-July and MOVES default data. We are doing a project-level inventory analysis to develop a emission rates in 2022, 2027, and 2050..
- MOVES modeling RunSpecs:
  - FHWA and the EPA noted that the MOVES RunSpec do not select CNG - other buses, school buses, and single unit long and short haul trucks. FHWA advised we might have used an older RunSpec.
  - ADOT Consultant team will revise the model with all vehicle/fuel types and all road types.
  - MOVES guidelines were followed to develop emission rates.
- Roadway links:
  - FHWA noted there was 0% grade on all the links. ADOT Consultant team advised the grade of Indian School Road and 35th Avenue change under the Build Alternative. The model will be revised to incorporate grade into the roadway links. FHWA noted we can use the worst case grade for all the links and forego preparing lookup tables.
- Receptor placement:
  - Figures 3 and 4 show the intersection configuration. There is a sidewalk along the intersection of 33rd Ave and Indian School, and this is where we placed the receptors. These locations capture where we could expect to find the highest concentrations.
  - EPA noted they are seeking clarification on where the receptors were placed. The receptors go out to mid-block and beyond, which is what they are looking for. EPA doesn't see the need to change anything in the model in this location.
- Meteorology:
  - EPA comments on the consultation documents touched on surface roughness. In examining an aerial view of the intersection, the project area is a business park setting in an urban environment. EPA clarified they would like to see additional detail in writing that justifies model inputs, and requested some quantitative detail on land use, if possible. This is clarification we could add to the report, rather than a change in the modeling.
- Persistence factor:
  - William Tsui (EPA), and Curt discussed the persistence factor. Curt noted that use of the default persistence of 0.7 is generally used in CO modeling and he has never seen a calculated persistence factor used in CO modeling
  - EPA noted the default value is used if there isn't any monitor data available, and it is preferred monitor data be used if it is available. The Maricopa County Air Quality Department confirmed they have the necessary data for the West Phoenix monitor. The ADOT Consultant team will coordinate with Ron Pope to develop a calculated persistence factor. EPA noted there is detail in the guidance on how to apply this data.
- Curt walked the consultation team through the various MOVES3.1 and CAL3QHC input parameters (Table 4) required to develop emission rates and inputs used in CAL3QHC dispersion modeling, noting where the data would come from for each parameter (i.e., MAG conformity inputs, MOVES default values, recommended inputs from guidance, design file information, etc.)
- The data provided in Table 5 of the consultation documents is based on the Fall 2022 MAG conformity runs provided in mid-July, which were the current runs available at the time the analysis was initiated. The ADOT consultant team proposed we continue to use this data in the modeling analysis. EPA clarified they would like the analysis documentation to incorporate a reference to the specific conformity run that was used.
- Curt discussed links used for MOVES and noted we are generating speed-related emission rates for use in the dispersion model. He also noted that EPA guidance indicates that link volume and link length in MOVES is not a critical consideration (it is very important in dispersion modeling) and that is why we used a link volume of 1 and a link length of 1 in the MOVES models. To confirm this

he ran MOVES with a volume of 500 and link length of 1,000 and generated identical emission rates. There was no follow-up discussion.

- Off-network links:
  - EPA comments on the consultation documents noted the intersection is near numerous parking lots and requested consideration of including the parking lots as off-network links. FHWA noted that the only elements that are being funded by the project are associated with intersection reconstruction, and the project does not include any parking lots. For these types of analyses, we only include parking lots if they are part of the project. FHWA further noted parking lots typically don't move the needle much in terms of air quality analysis, and can be considered de minimis sources of CO.

- Opening year evaluation:
  - The proposed modeling approach is to generate emission rates for 2027 when the FY 2022 to 2025 TIP indicates that project will be open to traffic to represent the opening year of the project. Those 2027 emission rates would be used with maximum 2050 volumes to get a worst case of emissions associated with the project. EPA considered this a sufficiently conservative modeling approach.
  - We are limiting our evaluation to the PM peak hour because there are no intersections operating at LOS D or worse in the AM peak hour. Curt referred to a figure in the appendix of the consultation document showing AM LOS (Figure 20).
- Agencies were provided with both the MOVES and CAL3QHC files with the consultation documents. Those will change slightly based on revisions discussed today and will be included with the revised documents..
-

V. Next Steps

- ADOT requested all comments and concerns on the consultation documents and modeling assumptions be submitted by September 18.
- The Air Quality Technical Report will be released with the Draft EA. The Draft EA is anticipated to be published on October 10, with a public review period through November 27. A public hearing is scheduled for October 25. ADOT will provide information on the public release of the Draft EA and Air Quality Technical Report on October 10.
- Comment response action items:
  - Revised Tables 1 and 3 will be distributed.
  - Modeling will be revised in include all vehicle/fuel types, maximum grades incorporated in roadway links,, and use of monitoring data for developing a persistence factor.

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ADOT Environmental Planning

Interagency Consultation Comments

Project Name:	US60 Grand Avenue/Indian School Road Traffic Interchange	**Name: Michael Dorantes**	
Project Number(s):	ADOT Project No. 060 MA 159 F0272 01C	**Agency: EPA**	
Document Name:	Interagency Consultation Document		**COMMENT RESOLUTION**
Document Date:	September 2023		**For ADOT USE**

Page Number	Paragraph	Table	Other	Comment	Response Notes
2				We suggest the following revisions for this statement: The proposed project is in Maricopa County, portions of which are currently designated as nonattainment or maintenance for the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), eight-hour ozone, and particulate matter less than or equal to ten microns (PM-10).	The text has been revised.
6				We suggest the following revision: If the project matches one of the listed project types listed in 40 CFR 93.123(a)(1) above…	The text has been revised.
6				40 CFR 93.123(a) was cited, outlining the criteria for which a project is considered a project of local air quality concern and therefore a hot-spot analysis based on the qualitative analysis methods in 40 CFR 93.116(a) would be required. A questionnaire was developed to assess the project in question against the individual subelements of 40 CFR 93.123(a). One of these questions, presumedly assessing the project against 40 CFR 93.123(a)(ii) asks: Is this a project that affects a congested intersection (LOS D or greater) (or?) will change LOS to D or greater because of increased traffic volumes related to the project? **For the EPA to sufficiently assess this project against this question and determine if, and to what extent this project is a of local air quality concern for both PM and CO, the analogous level of service intersection data for the current year conditions and project opening year needs to be evaluated. Please include the relevant data in Table 1 and reassess the project with this data taken into consideration. The discussions and conclusions for this and other project assessment sections, appendices, etc should be adjusted accordingly**.	For carbon monoxide (CO) hot-spot analysis the relevant text reads as follows: For projects affecting intersections that are at Level-of-Service D, E, or F, or that that will change to Level-of-Service D, E, or F because of increased traffic volumes related to the project (40 CFR 93.123(a)(1)(ii For particulate matter (PM) hot-spot analysis the relevant text reads as follows: Projects affecting intersections that are at Level-of-Service D, E, or F **with a significant number of diesel vehicles**, or those that will change to Level-of-Service D, E, or F **because of increased traffic volumes from a significant number of diesel vehicles related to the project** (40 CFR 93.123(b)(1)(ii) [emphasis added]. Table 1 and Table 3 of the Project Level CO Hot-Spot Analysis Consultation documwnt have been revised to incorporate additional information related to the project. Table 1 has been revised to include 2020 Existing Conditions (LOS, vehicle delay, truck volumes [medium and heavy trucks]. Table 3 has been revised to include additional intersections under 2020 Existing Conditions, 2050 No-Build, and 2050 Build (AADT, Total Truck AADT [medium and heavy trucks].
				Please provide justification that the 2020 year selection for "existing conditions" throughout the document are the latest planning data available for the project area.	The data provided in the tables is consistent with the existing condition information for the traffic analysis and other technical studies completed for the EA. Existing condition data, including field traffic counts from several locations on US 60, Indian School Road, and 35th Avenue, was collected from the City of Phoenix based on data collected in late 2019. The 2019 data was slightly adjusted to estimate 2020 conditions and has been the basis for all traffic analysis efforts. The project does not have any newer data.
9		3		**"Indian School Road AADT and Truck Volumes" please include data for the following road segments: Clarendon Avenue, West and East of 35th Avenue; 33rd Avenue, South of Indian School Road, and the Glenrosa extension West of 35th Avenue from the project build case. Please also provide AADT and Truck Volume data for the project opening year.**	Revised Table 3 includes this information.

Page Number	Paragraph	Table	Other	Comment	Response Notes
14		6		• [1] The time span input for MOVE3.1 is explained as using a “worst-case modeling scenario using January PM peak hour…” Please provide additional explanation that covers the reasoning behind this choice e.g., CO seasonality, emissions data. • [2] The “Urban Restricted” road type parameter was listed. The “Using MOVES3 in Project-Level Carbon Monoxide Analyses (EPA–420-B-21-047, December 2021) guidance suggests that this parameter is defined as “an urban highway that can be accessed only by an on-ramp.” For the intersection evaluated in the current draft and the other intersection within the project site, please use the “Urban Unrestricted” parameter for modeling purposes. • [3] The “Output” row cites “EPA Using MOVES3 in Project-Level Carbon Monoxide Analyses, Section 2.3.10” as the relevant section for this parameter, while sections 2.3.8 and 2.3.9 pertain to Output. • [4] T he “Project Data Manager” row states “See Table 3 below for details.” It is not clear which table this is referring to, as there is not a table 3 that appears after this information. • [5] The “Emissions Sources” row cites “Section 5.2.3 of Appendix W to 40 CFR Part 51. As there is no section 5.2.3 of Appendix W to 40 CFR Part 51 it is not entirely clear what this is referencing.	The commentor is referencing Table 6 (Construction Emissions); it's assumed these comments are addressed to Table 4 (Methods, Models, and Assumptions). (1). The Time Span input text has been revised to read as follows: The worst-case modeling scenario using January when CO emissions are typically greater due to colder temperatures and during the PM peak hour will be selected. As shown in the Appendix (Figure 20 - 2050 Build Alternative AM Peak Hour Levels of Service, there are no intersections in the project study area that would operate at LOS D or worse in 2050). 2027 MOVES emission rates (the FY 2022 - 2025 TIP indicates that the project will be open to traffic in 2027) will be used to represent the Year of Opening emission rates and will be used with 2050 traffic volumes (the year with maximum traffic volumes) to model worst-case emissions associated with the project. (2). The typographical mistake has been corrected. (3). The text has been revised to sections 2.3.8 and 2.3.9 (4). The reference to Table 3 has been revised to reference Table 5 (Project Data Manager Inputs). (5). The Appendix W reference to Section 5.2.3 has been replaced with a reference to Section 4.2.3.1 (Models for Carbon Monoxide) which notes the following: In applying these requirements, the existing 1992 EPA guidance for screening CO impacts from highways may be consulted.
15		4		Receptor Locations: Although the description here is consistent with the guidance, please provide more exact detail regarding the receptor placement in the “Select Air Quality Model, Data Inputs, and Receptors Using CAL3QHC” section on page 19. For example, are all receptors placed exactly 3 m away from the road? Are the receptors located up to mid-block in each direction, as recommended in the guidance?	As noted in Table 4 of the Modeling Assumptions document, receptors are typically located at locations where the general public has continuous access. Such locations include, for example, crosswalk locations, bus stops and sidewalks adjacent to the roadway. There are sidewalks on both Indian School Road and 33rd Avenue under Existing Conditions and under the 2050 Build Alternative. Model receptors were placed at the crosswalk locations and on sidewalks which are more representative of where the general public would have continuous access. Receptors are not placed exactly 3 meters from the road because the general public would be unlikely to have continuous access at such locations for extended periods of time. Receptors were placed at appropriate locations to capture the maximum CO concentration where the public would have continuous and extended access. Receptors are shown in Figure 3 and Figure 4 of the Modeling Assumpions document and extend more than 450 feet on each leg of the intersection. Additional text has been added under "Select Air Quality Model, Data Inputs, and Receptors Using CAL3QHC."
15		4		Traffic and Geometric Design: Please provide more information on how these data will be derived.	Traffic volumes were derived from the Design Concept Report (AECOM 2023). The relevant figures (for example, lane configurations and turning movements) used in deriving the traffic volumes used in modeling analysis are included as an Appendix to the Consultation Document. A CADD design file was provided from which the intersection geometry was derived.

Page Number	Paragraph	Table	Other	Comment	Response Notes
15		4		Meteorology: Please justify the use of 175 cm for the surface roughness. Table 4-1 of the 1992 guideline shows a range of surface roughness lengths for urban environments. 175 cm is listed as the value for an “office” land-use type so urban land-use data should be provided to support that determination.	**Land Use Type** / **Future Land Use** **Area (acres)** / **Percent** Commercial 51.0 34% Industrial 28.8 19% Multi-Family Res. 14.3 9% Office 0.3 <0.5% Other/Public Empl. 4.4 3% Single Family Res. 7.2 5% Transportation 45.3 30% Vacant 0 0% Source: MAG Existing and Future Land Use Dataset (2020) City land use surface roughness lengths in Table 4-1 of the 1992 guidance include the following: Single-family residential - 108 Apartment residential -- 370 Office -- 175 Central Business District -- 321 Park -- 127 While the "office" land use is a relatively small percentage of the overall land uses shown in the cited table above, of the available surface roughness lengths available, the Office length (175 cm) is more appropriate for capturing commercial and industrial land uses within the project study area than any of the other available choices.
15		4		Persistence Factor: The 1992 guideline states, “EPA recommends the use of a 0.7 persistence factor in a local area where monitoring data are not available. If a persistence factor other than 0.7 is obtained through the use of monitored data in a local area, it should be used rather than 0.7.” Based on the Background Monitor row of Table 4, it appears that there are monitored data available so these data should be used to calculate a persistence factor instead of using the default value. Further information on calculating a persistence factor from monitoring data can be found in Section 4.7.2 of the 1992 guideline.	Using 1-hour and 8-hour CO monitoring data from 2020 to 2022 at the West Phonix station, the Maricopa County Air Quality Department (MCAQD) derived a persistence factor of 0.86. References to the persistance factor of 0.7 in the Consultation Documents have been revised accordingly.
16		5		Meteorology: Please provide more information on the meteorological data used, including any specific monitors which are the source of the data, the data completeness, their representativeness of meteorology of the project area, and QA/QC. Furthermore, 40 CFR 51 App W 8.4.2(e) states that “the use of 5 years of adequately representative NWS or comparable meteorological data … are required.” Please ensure that there is sufficient meteorological data to fulfill this requirement.	As noted in the Consulation Document, the West Phoenix monitor was used to derive both the background concentrations and the persistence factor for two reasons; (1) the West Phoenix monitor is the closest monitor to the modeled intersection (33rd Avenue/Indian School Road), and (2) the West Phoenix monitor had the highest monitored CO concentrations at all active CO monitors in Maricopa County (Table 9 in the Consultation Document). For these reasons it would provide the highest (that is, worst-case) background concentration when assessing the potential for CO exceendances at the modeled intersection. The MCAQD 2023 Air Monitoring Network Plan (2023) indicated that the West Phoenix Monitor met all requirements of 40 CFR Part 58 Subpart G - Appendices A, C, D, and E related to QA requirements for monitors, monitoring methodology, and network design (page 125 of the May 2023 Air Monitoring Network Plan). The National Weather Service meteorology data (ZoneMonthHour) used in the MOVES modeling has been revised from 3 years to 5 years (2018 to 2022). The temperature increased from 55.8 to 57.6 degrees Faherenheit as a result of this revision. The Consultation Document text has been revised accordingly. In addition, the relative humidity used in the revised MOVES modeling has been revised from 46.2% to 50% based on available local information (https://weather-and-climate.com/average-monthly-Humidity-perc,phoenix,United-States-of-America, accessed September 9, 2023).

Page Number	Paragraph	Table	Other	Comment	Response Notes
17		5		Please specify which conformity analysis is referenced when stating "… using data from the latest regional conformity analysis provided by MAG" for relevant inputs.	The MAG conformity data used in the evaluations are from the "MOVES Input_Fall 2022 Conformity" runs provided in mid=July, 2023. A note has been included in the Consultation Document after the first reference to the MAG conformity evaluation that all subsequent references refer to the Fall 2022 Conformtiy evaluation.
17		5		Links; Please provide further information on the link length, traffic volume, average speed, and road grade in the modeling report.	As noted in the EPA's guidance document "Using MOVES3 in Project-Level Carbon Monoxide Analyses" (December 2021, page 38) "Since the goal of the MOVES run is to produce a grams/vehicle-mile and/or grams/vehicle-hour emission rate(s), the exact length or volume of each link is not important for running MOVES; in the post-processing script that creates these rates, total emissions will be divided by vehilce volume and for non-queue links divided by link length as well." Preceise link lengths and volumes on each link are important for CAL3QHC dispersion modeling. Hence, for MOVES modeling, volumes and lengths of 1 were used in developing emission rates. To confirm the validity of of the guidance a separate MOVES run with a volume of 500 and a length of 1,000. Identical emission rates were generated in both runs. As there are no substantial capacity improvements resulting from the project (that is, additional lanes, removeal of the traffic signal at the Indian School Road/33rd Avenue intersection, etc.), posted speed limits were used in the CAL3QHC modeling. In the August 7, 2023, Interagency Consultation meeting FHWA suggested using the maximum road grade (where Indian School Road would be elevated going over the BNSF tracks) to generate worst-case emission rates for all links in the MOVES models. The MOVES models have been revised to incorporate a 4% grade in all links.
17		5		Off-Network, Hotelling: The intersection is near numerous parking lots. Please consider including these parking lots as off-network links to the project.	As discussed in the August 7, 2023, Interagency Consultation meeting there are no project-related components that would necessitate using off network or hotelling links in the modeling.
22				Please cite the correct table for the following statement "Table 6 shows the maximum 1-hour and 8-hour CO concentration recorded…"	The text has been revised to reference Table 9.
22				Background CO Monitor: Please provide additional information on the QA/QC and the data completeness of the West Phoenix Station monitor.	As noted in the response to Comment 16, the MCAQD 2023 Air Monitoring Network Plan (2023) indicated that the West Phoenix Monitor met all requirements of 40 CFR Part 58 Subpart G - Appendices A, C, D, and E related to QA requirements for monitors, monitoring methodology, and network design (page 125 of the May 2023 Air Monitoring Network Plan).

Attachment 2 MOVES3.1 and CAL3QHC Input Files

Model files are available at ADOT Environmental Planning and are available upon request at 602.712.7767.

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sourcetypename="Passenger Car"/>
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sourcetypename="Passenger Car"/>
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sourcetypename="Passenger Truck"/>
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sourcetypename="Passenger Truck"/>
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sourcetypename="Passenger Truck"/>
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sourcetypeid="51" sourcetypename="Refuse Truck"/>
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sourcetypename="Refuse Truck"/>
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sourcetypename="Refuse Truck"/>
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sourcetypeid="43" sourcetypename="School Bus"/>
                <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="43"
sourcetypename="School Bus"/>
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sourcetypename="School Bus"/>
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sourcetypeid="53" sourcetypename="Single Unit Long-haul Truck"/>
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```
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sourcetypename="Single Unit Long-haul Truck"/>
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sourcetypeid="52" sourcetypename="Single Unit Short-haul Truck"/>
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sourcetypename="Single Unit Short-haul Truck"/>
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sourcetypename="Single Unit Short-haul Truck"/>
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sourcetypeid="42" sourcetypename="Transit Bus"/>
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sourcetypename="Transit Bus"/>
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sourcetypename="Transit Bus"/>
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        </offroadvehicleselections>
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        </offroadvehiclesccs>
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        <pollutantprocessassociations>
                <pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)"
processkey="1" processname="Running Exhaust"/>
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processkey="15" processname="Crankcase Running Exhaust"/>
        </pollutantprocessassociations>
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        </internalcontrolstrategies>
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        <outputemissionsbreakdownselection>
                <modelyear selected="false"/>
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                <onroadoffroad selected="false"/>
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                <sourceusetype selected="true"/>
                <movesvehicletype selected="false"/>
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                <sector selected="false"/>
                <engtechid selected="false"/>
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                <regclassid selected="false"/>
        </outputemissionsbreakdownselection>
        <outputdatabase servername="" databasename="CO_2050EmissionRatesrev_out" description=""/>
        <outputtimestep value="Hour"/>
        <outputvmtdata value="true"/>
        <outputsho value="false"/>
        <outputsh value="false"/>
        <outputshp value="false"/>
        <outputshidling value="false"/>
        <outputstarts value="false"/>
        <outputpopulation value="true"/>
        <scaleinputdatabase servername="localhost" databasename="co_emissionrates2050rev1_in"
description=""/>
        <pmsize value="0"/>
        <outputfactors>
                <timefactors selected="true" units="Hours"/>
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        </outputfactors>
        <savedata>

        </savedata>

        <donotexecute>

        </donotexecute>
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        <generatordatabase shouldsave="false" servername="" databasename="" description=""/>
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</runspec>
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'R2            '    635113.85    908040.81       5.9
'R3            '    635119.20    907959.00       5.9
'R4            '    635123.52    907877.11       5.9
'R5            '    635207.97    907870.83       5.9
'R6            '    635287.21    907871.68       5.9
'R7            '    635369.29    907869.81       5.9
'R8            '    635451.32    907869.33       5.9
'R9            '    635533.29    907869.39       5.9
'R10           '    635615.29    907868.75       5.9
'R11           '    635605.13    907778.79       5.9
'R12           '    635522.97    907778.81       5.9
'R13           '    635441.18    907776.52       5.9
'R14           '    635359.60    907768.42       5.9
'R15           '    635277.74    907772.88       5.9
'R16           '    635196.04    907780.53       5.9
'R17           '    635114.28    907774.33       5.9
'R18           '    635104.45    907692.93       5.9
'R19           '    635103.63    907610.99       5.9
'R20           '    635102.45    907529.01       5.9
'R21           '    635101.39    907447.00       5.9
'R22           '    635101.37    907365.01       5.9
'R23           '    635051.92    907365.74       5.9
'R24           '    635056.54    907447.61       5.9
'R25           '    635057.33    907529.61       5.9
'R26           '    635057.88    907611.60       5.9
'R27           '    635058.73    907693.58       5.9
'R28           '    635052.95    907775.38       5.9
'R29           '    634971.18    907781.66       5.9
'R30           '    634889.18    907781.27       5.9
'R31           '    634807.18    907781.15       5.9
'R32           '    634725.17    907781.90       5.9
'R33           '    634643.19    907782.54       5.9
'R34           '    634561.93    907782.09       5.9
'R35           '    634596.47    907914.65       5.9
'R36           '    634676.70    907897.85       5.9
'R37           '    634758.05    907887.53       5.9
'R38           '    634839.46    907877.65       5.9
'R39           '    634921.22    907871.38       5.9
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'R40          '    635003.21    907871.66       5.9
'R41          '    635085.19    907873.31       5.9
'R42          '    635085.91    907955.30       5.9
'R43          '    635086.11    908037.22       5.9
'R44          '    635083.58    908119.22       5.9

'IndianSchool&33rdAve      ' 21 1 1  'C'
1
'WB_Through_Approach     '    'AG'  635669.4    907848.8   635089.2     907851.1   2298   5.32   0    56
1
'WB_Through_Departure_1  '    'AG'  635089.2    907851.1   634723.4     907851.1   2713   5.32   0    56
1
'WB_Through_Departure_2  '    'BR'  634723.4    907851.1   634520.2     907870.1   2713   5.32   0    56
1
'EB_Through_Approach_1   '    'BR'  634520.2    907817.5   634725.0     907804.6   1588   5.32   0    56
1
'EB_Through_Approach_2   '    'AG'  634725.0    907804.6   635085.3     907802.2   1588   5.32   0    56
1
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1
'NB_Through_Approach_1   '    'AG'  635090.1    907306.2   635096.2     907767.3   504    5.27   0    44
1
'NB_Through_Approach_2   '    'AG'  635096.2    907767.3   635103.2     907835.1   504    5.27   0    44
1
'NB_Through_Departure_1  '    'AG'  635103.2    907835.1   635109.2     907884.2   11     5.39   0    32
1
'NB_Through_Departure_2  '    'AG'  635109.2    907884.2   635109.0     908176.3   11     5.39   0    32
1
'SB_Through_Approach_1   '    'AG'  635095.3    908176.3   635095.3     907885.4   34     5.39   0    32
1
'SB_Through_Approach_2   '    'AG'  635095.3    907885.4   635084.5     907835.2   34     5.39   0    32
1
'SB_Through_Departure_1  '    'AG'  635084.5    907835.2   635071.7     907764.4   115    5.27   0    32
1
'SB_Through_Departure_2  '    'AG'  635071.7    907764.4   635068.9     907306.4   115    5.27   0    32
2
'WB_TH_Queue             '    'AG'  635129.8    907850.9   635301.7     907849.9    0    36     3
  120   62    3     2254    4.69    1800  2   3
2
'WB_LT_Queue             '    'AG'  635129.4    907828.6   635302.6     907828.1    0    12     1
```

```
  120   62    3     44     4.69    1800  2   3
2
'EB_TH_Queue             '    'AG'  635039.2    907802.5   634831.1     907803.9    0    36     3
  120   62    3     1583    4.69    1800  2   3
2
'EB_LT_Queue             '    'AG'  635039.5    907823.4   634937.7     907823.4    0    12     1
  120   62    3     5       4.69    1800  2   3
2
'NB_TH_Quene             '    'AG'  635096.1    907763.5   635094.5     907639.6    0    12     1
  120   95    3     61      4.69    1800  2   3
2
'NB_LT_Queue             '    'AG'  635084.7    907763.8   635083.7     907639.5    0    12     1
  120   95   3      443     4.69    1800  2   3
2
'SB_TH_Quene             '    'AG'  635095.3    907888.6   635095.3     907974.9    0    12     1
  120   95    3     34     4.69    1800   2   3
1.0 00. 4 1000. 0. 'Y' 10 0 36
```

```
'IndianSchool&33rdAve_2050NoBuildPM' 60. 175. 0. 0. 44 0.3048 1 1
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'R4            '    635123.52    907877.11       5.9
'R5            '    635207.97    907870.83       5.9
'R6            '    635287.21    907871.68       5.9
'R7            '    635369.29    907869.81       5.9
'R8            '    635451.32    907869.33       5.9
'R9            '    635533.29    907869.39       5.9
'R10           '    635615.29    907868.75       5.9
'R11           '    635605.13    907778.79       5.9
'R12           '    635522.97    907778.81       5.9
'R13           '    635441.18    907776.52       5.9
'R14           '    635359.60    907768.42       5.9
'R15           '    635277.74    907772.88       5.9
'R16           '    635196.04    907780.53       5.9
'R17           '    635114.28    907774.33       5.9
'R18           '    635104.45    907692.93       5.9
'R19           '    635103.63    907610.99       5.9
'R20           '    635102.45    907529.01       5.9
'R21           '    635101.39    907447.00       5.9
'R22           '    635101.37    907365.01       5.9
'R23           '    635051.92    907365.74       5.9
'R24           '    635056.54    907447.61       5.9
'R25           '    635057.33    907529.61       5.9
'R26           '    635057.88    907611.60       5.9
'R27           '    635058.73    907693.58       5.9
'R28           '    635052.95    907775.38       5.9
'R29           '    634971.18    907781.66       5.9
'R30           '    634889.18    907781.27       5.9
'R31           '    634807.18    907781.15       5.9
'R32           '    634725.17    907781.90       5.9
'R33           '    634643.19    907782.54       5.9
'R34           '    634561.93    907782.09       5.9
'R35           '    634596.47    907914.65       5.9
'R36           '    634676.70    907897.85       5.9
'R37           '    634758.05    907887.53       5.9
'R38           '    634839.46    907877.65       5.9
'R39           '    634921.22    907871.38       5.9
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'R40          '    635003.21    907871.66       5.9
'R41          '    635085.19    907873.31       5.9
'R42          '    635085.91    907955.30       5.9
'R43          '    635086.11    908037.22       5.9
'R44          '    635083.58    908119.22       5.9

'IndianSchool&33rdAve      ' 21 1 1  'C'
1
'WB_Through_Approach     '    'AG'  635669.4    907848.8   635089.2     907851.1   2635   4.06   0    56
1
'WB_Through_Departure_1  '    'AG'  635089.2    907851.1   634723.4     907851.1   3060   4.06   0    56
1
'WB_Through_Departure_2  '    'AG'  634723.4    907851.1   634520.2     907870.1   3060   4.06   0    56
1
'EB_Through_Approach_1   '    'AG'  634520.2    907817.5   634725.0     907804.6   1855   4.06   0    56
1
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1
'EB_Through_Departure    '    'AG'  635085.3    907802.2   635670.3     907800.0   2100   4.06   0    56
1
'NB_Through_Approach_1   '    'AG'  635090.1    907306.2   635096.2     907767.3   940    3.97   0    44
1
'NB_Through_Approach_2   '    'AG'  635096.2    907767.3   635103.2     907835.1   940    3.97   0    44
1
'NB_Through_Departure_1  '    'AG'  635103.2    907835.1   635109.2     907884.2   40     3.97   0    32
1
'NB_Through_Departure_2  '    'AG'  635109.2    907884.2   635109.0     908176.3   40     3.97   0    32
1
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1
'SB_Through_Approach_2   '    'AG'  635095.3    907885.4   635084.5     907835.2   90     3.97   0    32
1
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1
'SB_Through_Departure_2  '    'AG'  635071.7    907764.4   635068.9     907306.4   320    3.97   0    32
2
'WB_TH_Queue             '    'AG'  635129.8    907850.9   635301.7     907849.9    0    36     3
  120   62    3     2435    3.57    1800  2   3
2
'WB_LT_Queue             '    'AG'  635129.4    907828.6   635302.6     907828.1    0    12     1
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2
'EB_TH_Queue             '    'AG'  635039.2    907802.5   634831.1     907803.9    0    36     3
  120   62    3     1840    3.57    1800  2   3
2
'EB_LT_Queue             '    'AG'  635039.5    907823.4   634937.7     907823.4    0    12     1
  120   62    3     15      3.57    1800  2   3
2
'NB_TH_Quene             '    'AG'  635096.1    907763.5   635094.5     907639.6    0    12     1
  120   95    3     330     3.57    1800  2   3
2
'NB_LT_Queue             '    'AG'  635084.7    907763.8   635083.7     907639.5    0    12     1
  120   95   3     610     3.57    1800  2   3
2
'SB_TH_Quene             '    'AG'  635095.3    907888.6   635095.3     907974.9    0    12     1
  120   95    3     90     3.57    1800   2   3
1.0 00. 4 1000. 0. 'Y' 10 0 36
```

```
'IndianSchool&33rdAve_2050BuildPM' 60. 175. 0. 0. 45 0.3048 1 1
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'R3            '    635127.52    908057.78       5.9
'R4            '    635120.50    907975.67       5.9
'R5            '    635121.93    907893.71       5.9
'R6            '    635203.23    907883.06       5.9
'R7            '    635284.60    907872.91       5.9
'R8            '    635366.63    907870.27       5.9
'R9            '    635448.51    907866.80       5.9
'R10           '    635530.63    907870.27       5.9
'R11           '    635612.63    907869.31       5.9
'R12           '    635615.73    907768.97       5.9
'R13           '    635533.72    907766.19       5.9
'R14           '    635452.43    907755.40       5.9
'R15           '    635370.60    907750.18       5.9
'R16           '    635288.62    907751.83       5.9
'R17           '    635206.99    907759.70       5.9
'R18           '    635124.99    907759.70       5.9
'R19           '    635115.75    907678.22       5.9
'R20           '    635113.06    907596.27       5.9
'R21           '    635107.75    907514.44       5.9
'R22           '    635101.74    907432.66       5.9
'R23           '    635101.74    907350.66       5.9
'R24           '    635051.45    907361.41       5.9
'R25           '    635051.73    907443.41       5.9
'R26           '    635052.55    907525.41       5.9
'R27           '    635053.38    907607.40       5.9
'R28           '    635054.21    907689.40       5.9
'R29           '    635047.59    907771.19       5.9
'R30           '    634968.48    907792.78       5.9
'R31           '    634889.01    907812.98       5.9
'R32           '    634810.43    907836.16       5.9
'R33           '    634732.96    907863.06       5.9
'R34           '    634656.30    907892.16       5.9
'R35           '    634577.52    907915.19       5.9
'R36           '    634662.86    908021.08       5.9
'R37           '    634738.14    907988.52       5.9
'R38           '    634814.84    907959.51       5.9
'R39           '    634892.74    907933.91       5.9
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'R40          '    634972.20    907913.66       5.9
'R41          '    635053.52    907903.14       5.9
'R42          '    635070.51    907983.36       5.9
'R43          '    635073.74    908072.73       5.9
'R44          '    635090.37    908153.02       5.9
'R45          '    635097.53    908234.73       5.9

'IndianSchool&33rdAve      ' 27 1 1  'C'
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'WB_Through_Approach_1   '    'AG'  635669.4    907848.8   635242.8     907850.1   2719   4.06   0    56
1
'WB_Through_Approach_2   '    'AG'  635242.8    907850.1   635085.4     907858.0   2719   4.06   0    56
1
'WB_Through_Departure_1  '    'AG'  635085.4    907858.0   634897.3     907899.2   2869   4.06   0    56
1
'WB_Through_Departure_2  '    'BR'  634897.3    907899.2   634615.2     908001.6   2869   4.06   0    56
1
'EB_Through_Approach_1   '    'BR'  634584.7    907957.6   634847.0     907857.6   2349   4.06   0    68
1
'EB_Through_Approach_2   '    'AG'  634847.0    907857.6   635082.5     907802.6   2349   4.06   0    68
1
'EB_Through_Departure_1  '    'AG'  635082.5    907802.6   635254.3     907795.5   2063   4.06   0    68
1
'EB_Through_Departure_2  '    'AG'  635254.3    907795.5   635670.2     907793.9   2063   4.06   0    68
1
'NB_Through_Approach     '    'AG'  635089.9    907296.1   635097.1     907835.1    619   3.97   0    44
1
'NB_Through_Departure    '    'AG'  635097.1    907835.1   635134.8     908245.6   395    3.97   0    44
1
'SB_Through_Approach     '    'AG'  635111.7    908249.1   635064.1     907839.4   136    3.97   0    32
1
'SB_Through_Departure    '    'AG'  635064.1    907839.4   635060.1     907296.4   496    3.97   0    32
2
'WB_RT_Queue             '    'AG'  635130.5    907878.1   635245.4     907871.0    0    12     1
  120   75    3     46      3.57    1800  2   3
2
'WB_TH_Queue_1           '    'AG'  635130.5    907855.8   635242.8     907850.1    0    36     3
  120   75    3     2719    3.57    1800  2   3
2
'WB_TH_Queue_2           '    'AG'  635242.8    907850.1   635367.2     907849.7    0    36     3
```

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  120   75    3     2719    3.57    1800  2   3
2
'WB_LT_Queue            '    'AG'  635130.4    907832.2   635368.5     907827.9    0    12     1
  120   105   3     200     3.57    1800  2   3
2
'EB_RT_Queue_1          '    'AG'  635037.6    907796.6   634919.6     907820.4    0    12     1
  120   81    3     270     3.57    1800  2   3
2
'EB_RT_Queue_2          '    'AG'  634919.6    907820.4   634795.0     907857.3    0    12     1
  120   81    3     270     3.57    1800  2   3
2
'EB_TH_Queue_1          '    'AG'  635038.5    907812.8   634847.0     907857.6    0    36     3
  120   81    3     1927    3.57    1800  2   3
2
'EB_TH_Queue_2          '    'AG'  634847.0    907857.6   634797.2     907876.5    0    36     3
  120   81    3     1927    3.57    1800  2   3
2
'EB_LT_Queue_1          '    'AG'  635039.9    907840.6   634917.7     907865.8    0    12     1
  120   111   3     152     3.57    1800  2   3
2
'EB_LT_Queue_2          '    'AG'  634917.7    907865.8   634800.7     907902.5    0    12     1
  120   111   3     152    3.57    1800  2   3
2
'NB_RT_Queue            '    'AG'  635108.8    907749.3   635105.0     907554.1    0    12     1
  120   59    3     105     3.57    1800  2   3
2
'NB_TH_Quene            '    'AG'  635096.0    907751.3   635093.4     907553.6    0    12     1
  120   59    3     190     3.57    1800  2   3
2
'NB_LT_Queue            '    'AG'  635080.1    907753.9   635076.8     907352.4    0    12     1
  120   89    3     317     3.57    1800  2   3
2
'SB_TH_Quene            '    'AG'  635072.6    907912.2   635083.2     908003.7    0    12     1
  120   91    3     136     3.57    1800  2   3
2
'SB_LT_Quene            '    'AG'  635091.3    907909.1   635094.4     908001.6    0    12     1
  120   91    3     31      3.57    1800  2   3
1.0 00. 4 1000. 0. 'Y' 10 0 36
```

Attachment 3 Persistence Factor Excel Spreadsheet Summary Results

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Date	Time	1-hr	8-hr	Ratio 8-hr to 1-hr	Date	Time	1-hr	8-hr	Ratio 8-hr to 1-hr	Date	Time	1-hr	8-hr	Ratio 8-hr to 1-hr
#1					#2					#3				
	1:00:00 AM	3.5				9:00:00 PM	2.5				7:00:00 PM	1.9		
	2:00:00 AM	3.7		0.93		10:00:00 PM	2.8				8:00:00 PM	2		
	3:00:00 AM	3.4				11:00:00 PM	3.1		0.85		9:00:00 PM	2.4		
	4:00:00 AM	3.4				12:00:00 AM	3				10:00:00 PM	2.8		
	5:00:00 AM	3.6				1:00:00 AM	2.7				11:00:00 PM	2.5		
	6:00:00 AM	3.4				2:00:00 AM	2.4				12:00:00 AM	2.6		
	7:00:00 AM	3.5				3:00:00 AM	2.1				1:00:00 AM	2.6		
01-Jan-2021 08:00	8:00:00 AM	3.1	3.45		05-Dec-2021 04:00	4:00:00 AM	2.5	2.6375		25-Dec-2020 02:00	2:00:00 AM	2.9	2.4625	0.849
#4					#5					#6				
	7:00:00 PM	1.6				7:00:00 PM	1.6				7:00:00 PM	2		
	8:00:00 PM	1.9				8:00:00 PM	2.2				8:00:00 PM	2.4		
	9:00:00 PM	2.4				9:00:00 PM	2.3				9:00:00 PM	2.6		0.851
	10:00:00 PM	2.7		0.83		10:00:00 PM	2.4				10:00:00 PM	2.4		
	11:00:00 PM	2.6				11:00:00 PM	2.5		0.89		11:00:00 PM	2.2		
	12:00:00 AM	2.5				12:00:00 AM	2.5		0.89		12:00:00 AM	2		
	1:00:00 AM	2.3				1:00:00 AM	2.5		0.89		1:00:00 AM	2.1		
18-Jan-2021 02:00	2:00:00 AM	2	2.25		16-Jan-2021 02:00	2:00:00 AM	1.8	2.225		21-Dec-2020 02:00	2:00:00 AM	2	2.2125	
#7					#8					#9				
	7:00:00 PM	1.8				7:00:00 PM	1.9				7:00:00 PM	2.3		
	8:00:00 PM	1.9				8:00:00 PM	2.1				8:00:00 PM	2.1		
	9:00:00 PM	2.4				9:00:00 PM	2.4				9:00:00 PM	2.6		0.841
	10:00:00 PM	2.6		0.85		10:00:00 PM	2.4				10:00:00 PM	2.2		
	11:00:00 PM	2.4				11:00:00 PM	2.6		0.84		11:00:00 PM	1.9		
	12:00:00 AM	2.3				12:00:00 AM	2.6		0.84		12:00:00 AM	2		
	1:00:00 AM	2.3				1:00:00 AM	2.1				1:00:00 AM	2.2		
06-Nov-2021 02:00	2:00:00 AM	1.9	2.2		18-Nov-2020 02:00	2:00:00 AM	1.4	2.1875		06-Dec-2020 02:00	2:00:00 AM	2.2	2.1875	
#10														
	8:00:00 PM	1.8												
	9:00:00 PM	2.2												
	10:00:00 PM	2.5		0.87										
	11:00:00 PM	2.5		0.87										
	12:00:00 AM	2.1												
	1:00:00 AM	2.2												
	2:00:00 AM	2.1												
14-Nov-2021 03:00	3:00:00 AM	1.9	2.1625											

Rank of highest non-overlapping average	Date	Time	8-hr Average	Max 1-hr average within the 8-hr period	Ratio (8-hr/1-hr)	
1	1/1/2021	8:00:00 AM	3.45	3.7	0.93	
2	12/5/2021	4:00:00 AM	2.64	3.1	0.85	
3	12/25/2020	2:00:00 AM	2.46	2.9	0.85	
4	1/18/2021	2:00:00 AM	2.25	2.7	0.83	
5	1/16/2021	2:00:00 AM	2.23	2.5	0.89	
6	12/21/2020	2:00:00 AM	2.21	2.6	0.85	
7	11/6/2021	2:00:00 AM	2.20	2.6	0.85	
8	11/18/2020	2:00:00 AM	2.19	2.6	0.84	
9	12/6/2020	2:00:00 AM	2.19	2.6	0.84	
10	11/14/2021	3:00:00 AM	2.16	2.5	0.87	
					0.86	Average (Persistent Factor)