D.6 AIR QUALITY

Spaghetti Bowl Project
Air Quality Analysis
Technical Report

As part of the Environmental Review Process for

I-80/I-580/US 395
Spaghetti Bowl Interchange Reconstruction
Washoe County, Nevada

Federal Highway Administration, Nevada Division

Nevada Department of Transportation

NDOT Project Number: 74020
FHWA Project Number: NHFP-080-1(172)

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ACRONYMS AND ABBREVIATIONS

µg/m^3	microgram(s) per cubic meter
AADT	annual average daily traffic
CAA	Clean Air Act
CFR	Code of Federal Regulations
cm	centimeter(s)
CO	carbon monoxide
CO_2	carbon dioxide
EO	Executive Order
EPA	U.S. Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FTIP	Federal Transportation Improvement Program
GHG	greenhouse gas
HEI	Health Effects Institute
I-580	Interstate 580
I-80	Interstate 80
IRIS	Integrated Risk Information System
LOS	level of service
m	meter(s)
m/s	meter(s) per second
$MMTCO_2eq$	million metric ton(s) of carbon dioxide equivalents
mph	miles per hour
MSAT	mobile source air toxic
N/A	not available
NAAQS	national ambient air quality standards
NDOT	Nevada Department of Transportation
NEPA	National Environmental Policy Act
NHTSA	National Highway Traffic Safety Administration
NO_2	nitrogen dioxide
$PM_{2.5}$	particulate matter less than 2.5 micrometers in aerodynamic diameter
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter

POAQC	project of air quality concern
ppm	parts per million
RTC	Regional Transportation Committee
RTP	Regional Transportation Plan
SIP	State Implementation Plan
SO_2	sulfur dioxide
US 395	U.S. Highway 395
VMT	vehicle miles traveled
WCAQMD	Washoe County Health District—Air Quality Management Division

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1.0 INTRODUCTION

This report documents the air quality analysis performed as part of the environmental review of the Reno Spaghetti Bowl (Interstate 80/Interstate 580/U.S. Highway 395 [I-80/I-580/US 395]) Reconstruction Project, referred to as the Spaghetti Bowl Project, or project, in Washoe County, Nevada. The Spaghetti Bowl Project is designed to address the obsolete design of the interchange, improve safety, and reduce travel delays by eliminating lane drops, improving ramp spacing, and replacing the low-speed loop ramps with new ramps that have more capacity and allow safe travel at higher speeds.

1.1 PROJECT OVERVIEW AND NEED FOR THE PROJECT

The Spaghetti Bowl (I-80/I-580/US 395) is a freeway-to-freeway interchange that was constructed between 1969 and 1971, when Washoe County had a population of about 130,000 people. At that time, about 90,000 vehicles per day used the Spaghetti Bowl. In 2015, the combined population of Reno and Sparks was about 327,000 people and the population of Washoe County was about 435,000 people (U.S. Census Bureau 2016). About 260,000 vehicles per day used the Spaghetti Bowl in 2016, making it is the busiest interchange in northern Nevada.

The Spaghetti Bowl's 1960s-era design is obsolete for several reasons:

- Interchange ramps are spaced too closely to one another. Vehicles entering or exiting the freeway at these closely spaced interchanges must cross paths with other vehicles traveling in the same direction, sometimes across two or more lanes of traffic, which is referred to as weaving. In general, short "weave segments," like those found in the Spaghetti Bowl, result in increased congestion.

- There are five locations on I-80, I-580, and US 395 in and around the Spaghetti Bowl where a freeway lane ends. These "lane drops" are bottlenecks that cause congestion.

- There are four low-speed ramps in the Spaghetti Bowl that do not have the capacity to accommodate existing traffic volumes. These low-speed ramps are bottlenecks and are regularly congested during rush hour.

- There are multiple locations throughout the length of I-80, I-580, and US 395 where design guidelines and standards are no longer met. These locations result from design exceptions incorporated into prior projects and changes to design guidelines and standards applicable to the freeways. These affect some travelers' ability to navigate the project limits comfortably at speed, adding to congestion.

These deficiencies create congestion, contribute to a higher-than-average crash rate, and delay drivers. Based on data the Nevada Department of Transportation (NDOT) prepared for the project's Draft Environmental Impact Statement, there is on average one injury crash in or around

the Spaghetti Bowl each day. The average delay for drivers is anticipated to increase by 53 percent between 2016 and 2040 if no improvements are made to the freeway system in the study area (Federal Highway Administration [FHWA] and NDOT 2016). The Spaghetti Bowl Reconstruction Project (Spaghetti Bowl Project) is designed to address the obsolete design of the interchange, improve safety, and reduce travel delays by eliminating lane drops, improving ramp spacing, and replacing the low-speed loop ramps with new ramps that have more capacity and allow safe travel at higher speeds.

The study area encompasses the area within which the proposed construction activities would occur and includes the Spaghetti Bowl, each of the four legs of the freeway-to-freeway system, and 16 service interchanges that connect the freeways to local roads.

The project is in Washoe County, Nevada, within the cities of Reno and Sparks, and has the following limits:

- I-80 between Keystone Avenue on the west and McCarran Boulevard on the east, a distance of approximately 5 miles
- I-580/US 395 between Meadowood Mall Way on the south and Parr Avenue/Dandini Boulevard on the north, a distance of approximately 7 miles (Figure 1-1)

The lead agencies for this project are NDOT and FHWA.

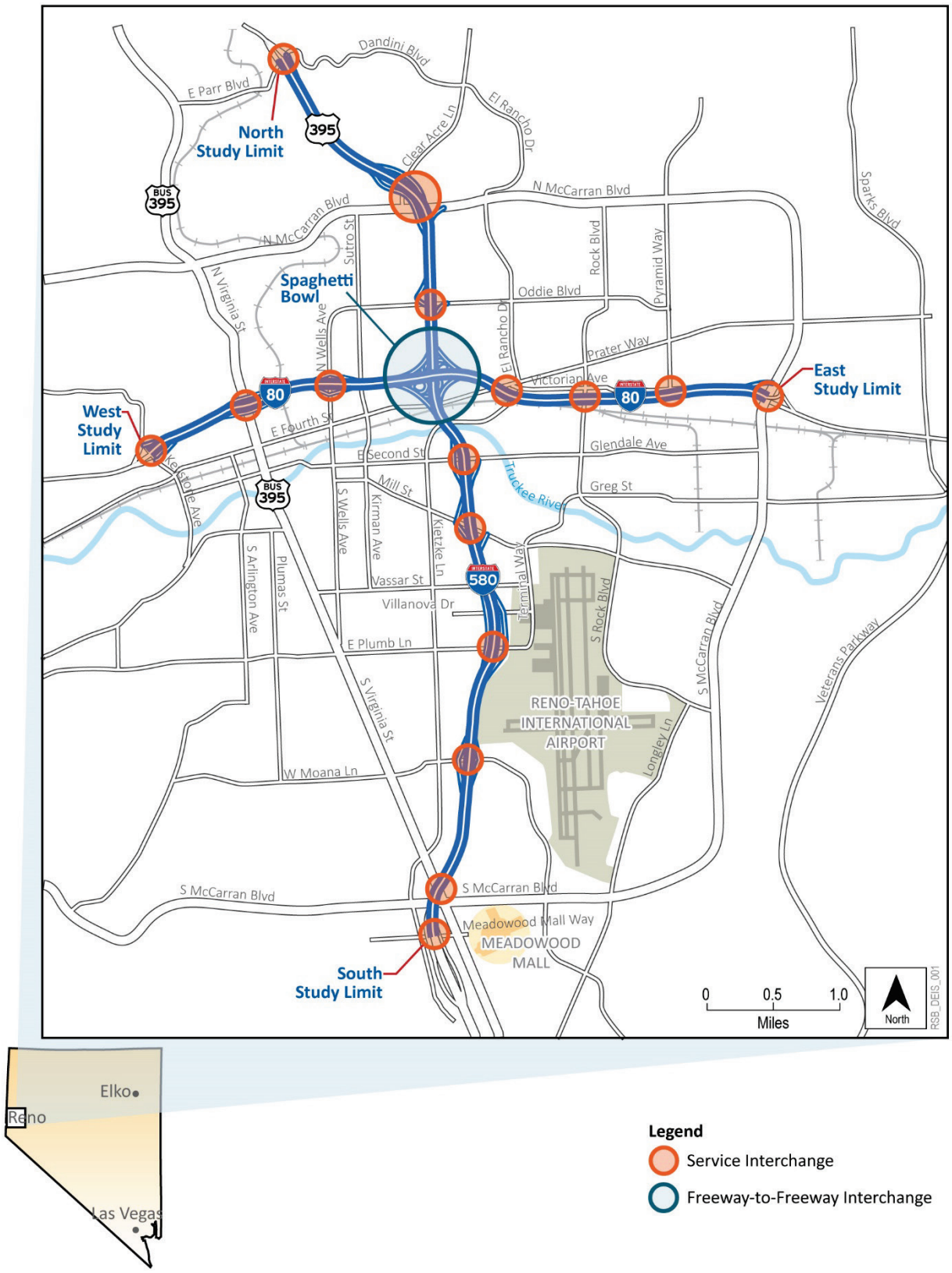

Figure 1-1. Project Vicinity

2.0 PROPOSED ACTION

NDOT and the FHWA are studying several alternatives along I-580/US 395 from the Meadowood Mall Way interchange on the south to the Parr Boulevard/Dandini Boulevard interchange on the north and along I-80 between Keystone Avenue on the west and McCarran Boulevard on the east. The alternatives would bring the freeway up to current standards, improve operations and safety, and increase capacity. They would also reduce travel delays in the I-80 and I-580/US 395 corridors and in the freeway-to-freeway interchange that connects these two freeways (known locally as the "Spaghetti Bowl"). Reconstruction of the interchanges could include new or modified ramps and frontage roads on new alignments.

2.1 DESCRIPTION OF PROJECT ELEMENTS

Three preliminary project alternatives are being considered and are presented on the following pages. In June 2018, NDOT identified Alternative 2 as the Preferred Alternative.

2.1.1 Alternatives

2.1.1.1 Alternative 1

Alternative 1 would keep all existing access between the local roads and freeway system while maximizing traffic movement through the Spaghetti Bowl interchange by:

- Using longer sweeping ramps with more gradual curves to increase ramp speed (up to 50 miles per hour) in the Spaghetti Bowl. This would increase the footprint of the interchange compared to its current footprint.
- Reconstructing the Wells Avenue, Oddie Boulevard, Second Street/Glendale Avenue, Mill Street, Prater Way, Rock Boulevard, and Pyramid Way interchanges into configurations that "braid" (see inset for a description of braided ramps).

2.1.1.2 Alternative 2

Alternative 2 would modify the access between the local roads and freeway system, and it would reduce the project footprint compared to Alternative 1, by:

- Reconstructing the Spaghetti Bowl into a configuration similar to the existing configuration, including converting the south-to-east and north-to-west low-speed loop ramps to longer

ramps with more gradual curves that allow higher speeds and increase capacity to meet or exceed the minimum design speed standards.

- Reconstructing the Wells Avenue and Oddie Boulevard interchange so that its on- and off-ramps are braided with the adjacent Spaghetti Bowl ramps. At these locations, freeway access would be limited to the freeway on which the interchange is located. The Oddie Boulevard interchange would provide access to US 395, and the Wells Avenue interchange would provide access to I-80.

- Reconstructing the Second Street/Glendale Avenue interchange and then braiding the ramps with the adjacent Spaghetti Bowl ramps and Mill Street ramps.

- Relocating the I-80/Fourth Street/Prater Way interchange and the Rock Boulevard interchange to Kietzke Lane and then braiding the Kietzke Lane interchange on- and off-ramps with the adjacent Spaghetti Bowl ramps.

- Reducing the Spaghetti Bowl's footprint compared to Alternative 1 by modifying interchanges and reducing on- and off-ramp connections.

2.1.1.3 Alternative 3

Alternative 3 would modify the access between the local roads and freeway system and reduce the project footprint compared to Alternative 1 and Alternative 2 by:

- Reconstructing the system interchange into a configuration similar to the existing configuration, while increasing capacity to meet or exceed the minimum design standards.

- Reconstructing the Wells Avenue, Oddie Boulevard, and Second Street/Glendale Avenue interchanges as partial clover loop ramp configurations to increase interchange separation between those interchanges and the Spaghetti Bowl.

- Eliminating the I-580/Fourth Street/Prater Way interchange to increase interchange separation from Rock Boulevard.

- Modifying the Mill Street interchange to access I-580 indirectly via frontage road connections to the Second Street/Glendale Avenue interchange to increase interchange separation from the Spaghetti Bowl and Plumb Lane.

- Reducing the project footprint, compared to Alternative 2 and Alternative 3, by modifying service interchanges to increase spacing and minimize the need for ramp braiding.

2.1.2 No Build Alternative

The No Build Alternative serves as the baseline for assessing the potential impacts of Alternatives 1, 2, and 3. The No Build Alternative does not include any safety or capacity improvements of the freeway system in the study area. Only routine maintenance would be performed on I-80 and I-580/US 395. Other planned transportation improvement projects in the study area may still move forward. The impact-causing activities of the No Build Alternative relate to its lack of action. It does not address the problems on the study area freeway system. Under the No Build Alternative, bottlenecks and vehicle crashes would continue to increase, resulting in greater travel times and less reliable travel throughout the corridor. The condition of the freeway bridges would continue to deteriorate, requiring more frequent and extensive maintenance. Additionally, more commuter traffic would shift to local streets to avoid the congested freeway, which could diminish the neighborhood and business environments along several streets in the primary study area by increasing pedestrian-vehicle conflicts. The No Build Alternative also does not provide the opportunity to treat stormwater runoff before it enters the Truckee River because there is currently no engineered treatment (e.g., detention ponds) to capture runoff. This indirectly affects water quality in the Truckee River.

The air quality analysis was performed for Alternatives 1, 2, and 3 and the No Build Alternative.

3.0 REGULATORY SETTING

3.1 FEDERAL REGULATIONS

3.1.1 Clean Air Act and National Ambient Air Quality Standards

Federal air quality policies are regulated through the federal Clean Air Act (CAA). The United States Congress adopted the CAA in 1970 and its amendments in 1977 and 1990. Pursuant to the CAA, the U.S. Environmental Protection Agency (EPA) has established nationwide air quality standards to protect public health and welfare with an adequate margin of safety. These federal standards, known as the National Ambient Air Quality Standards (NAAQS), were developed for six criteria pollutants: ozone, nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter less than 10 micrometers in aerodynamic diameter (PM_{10}) and particulate matter less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$), sulfur dioxide (SO_2), and lead.

The NAAQS represent safe levels of each pollutant to avoid specific adverse effects to human health and the environment. Two types of NAAQS have been established, primary and secondary standards. Primary standards set limits to protect public health, especially that of sensitive populations such as asthmatics, children, and seniors. Secondary standards set limits to protect public welfare, including protections against decreased visibility and damage to animals, crops, and buildings. The NAAQS are summarized in Table 3-1.

The federal CAA requires EPA to classify areas in the country as attainment or nonattainment with respect to each criteria pollutant, depending on whether the areas meet the applicable NAAQS. The air quality designations that can be given to an area for each criteria pollutant are:

- Nonattainment: Ambient air quality monitoring data indicate that NAAQS have not been consistently achieved.
- Attainment: NAAQS have been achieved.
- Unclassified: Monitoring data are insufficient to determine whether the area is in attainment or nonattainment.

In addition, “maintenance” areas are the former nonattainment areas that are now consistently meeting the NAAQS, and have been reclassified by EPA from "nonattainment" to "attainment with a maintenance plan.”

Table 3-1. National Ambient Air Quality Standards

Pollutant	Averaging Time	Primary Standards	Secondary Standards	Standard Form
Ozone	8 hours	0.070 ppm	0.070 ppm[a]	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
PM_{10}	24 hours	150 µg/m^3	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
$PM_{2.5}$	Annual arithmetic mean 24 hours	12 µg/m^3 35 µg/m^3	15 µg/m^3 35 µg/m^3	Annual mean, averaged over 3 years 98th percentile, averaged over 3 years
CO	8 hours 1 hour	9 ppm 35 ppm	— —	Not to be exceeded more than once per year
NO_2	Annual arithmetic mean 1 hour	0.053 ppm 0.100 ppm	0.053 ppm —	Annual mean 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
SO_2	3 hours 1 hour	— 0.075 ppm[b]	0.5 ppm —	Not to be exceeded more than once per year 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
Lead	Calendar quarter Rolling 3-month average	1.5 µg/m^3 (certain areas) 0.15 µg/m^3	1.5 µg/m^3[c] —	Not to be exceeded

Source: https://www.epa.gov/criteria-air-pollutants/naaqs-table

[a] Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) ozone standards additionally remain in effect in some areas.

[b] The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will remain in effect in certain areas: a) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and b) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or

Pollutant	Averaging Time	Primary Standards	Secondary Standards	Standard Form
is not meeting the requirements of a State Implementation Plan (SIP) call under the previous SO_2 standards (40 Code of Federal Regulations [CFR] 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its SIP to demonstrate attainment of the required NAAQS.				
[c] In areas designated nonattainment for the lead standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m^3 as a calendar quarter average) also remain in effect.				
µg/m^3 = micrograms per cubic meter; ppm = parts per million				

The 1977 CAA amendments required each state to develop and maintain a State Implementation Plan (SIP) for each criteria pollutant that violates the applicable NAAQS. The SIP serves as a tool to avoid and minimize emissions of pollutants that would exceed ambient threshold criteria and to achieve compliance with the NAAQS. In 1990, the CAA was amended to strengthen regulation of both stationary and mobile emission sources for criteria pollutants.

3.1.2 Transportation Conformity Rules

The conformity requirement is based on the federal CAA Section 176(c), which prohibits the U.S. Department of Transportation and other federal agencies from funding, authorizing, or approving plans, programs, or projects that do not conform to the applicable SIP for attaining the NAAQS. Transportation conformity applies to highway and transit projects and takes place on two levels: the regional—or planning and programming—level, and the project level. A transportation project must conform at both levels to be approved.

Conformity requirements apply only in nonattainment and maintenance areas for the NAAQS, and only for the specific NAAQS that are or were violated. Conformity requirements do not apply in unclassifiable/attainment areas for NAAQS and do not apply at all for state standards regardless of the status of the area. The Spaghetti Bowl project is subject to the conformity requirements because the project's study area has been designated as a maintenance area for PM_{10} and CO (EPA 2018a).

Regional conformity is concerned with how well the regional transportation system supports plans for attaining the NAAQS. Regional conformity is based on emission analysis of Regional Transportation Plans (RTPs) and Federal Transportation Improvement Programs (FTIPs), which include all transportation projects planned for a region over a period of at least 20 years for the RTP, and 4 years for the FTIP. RTP and FTIP conformity uses travel demand and emission models to determine whether or not the implementation of the projects would conform to emission budgets or other tests at various analysis years, showing that requirements of the CAA and the SIP are met. If the conformity analysis is successful, the Metropolitan Planning Organization, FHWA, and Federal Transit Administration (FTA), make determinations that the RTP and FTIP are

in conformity with the SIP for achieving the goals of the CAA. Otherwise, the projects in the RTP and/or FTIP must be modified until conformity is attained. If the design concept, scope, and "open-to-traffic" schedule of a proposed transportation project are the same as described in the RTP and FTIP, then the project meets regional conformity requirements for purposes of project-level analysis. The Washoe County Regional Transportation Committee (RTC) is the federally designated Metropolitan Planning Organization responsible for transportation planning for the area where the Spaghetti Bowl project would be located.

Project-level conformity is achieved by demonstrating that:

- The project comes from a conforming RTP and FTIP.
- The project has a design concept and scope that has not changed significantly from those in the RTP and FTIP.
- Project analyses have used the latest planning assumptions and EPA-approved emissions models.
- In PM areas, the project complies with control measures in the SIP, if any.

Additional analyses known as "hot-spot" analyses may be required for projects in CO and PM nonattainment or maintenance areas to examine localized air quality impacts.

The conformity demonstration is not required for construction-related activities that occur only during the construction phase and last 5 years or less at any individual site (40 CFR 93.123(c)(5)).

3.1.3 Mobile Source Air Toxics

In addition to the criteria pollutants, EPA regulates air toxic emissions. Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments of 1990, whereby Congress mandated that EPA regulate 188 air toxics, also known as hazardous air pollutants. EPA has assessed this expansive list in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (*Federal Register*, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are listed in EPA's Integrated Risk Information System (IRIS) (EPA 2018b). In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from EPA's *National Air Toxics Assessment* (EPA 2014). These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics (MSATs), the list is subject to change and may be adjusted in future EPA rules. The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines (FHWA 2016).

Unlike the criteria pollutants, MSATs do not have NAAQS, making evaluation of their impacts more subjective.

3.1.4 Greenhouse Gases

Greenhouse gases (GHGs) include both naturally occurring and anthropogenic gases that trap heat in the earth's atmosphere. GHGs include, but are not limited to, carbon dioxide (CO_2), methane, nitrous oxide, hydro-chlorofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

EPA's authority to regulate GHG emissions stems from the U.S. Supreme Court decision in Massachusetts v. EPA (2007). The Supreme Court ruled that GHGs meet the definition of air pollutants under the existing CAA and must be regulated if these gases could be reasonably anticipated to endanger public health or welfare. Responding to the Court's ruling, EPA finalized an endangerment finding in December 2009.

3.2 STATE AND LOCAL REGULATIONS

The Washoe County Health District—Air Quality Management Division (WCAQMD) is the air pollution control agency for Washoe County, Nevada. WCAQMD administers the permitting of stationary sources, and oversees regulatory compliance, air quality monitoring, and the air pollution control program for Washoe County. The agency is responsible for preparing a SIP for nonattainment and maintenance areas of Washoe County. The SIP outlines goals and strategies that would lead the area into compliance with NAAQS. WCAQMD prepared the CO SIP in 2005 and 2014, and the PM_{10} SIP in 2010.

WCAQMD regulation Section 040.030 Dust Control requires limiting fugitive dust emissions into ambient air during construction, and a construction project must obtain a dust control permit from WCAQMD unless the project is exempt from such requirements.

4.0 EXISTING CONDITIONS

4.1 TOPOGRAPHY AND CLIMATE

Nevada has wide climatic diversity, ranging from scorching lowland desert in the south to cool mountain forests in the north. Its varied and rugged topography, mountain ranges, and narrow valleys range in elevation from about 1,500 feet to more than 13,000 feet above sea level.

Washoe County is in the northwest portion of Nevada and is bounded by the states of California and Oregon, and the counties of Humboldt, Pershing, Storey, Churchill, Lyon, and Carson City. The Spaghetti Bowl project is in the Truckee Meadows valley in the southern portion of Washoe County. This area is geographically identified as Hydrographic Area 87 as defined by the State of Nevada, Division of Water Resources. It is surrounded by mountain ranges, which can lead to wintertime temperature inversions, when a layer of cold air is trapped in the valley and warmer air above the inversion acts as a lid, containing and concentrating air pollutants. Much of Washoe County's urban population lives in the cities of Reno and Sparks in the Truckee Meadows valley. Anthropogenic activities, such as automobile use and residential wood combustion, are also concentrated here (WCAQMD 2014a).

4.2 EXISTING AIR QUALITY CONDITIONS

This section describes the existing air quality conditions and maintenance status in the project vicinity, and the emission trends of air pollutants in the area.

4.2.1 Attainment Status

The study area is currently designated as "maintenance" for CO and PM_{10} under NAAQS and is "unclassifiable/attainment" for all other criteria pollutants.

The Truckee Meadows area has attained the 8-hour CO NAAQS since 1991. A redesignation request and maintenance plan for the Truckee Meadows carbon monoxide nonattainment area was first submitted to the EPA in September 2005 (WCAQMD 2005). Truckee Meadows was redesignated to attainment status effective August 4, 2008. In 2014, WCAQMD prepared the Second 10-Year Maintenance Plan for the Truckee Meadows 8-Hour Carbon Monoxide Attainment Area (WCAQMD 2014b). The PM_{10} SIP is the *Redesignation Request and Maintenance Plan for the Truckee Meadows 24-Hour PM_{10} Non-Attainment Area* (WCAQMD 2014a).

4.2.2 Monitored Air Quality

WCAQMD implements an ambient air monitoring program in Washoe County. There are four air quality monitoring stations within 1 mile of the project. They are:

- 301A State Street, Reno: measures ozone, PM_{10}, $PM_{2.5}$, CO, NOx, SO_2

- 4110 Delucchi Lane, Reno: measures ozone, PM10, and CO
- 891 E Plumb Lane, Reno: measures PM_{10}
- 750 Fourth Street, Sparks: measures ozone, PM_{10}, $PM_{2.5}$, and CO

Table 4-1 summarizes the maximum pollutant concentrations and the numbers of days each year that the measured concentrations were greater than the NAAQS from 2013 to 2017. Table 4-1 presents the worst-case concentration of all four stations.

Table 4-1. Maximum Pollutant Concentrations Measured at Air Quality Monitoring Stations Near the Project

Pollutant	Parameter	2013	2014	2015	2016	2017
CO	Max. 1-hour concentration (ppm)	3.1	3.4	2.7	2.7	3.0
	Max. 8-hour concentration (ppm)	2.6	2.7	2.1	1.9	2.3
	# Days > 1-hour std. of 35 ppm	0	0	0	0	0
	# Days > 8-hour std. of 9 ppm	0	0	0	0	0
Ozone	Max. 8-hour concentration (ppm)	0.073	0.076	0.075	0.073	0.071
	# Days > 8-hour std. of 0.070 ppm	2	4	6	6	2
NOx	Max. 1-hour concentration (ppm)	0.084	0.06	0.067	0.05	0.089
	Annual average (ppm)	0.160	0.137	0.141	0.127	0.126
	# Days > 1-hour std. of 0.10 ppm	0	0	0	0	0
PM_{10}	Max. 24-hour concentration ($\mu g/m^3$)	133	136	100	80	122
	# Days > 24-hour std. of 150 $\mu g/m^3$	0	0	0	0	0
$PM_{2.5}$	Max. 24-hour concentration ($\mu g/m^3$)	89.4	100.9	39.2	24.8	45.6
	Annual average ($\mu g/m^3$)	12.3	8.7	7.8	7	8
	# Days > 24-hour std. of 35 $\mu g/m^3$	N/A	N/A	N/A	N/A	N/A
SO_2	Max. 1-hour concentration ($\mu g/m^3$)	0.008	0.0069	0.0072	0.0056	0.0097
	# Days > 1-hour std. of 0.075 ppm	0	0	0	0	0

Source: EPA 2018c.

N/A = Information is not available

As shown in Table 4-1, maximum ozone concentrations exceeded the 8-hour NAAQS in the past 5 years. $PM_{2.5}$ concentrations exceeded the 24-hour NAAQS during four of the past 5 years. NAAQS were not exceeded for other pollutants and averaging time periods.

Ozone is formed through a series of reactions that occur in the atmosphere in the presence of sunlight. Since the reactions are slow and occur as the pollutants are diffusing downwind, elevated ozone levels are often found many miles from the sources of the precursor pollutants. Therefore, the effects of ozone and its precursors are examined on a regional or "mesoscale" basis and assessed in system-level planning in developing state implementation plans.

4.2.3 Mobile Source Air Toxics

Transportation projects may affect the regional or local air toxics concentrations due to the MSAT emissions from vehicles. MSAT emissions are expected to be lower than present levels in future years nationwide. Using EPA's MOVES2014a model, as shown in Figure 4-1, FHWA estimates that even if vehicle miles traveled (VMT) increase by 45 percent from 2010 to 2050 as forecast, a combined reduction of 91 percent in the total annual emissions for the priority MSATs is projected for the same time period. Diesel PM is the dominant component of MSAT emissions, making up 50 to 70 percent of all priority MSAT pollutants by mass, depending on calendar year (FHWA 2016).

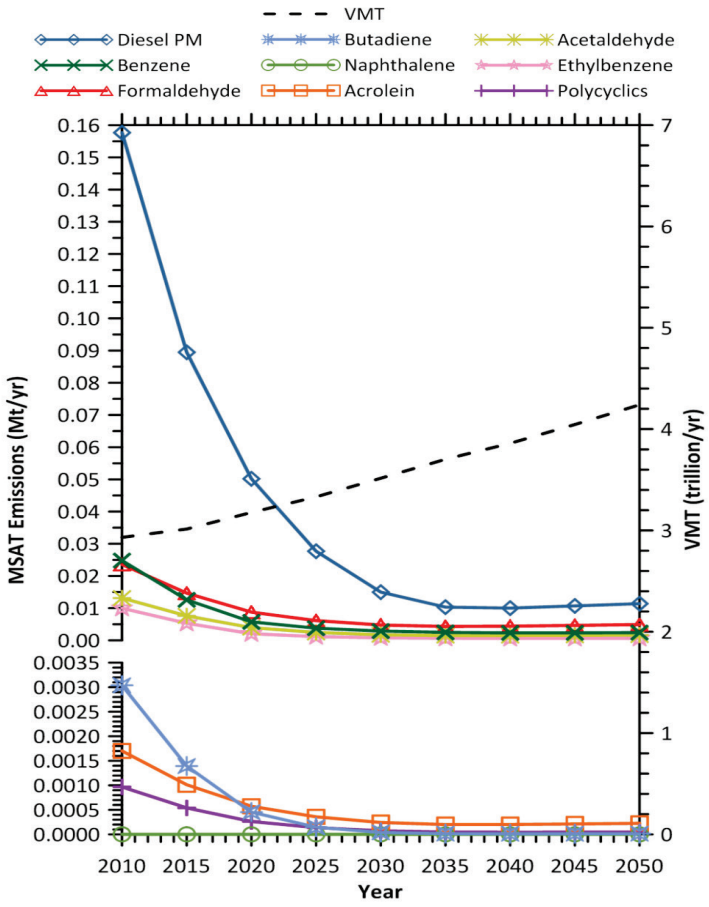

Figure 4-1. National MSAT Emissions Trends 2010-2050 for Vehicles Operating on Roadways, Projected by FHWA Using EPA's MOVES2014a Model

Note: Trends for specific locations may be different, depending on locally derived information representing VMT, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.
Mt = million tons
Source: EPA MOVES2014a model runs conducted by FHWA (FHWA 2016)

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how the potential health risks

posed by MSAT exposure should be factored into project-level decision-making within the context of the National Environmental Policy Act (NEPA). Nevertheless, air toxics concerns continue to be raised on highway projects during the NEPA process.

Even as the science emerges, decision-makers are expected by the public and other agencies to address MSAT impacts in environmental documents. FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects.

4.2.4 Greenhouse Gases

The inventory of Nevada's GHG emissions (Nevada Division of Environmental Protection 2016) estimated that gross GHG emissions for the state in 2013 totaled 44.039 million metric tons of carbon dioxide equivalents ($MMTCO_2eq$). Total Nevada GHG emissions have increased 25 percent since 1990 but have decreased 27 percent from the 2005 peak of 60.362 $MMTCO_2eq$.

In 2008, Washoe County emitted approximately 6.09 $MMTCO_2eq$ from the residential, commercial, industrial, transportation, and waste sectors. Fuel consumption in the transportation sector contributed 43 percent of total emissions (WCAQMD 2010).

4.2.5 Sensitive Receptors

Sensitive air quality receptors include receptors such as residences, schools, daycare centers, nursing homes, and hospitals. The study area has mixed residential, commercial, and industrial land uses. The area north of the Spaghetti Bowl along US 395 is mostly residential. Other parts of the study area are mixed residential/commercial/industrial. Nonresidential sensitive receptors, such as schools, daycare centers, and hospitals, within the study area of 600 feet from the nearest travel lanes, are shown in Figure 4-2. The ambient air concentrations shown in Table 4-1 are representative of the existing conditions experienced by sensitive receptors in the study area.

Figure 4-2. Sensitive Receptor Locations

5.0 ENVIRONMENTAL CONSEQUENCES

This section discusses the potential of the Spaghetti Bowl Project to affect air quality due to air pollutant emissions from construction and post-construction use of the study area freeway system, and the avoidance, minimization, and mitigation measures that could be implemented.

5.1 LONG-TERM IMPACTS

The long-term, operational impact analysis includes an evaluation of project conformity at the regional and project levels and an analysis of MSAT effects. In the long-term, the project would relieve congestion, improve level of service (LOS), reduce delay from incidents, and thereby reduce emissions for the build alternatives and be beneficial to regional air quality. The analyses show that the project meets the transportation conformity requirements and that impacts associated with project operation would not have an adverse effect on air quality.

5.1.1 Transportation Conformity

The Spaghetti Bowl project is in Truckee Meadows (Hydrographic Area 87) in Washoe County, Nevada. The area is currently designated as "maintenance" for CO and PM_{10}. Therefore, the project would be subject to transportation conformity requirements and needs to demonstrate regional and project-level conformity for these two pollutants.

5.1.1.1 Regional Conformity

Regional conformity for transportation projects is satisfied by the project's inclusion in a federally approved RTP and Regional Transportation Improvement Program (a subset of projects in the RTP). The project meets the regional conformity requirements and is included in Washoe County RTC's financially constrained RTP and FTIP amendments that were adopted on August 17, 2018. FHWA approved the RTP and FTIP amendments on September 19, 2018.

Inclusion in the conforming RTP and FTIP demonstrates that the project was evaluated for regional impacts, meets the planning and regional requirements for demonstration of federal conformity, and is consistent with local air quality planning efforts.

5.1.1.2 Project Level Conformity

A project-level conformity determination is required for projects in nonattainment and maintenance areas for CO, PM_{10}, and $PM_{2.5}$. Because the project is in a CO and PM_{10} maintenance area, localized CO and PM_{10} impacts were evaluated to determine if the project would cause any new violations of the CO or PM_{10} NAAQS or increase the frequency or severity of any existing violation. As discussed in the following sections, the project is included in the financially constrained RTP and FTIP, and it would not cause localized CO or PM_{10} hot-spot impacts. Therefore, the proposed project meets the project-level conformity requirements.

Carbon Monoxide Hot-Spot Analysis

To evaluate whether the project would cause localized increases of CO concentrations that would violate NAAQS due to traffic delay at congested intersections, the Nevada Department of Transportation (NDOT) performed a CO hot-spot analysis following EPA's *Guideline for Modeling Carbon Monoxide from Roadway Intersections* (EPA 1992).

The LOS during morning (AM) and afternoon (PM) peak hours in 2040 was reviewed for signalized intersections affected by Alternatives 1, 2, and 3. Intersections with LOS A, B, or C were considered to have insignificant impacts on air quality, and no further analysis was needed (EPA 1992). For those intersections found to be at LOS D, E, or F, further screening criteria were applied to select the worst-case intersections for quantitative air dispersion modeling. Following EPA's guideline, NDOT selected the three intersections with the highest volume and the three intersections with the highest delay for further analysis. Intersection data for each alternative were screened separately. A complete list of the LOS, volume, and delay for the affected intersections is presented in Attachment 1. The following intersections were selected for CO hot-spot analysis based on traffic information available during initial report preparation in 2018:

Alternative 1

- Mill Street/Kietzke Lane, PM peak hour
- Mill Street/Greg Street and Terminal Way, PM peak hour
- Plumb Lane/Harvard Way, PM peak hour
- Moana Lane/Kietzke Lane, PM peak hour
- Moana Lane and Airway Drive/Neil Road, PM peak hour

Alternative 2

- McCarran Boulevard/US 395 Northbound ramps, PM peak hour
- McCarran Boulevard/Northtowne Lane, PM peak hour
- Moana Lane/Kietzke Lane, PM peak hour
- Moana Lane and Airway Drive/Neil Road, PM peak hour
- Wells Avenue/Sixth Street, PM peak hour
- Pyramid Way/Victorian Avenue, PM peak hour

Alternative 3

- Mill Street/Kietzke Lane, PM peak hour
- Moana Lane/Kietzke Lane, PM peak hour
- Moana Lane/I-580 Southbound ramps, PM peak hour
- Moana Lane and Airway Drive/Neil Road, PM peak hour
- Pyramid Way/Victorian Avenue, PM peak hour

In April 2019, the project's traffic study was updated for Alternative 2 to include the southbound I-580 airport direct-connect ramp and other updated design refinements. The updated traffic conditions at the selected intersections for Alternative 2 are similar or slightly better than the conditions used in the 2018 modeling analysis. Therefore, remodeling is not needed for those intersections. However, due to the design changes, two intersections previously not selected for hot-spot modeling in the 2018 analysis are now intersections with the highest traffic volumes. These two intersections were added to the modeling in the updated CO hot-spot analysis:

- Plumb Lane/Harvard Way: PM peak hour
- Keystone Avenue/I-80 ramps: PM peak hour

NDOT examined the selected worst-case intersections for applicability under FHWA's 2017 Carbon Monoxide Categorical Hot-Spot Finding (CO Categorical Finding, FHWA 2017) to determine if quantitative CO modeling is required. Intersections within the range of the CO Categorical Finding would not require quantitative CO modeling to demonstrate conformity. For intersections that do not fall within the range of the CO Categorical Finding, quantitative CO hot-spot modeling is required for conformity determination (FHWA 2017).

NDOT determined the truck percentages, median widths, and alignments of the selected worst-case intersections do not fall within the range defined in the CO Categorical Finding. Therefore, quantitative CO hot-spot modeling was performed using the MOVES2014a and CAL3QHC models for the selected intersections for the No Build Alternative and Alternatives 1, 2, and 3. NDOT followed the guidance in *Using MOVES2014 in Project-Level Carbon Monoxide Analyses* (EPA 2015a) and *Guideline for Modeling Carbon Monoxide from Roadway Intersections* (EPA 1992). NDOT compared the modeling results to the CO NAAQS to demonstrate project-level conformity.

NDOT derived traffic data for the CO hot-spot modeling from traffic counts and other information developed as part of a traffic analysis in the study area. Output from two signal-timing traffic models, Vissim and Synchro9, were used to evaluate CO impacts for the design year of 2040. Specifically, peak hour LOS, delay, and traffic volumes were taken from Vissim output, while lane configurations and cycle times were taken from Synchro9 output. Saturated flow rate is an optional input and was not used in the CO hot-spot analysis. The following describes the key parameters used in the modeling:

- NDOT estimated vehicular CO emissions using the EPA's MOVES2014a vehicle emission simulation model. Emission factors were obtained for both free-flow speeds and periods of idle for the design year of 2040.

- Free-flow speeds were selected based on posted speed limits in the vicinity of the intersections evaluated, and ranged from 20 to 45 mph. A speed of 0 mph was used to calculate an idle emission factor in units of grams per hour.

- Project-specific vehicle data were not available; therefore, default data from MOVES2014a were used as a surrogate.

- Source type hour fraction default data were adopted from EPA's Mobile6.2 model, converted for use with MOVES2014a. MOVES2014a default peak hour winter and summer temperatures and relative humidity were modeled with the maximum emission rate, from either winter or summer conditions, selected for use in this analysis.

The CO hot-spot modeling used CAL3QHC dispersion model to estimate the maximum 1-hour CO concentrations in the vicinity of the affected intersection. Eight-hour CO concentrations were obtained by multiplying the maximum 1-hour CO concentrations by a persistence factor of 0.7 (EPA 1992). The persistence factor accounts for the fact that over 8 hours (as distinct from a single hour), vehicle volumes will fluctuate downward from the peak hour, vehicle speeds may vary, and meteorological conditions, including wind speed and wind direction, will vary compared to the conservative assumptions used for the single hour.

Receptors were placed around the intersections at distances of 0, 25, and 50 meters along each approach. The receptors were placed 3 meters from the edge of the street to ensure that they were not within the mixing zone of the travel lanes (EPA 1992). Table 5-1 summarizes the input values used in CAL3QHC modeling. While the EPA guidance recommends using atmospheric stability class[1] "D" for urban conditions, the CO hot-spot modeling used a more conservative stability class "E" in the modeling to account for the stable conditions during inversions.

Table 5-1. CO Modeling - CAL3QHC Input Parameters

Parameter	Value[a]
Surface roughness	321 cm
Wind speed	1 m/s
Stability class	E[b]
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
[a] Parameter values are from EPA 1992.	

[1] Property of ambient air that either enhances (unstable) or suppresses (stable) vertical motion of air parcels; depends on the vertical temperature profile or sounding of the ambient air and whether air parcels are saturated (cloudy) or unsaturated (clear).

Parameter	Value[a]
[b] Stability class E is considered more stable and conservative than stability class D, which is the recommended value for urban areas. cm = centimeter(s); m = meter(s); m/s = meter(s) per second	

The modeling results demonstrated that the CO concentrations at the worst-case intersections would not cause exceedances of the 1-hour or 8-hour CO NAAQS. All other intersections within the project study area would have lower CO concentrations than these worst-case intersections. Therefore, the project would not cause new violations of the NAAQS for CO at affected intersections within the project study area. Modeling results of CO concentrations are shown in Table 5-2.

Table 5-2. Maximum Predicted Concentrations for Worst-Case Intersections

Intersection	2040 No Build		2040 Alternative 1		2040 Alternative 2		2040 Alternative 3	
	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
NAAQS	**35**	**9**	**35**	**9**	**35**	**9**	**35**	**9**
McCarran Blvd/US 395 Northbound Ramps	3.5	2.8	N/A	N/A	3.6	2.8	N/A	N/A
McCarran Blvd/Northtowne Ln	3.5	2.8	N/A	N/A	3.6	2.8	N/A	N/A
Mill St/Kietzke Ln	3.5	2.8	3.5	2.8	N/A	N/A	3.5	2.8
Mill St/Greg St and Terminal Way	3.5	2.8	3.5	2.8	N/A	N/A	N/A	N/A
Plumb Lane/Harvard Way	3.5	2.8	3.6	2.8	3.6	2.8	N/A	N/A
Moana Lane/Kietzke Ln	3.5	2.8	3.6	2.8	3.6	2.8	3.6	2.8
Moana Lane/I-580 Southbound Ramps	3.5	2.8	N/A	N/A	N/A	N/A	3.6	2.8
Moana Lane and Airway Dr/Neil Rd	3.5	2.8	3.5	2.8	3.5	2.8	3.5	2.8
Wells Ave/Sixth St	3.7	2.9	N/A	N/A	3.6	2.8	N/A	N/A
Pyramid Way/Victorian Ave	3.5	2.8	N/A	N/A	3.5	2.8	3.5	2.8
Keystone Avenue/I-80 Ramps	3.6	2.8	N/A	N/A	3.6	2.8	N/A	N/A

Notes:

The results presented in the table include the maximum 1-hour and 8-hour background concentrations of 3.4 ppm and 2.7 ppm, respectively, measured during 2013 to 2017.

N/A = Not applicable (i.e., intersection did not require evaluation based on screening criteria presented above)

PM_{10} Hot-Spot Analysis

NDOT evaluated the project's potential to cause localized PM_{10} impacts to demonstrate that the project is unlikely to cause new violations or contribute to existing violations of the PM_{10} standards. The analysis followed the criteria listed in *Transportation Conformity Guidance for*

Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas (EPA 2015b). According to this guidance, the first step in the PM_{10} hot-spot evaluation is to determine if the project is a project of air quality concern (POAQC). A project that is not POAQC is unlikely to cause localized PM_{10} hot-spot impacts.

EPA specified in 40 CFR 93.123(b)(1) that POAQC are certain highway and transit projects that involve significant levels of diesel vehicle traffic, such as major highway projects and projects at congested intersections that handle significant diesel traffic, or any other project that is identified in the $PM_{2.5}$ or PM_{10} SIP as a localized air quality concern. NDOT conducted a preliminary evaluation of the project in accordance with the following criteria:

- Criterion #1: 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.
  - The proposed project is not a new highway or expressway that serves a significant volume of diesel truck traffic. The annual average daily traffic (AADT) on I-80, I-580, and US 395 in the project study area ranges from 74,000 to 186,000 vehicles per day in 2040, as shown in Table 5-3. The traffic volume for Alternatives 1, 2, and 3 would be the same as for the No Build Alternative because the project would not induce additional traffic (CH2M 2018).
  - The percentage of truck traffic in the project study area is approximately 4 to 6 percent on highways and 3 percent on arterials according to the RTC's regional traffic demand model. While there is diesel truck traffic on highways within the study area, Alternatives 1, 2, and 3 would not increase the annual average daily traffic or change the vehicle fleet mix in the study area when compared to the No Build Alternative. Therefore, the truck volume would be the same as the No Build Alternative, and the project would not cause a significant increase in the number of diesel vehicles.

Table 5-3. AADT on Freeway Segments in the Study Area

Freeway Segments	2040 AADT (Alternatives 1, 2, 3, and No Build Alternative)
I-80 Keystone - Virginia Street	121,000
I-80 Virginia Street - Wells Avenue	134,000
I-80 Wells Avenue – I-580	141,000
I-80 I-580 – Prater Way	129,000
I-80 Prater Way – Rock Boulevard	126,000
I-80 Rock Boulevard – Pyramid Way	116,000
I-80 Pyramid Way- McCarran Boulevard	113,000
I-580 McCarran Boulevard - Virginia Street	93,000
I-580 Virginia Street - Moana Lane	141,000
I-580 Moana Lane - Plumb Lane/Villanova Drive	167,000

Freeway Segments	2040 AADT (Alternatives 1, 2, 3, and No Build Alternative)
I-580 Plumb Lane/Villanova Drive - Mills Street	171,000
I-580 Mills Street – Second Street	186,000
I-580 Second Street – I-80	183,000
I-580 I-80 – Oddie Boulevard	159,000
I-580 Oddie Boulevard - McCarran Boulevard	142,000
I-580 McCarran Boulevard - Clear Acre Lane	150,000
Source: AADT for No Build Alternative was from NDOT Traffic Information Systems (TRINA) and Washoe County RTC *2040 Regional Transportation Plan* (RTP; RTC, 2017) Model. Alternatives 1, 2, and 3 have the same AADT as the No Build Alternative in 2040 (CH2M 2018).	

- Criterion #2: Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles, or those that will change to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project.
  - The project would improve the traffic conditions in the project study area by providing additional travel lanes and improvements to the Spaghetti Bowl. The added lanes would increase travel speed and reduce congestion and idling of vehicles. The project is not expected to induce additional diesel vehicle traffic into the project study area; therefore, the project would not increase diesel vehicle traffic at intersections that are at LOS D, E, or F.
- Criterion #3: New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location.
  - No new bus or rail terminals would be constructed under the proposed project.
- Criterion #4: Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location.
  - No bus or rail terminals would be expanded under the proposed project.
- Criterion #5: Projects in or affecting locations, areas, or categories of sites which are identified in the PM_{10} or $PM_{2.5}$ applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.
  - The project location was not identified in the region's SIP as a site of possible violation of PM_{10}.

In summary, although the proposed project is in a maintenance area for PM_{10} under NAAQS, the project would not be a POAQC based on the EPA criteria discussed above. Therefore, the project is not expected to cause or contribute to new localized PM_{10} violations or increase frequency or severity of existing violations. As such, the project would meet the conformity requirements of 40 CFR 93.116 without a quantitative hot-spot analysis.

A memorandum documenting NDOT's determination was submitted to the RTC's Air Quality Interagency Consultation Group for discussion at its July 2018 meeting. On July 24, 2018, RTC's interagency consultation group concurred with the NDOT conclusion that the project is not of air quality concern, and further quantitative hot-spot analysis is not needed to demonstrate conformity.

5.1.2 Mobile Source Air Toxics

5.1.2.1 Qualitative Analysis of Mobile Source Air Toxics Effects

Transportation projects may affect the regional or local air toxic concentrations due to the MSAT emissions from vehicles. Potential MSAT effects from the project operation were evaluated following the FHWA memorandum titled *Updated Interim Guidance on Air Toxic Analysis in NEPA Documents* (FHWA 2016). FHWA developed a tiered approach with three categories for analyzing MSAT impacts, depending on specific project circumstances:

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

According to FHWA's updated interim guidance, the types of projects considered to have low potential MSAT effects include those that improve operations of highway, transit, or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions (FHWA 2016). As discussed above, compared to the No Build Alternative, Alternatives 1, 2, and 3 would not increase the vehicle volume or change the vehicle mix of highways and local streets in the project study area (CH2M 2018). The project is not expected to increase the number of diesel vehicles or concentrate diesel vehicles at a single location. Therefore, this project would have low potential for MSAT effects.

For each alternative in this analysis, the amount of MSATs emitted would be proportional to the VMT, assuming that other variables such as fleet mix (i.e., percentage of each type of vehicle category such as passenger cars, light to medium-duty vehicles, and heavy duty trucks) are the same for each alternative. The VMT for Alternatives 1, 2, and 3 would be similar to the No Build Alternative because Alternatives 1, 2, and 3 would not induce additional vehicle travel into the project study area based on NDOT's traffic study for this project. According to EPA's MOVES2014 model, emissions of all priority MSATs decrease as speed increases. Therefore, the improvements to the study area freeway system would increase the vehicle travel speed and reduce vehicle idling time, which in turn would lower MSAT emissions in the project study area.

Because the estimated VMT under all of the alternatives are nearly the same, it is expected there would be no appreciable difference in overall MSAT emissions among the alternatives. Also, regardless of the alternative chosen, emissions would likely be lower than present levels in the design year as a result of EPA's programs that are projected to reduce annual MSAT emissions by over 90 percent between 2010 and 2050 (FHWA 2016). Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

The proposed interchange modifications and additional travel lanes would have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, there may be localized areas where ambient concentrations of MSATs could be higher under Alternatives 1, 2, and/or 3 than the No Build Alternative.

The localized increases in MSAT concentrations would likely be most pronounced along the expanded freeway sections and new or reconstructed ramps. Shifting of the freeway and ramps would occur at multiple locations in the study area; however, in some locations the freeway would shift minimal distances and would not cause meaningful change of MSAT exposure by the nearby receptors. Table 5-4 lists the locations of residents and other sensitive receptors that may have increased MSAT concentrations due to the roadways shifting closer to them. However, the magnitude and the duration of these potential increases compared to the No Build Alternative cannot be reliably quantified due to incomplete or unavailable information for forecasting project-specific MSAT health impacts. In summary, when a highway is widened, the localized level of MSAT emissions for Alternatives 1, 2, and 3 could be higher relative to the No Build Alternative at certain locations, but this could be offset by increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSATs would be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause regionwide and corresponding localized MSAT levels to be significantly lower than today.

5.1.2.2 Incomplete or Unavailable Information for Project-Specific MSAT Health Impacts Analysis

The MSAT analysis above includes a basic analysis of the likely MSAT impacts of the proposed project. Due to the limitations of information and methodology of the analysis, the following discussion is included in accordance with Council on Environmental Quality regulations regarding incomplete or unavailable information (40 CFR 1502.22[b]).

Table 5-4. Locations Where Roadways Would Shift Closer to Sensitive Receptors

Areas	Alternative 1	Alternative 2	Alternative 3
Spaghetti Bowl ramps and through lanes	• Residents north of I-80 on both sides of US 395 • Coral Academy • University of Nevada, Reno Early Head Start • Community Service Agency Head Start Learning Center • West Hills Hospital • Mater Academy of Northern Nevada	• Residents north of I-80 on west sides of US 395 • Coral Academy • University of Nevada, Reno Early Head Start • Community Service Agency Head Start Learning Center • West Hills Hospital	• Residents north of I-80 on west sides of US 395
Wells Avenue interchange	• Residents south of I-80 east of Wells Avenue	• Residents south of I-80 between Wells Avenue and Sutro Street	• Residents south of I-80 west of Wells Avenue, along Eureka Avenue
Pyramid Way interchange	• Residents north of I-80 along Pyramid Way and C Street	• N/A	• N/A
Plumb Lane interchange	• Wooster High School	• Wooster High School	• Wooster High School
Second Street and Mill Street interchanges	• Residents west of US 395 between Second Street and Mill Street • Reno-Sparks Indian Colony Head Start • Reno-Sparks Indian Colony Senior Center	• Residents west of US 395 between Second Street and Mills Street • Reno-Sparks Indian Colony Head Start • Reno-Sparks Indian Colony Senior Center	• Residents west of I-580 between Second Street and Mill Street • Reno-Sparks Indian Colony Head Start • Reno-Sparks Indian Colony Senior Center
Second Street interchange freeway and ramps connecting Spaghetti Bowl	• Residents west of US 395 north of Second Street	• N/A	• N/A
Oddie Boulevard interchange	• Residents on both side of US 395 south of Oddie Boulevard	• Residents on both side of US 395 south of Oddie Boulevard	• Residents on east side of US 395 north of Oddie Boulevard

Note: Roads with minimal shifting are not included in this table.
N/A = Not applicable or roadway shifting is minimal

The discussion regarding the limitations of the MSAT analysis is prototype language taken from Appendix C of the FHWA *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents* (FHWA 2016).

In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

EPA is responsible for protecting the public health and welfare from any known or anticipated effects of an air pollutant. EPA is the lead authority for administering the CAA and its amendments and has specific statutory obligations with respect to hazardous air pollutants and MSATs. EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. It maintains IRIS, which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (https://www.epa.gov/iris). Each report provides assessments of noncancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSATs, including the Health Effects Institute (HEI). A number of HEI studies are summarized in Appendix D of FHWA's *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents* (FHWA 2016). Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings, cancer in animals, and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI 2007) or in the future as vehicle emissions substantially decrease.

The methodologies for forecasting health impacts include emissions modeling, dispersion modeling, exposure modeling, and then final determination of health impacts, with each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70-year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways, to determine the portion of time that people are actually exposed at a specific

location, and to establish the extent of exposure attributable to a specific proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSATs because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (HEI 2007). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. EPA states that with respect to diesel engine exhaust, "[t]he absence of adequate data to develop a sufficiently confident dose-response relationship from the epidemiologic studies has prevented the estimation of inhalation carcinogenic risk" (EPA IRIS database, Diesel Engine Exhaust, Section II.C, https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0642.htm#quainhal).

There is also a lack of national consensus on an acceptable level of risk. The current context is the process used by EPA as provided by the CAA to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than one in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than one in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable (https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD59852578000050C9DA/$file/07-1053-1120274.pdf).

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision-makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

5.2 SHORT-TERM IMPACTS

5.2.1 Construction Emissions

Project construction would result in short-term, temporary emissions of fugitive dust and equipment-related exhaust emissions such as nitrogen oxides, CO, volatile organic compounds, SO_2, and particulate matter (PM_{10}/$PM_{2.5}$) in the study area. Construction of the project is not expected to last longer than 5 years. Therefore, a project-level conformity analysis is not required, and construction emissions do not need to be accounted for in a hot-spot analysis per 40 CFR 93.123(c)(5).

Sources of fugitive dust (PM_{10} and $PM_{2.5}$) during project construction would include disturbed surface areas at the construction site and trucks carrying uncovered loads of soil/debris. Fugitive dust emissions would vary from day to day, depending on the nature and magnitude of construction activity and local weather conditions. Dust emissions would depend on soil moisture, silt content of soil, wind speed, and the number of equipment operating.

Exhaust emissions during construction would be generated by fuel combustion in motor vehicles and construction equipment. Construction vehicles and disruption of normal traffic flow could result in increased motor vehicle emissions in certain areas. These emissions would be temporary and limited to the immediate area surrounding the construction site.

NDOT would require equipment and vehicles used for construction to comply with EPA's emissions standards for on-road vehicles and off-road construction equipment. NDOT would require its construction contractor to comply with applicable dust-control requirements in WCAQMD regulations, and would implement best management practices to minimize emissions from construction. Potential air quality impacts would be temporary and short-term. Nevertheless, the project would comply with WCAQMD regulations to minimize fugitive dust emissions from construction.

Construction is anticipated to disturb more than one acre of land; therefore, NDOT's construction contractor would be required to obtain a dust-control permit from the WCAQMD (Regulation 040.030 of the District Board of Health Regulations) by submitting a Dust Mitigation Plan. NDOT would include additional measures to reduce construction fugitive dust emissions in the plans and specifications for construction in accordance with NDOT's *Standard Specifications for Road and Bridge Construction* (NDOT 2014). Typical emission control measures include, but are not limited to:

- Use periodic watering of disturbed surface areas to minimize visible fugitive dust emissions.
- Apply nontoxic soil stabilizers according to manufacturers' specifications to inactive construction areas.

- Reduce nonessential earth-moving activity under high wind conditions.
- Take actions sufficient to prevent project-related trackout onto paved surfaces, such as installing one or more grizzlies, gravel pads, and/or wash down pads adjacent to the entrance of a paved public roadway to control carry-out and trackout.
- Cover loads in haul vehicles or leave at least 6 inches of freeboard.
- Maintain the project vehicles and equipment in good operational conditions.
- Limit vehicle and equipment idling to the extent practicable.
- Configure construction parking to minimize traffic interference on local streets.

5.3 AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

Based on the analysis discussed above, the project is not expected to cause substantial adverse effects on air quality during construction and operation. Therefore, mitigation measures would not be required. The project would comply with WCAQMD regulations to minimize fugitive dust emissions by implementing the best management practice program and control measures included in the Dust Mitigation Plan and would comply with the requirements of the *Standard Specifications for Road and Bridge Construction* (NDOT 2014).

5.4 GREENHOUSE GASES

5.4.1 Project Greenhouse Gas Emissions

While there is no federal requirement to address GHG emissions or climate change in NEPA documents, this section includes a discussion of GHG emissions associated with the project. To date, no national standards have been established regarding GHGs, nor has EPA established criteria or thresholds for ambient GHG concentrations pursuant to its authority to establish motor vehicle emission standards for CO_2 under the CAA.

GHGs are different from other air pollutants evaluated in federal environmental reviews because their impacts are not localized or regional due to their rapid dispersion into the global atmosphere, which is characteristic of these gases. The environment for CO_2 and other GHG emissions is the planet. In addition, from a quantitative perspective, fluctuations in global climate are the cumulative result of numerous and varied parameters, which may include emission sources (in terms of both absolute numbers and types). Each emission source may make a relatively small contribution to global atmospheric GHG concentrations. However, it is not meaningful or useful to attempt to translate those relatively small emission differences into climate outcomes (e.g., temperature changes, drought/flooding severity). At this time, there is no scientific methodology for attributing specific climatological changes to emissions from a particular transportation project.

Under NEPA, detailed environmental analysis focuses on issues that are significant and meaningful to decision-making.[2] NDOT has concluded, based on the nature of GHG emissions and the exceedingly small potential GHG impacts of proposed projects, that GHG emissions from proposed actions will not result in "reasonably foreseeable significant adverse impacts on the human environment" (40 CFR 1502.22(b)). The GHG emissions from Alternatives 1, 2, and 3 would be insignificant during project construction, and would be similar to the No Build Alternative during operation. Therefore, the GHG emissions from the project would not play a meaningful role in a determination of the environmentally preferable alternative or the selection of the preferred alternative. More detailed information on GHG emissions "is not essential to a reasoned choice among reasonable alternatives" (40 CFR 1502.22(a)) or to making a decision in the best overall public interest based on a balanced consideration of transportation, economic, social, and environmental needs and impacts (23 CFR 771.105(b)). For these reasons, no alternatives-level GHG analysis has been performed for this project.

GHG emissions would be produced at different levels throughout the project's construction phase; their frequency and occurrence can be reduced through innovations in plans and specifications and by implementing better traffic management during the construction phase. Reducing idling times reduces harmful emissions from passenger cars and diesel-powered construction vehicles. In addition, with innovations such as longer pavement lives, improved traffic management plans, and changes in materials, the GHG emissions produced during construction can be mitigated to some degree by longer intervals between maintenance and rehabilitation events.

Even though project-level mitigation measures would not have a substantial impact on global GHG emissions because of the exceedingly small amount of GHG emissions involved, emission control measures such as limiting vehicle idling time and keeping equipment in good operational condition would have the effect of reducing GHG emissions. These activities are part of a program-wide effort by FHWA to adopt practical means to avoid and minimize environmental impacts in accordance with 40 CFR 1505.2(c).

5.4.2 Summary

This document does not incorporate an analysis of the GHG emissions or climate change effects of the alternatives because the potential change in GHG emissions is very small in the context of the affected environment. Because of the insignificance of the GHG impacts, those impacts would not be meaningful to a decision on the environmentally preferable alternative or to a choice among alternatives. The emission-reduction measures for project construction described in Section 5.2.1 represent practical project-level measures that may help reduce GHG emissions on an incremental basis and could contribute in the long term to a meaningful cumulative reduction when considered across the federal-aid highway program.

[2] See 40 CFR 1500.1(b), 1500.2(b), 1500.4(g), and 1501.7.

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ATTACHMENT 1 LOS, VOLUME, AND DELAY FOR INTERSECTION SCREENING

Air Quality Analysis - Spaghetti Bowl Project
Alternative 1 CO Hot-Spot Intersection Screening

Peak Hour	ID	Intersection	Volume Served (veh/hr)	Delay (sec/veh)	Intersection LOS
AM	1	Sutro Street / US 395 SB Ramps	843	5	A
AM	2	Sutro Street / US 395 NB Ramps	277	1	A
AM	3	Clear Acre Lane / Selmi Drive	948	23	C
AM	4	Clear Acre Lane / US 395 SB Ramps	2560	10	A
AM	5	Clear Acre Lane / US 395 NB Ramps	1761	15	B
AM	6	Clear Acre Lane / Epley Road	1934	4	A
AM	7	McCarran Boulevard / Clear Acre Lane	2204	30	C
AM	8	McCarran Boulevard / US 395 SB Ramps	3848	33	C
AM	9	McCarran Boulevard / US 395 NB Ramps	2655	34	C
AM	10	McCarran Boulevard / Northtowne Lane	2597	29	C
AM	11	Oddie Boulevard and Montello Street	1490	19	B
AM	12	Oddie Boulevard / US 395 SB Ramps	1951	16	B
AM	13	Oddie Boulevard / US 395 NB Ramps	1845	5	A
AM	14	Oddie Boulevard / Silverada Boulevard	1790	26	C
AM	15	2nd Street / Kietzke Lane	2542	33	C
AM	16	2nd Street / I-580 SB Ramps	1905	19	B
AM	17	2nd Street / I-580 NB Ramps	1715	10	A
AM	18	2nd Street / Grand Sierra Resort Entrance	1378	11	B
AM	19	Mill Street / Kietzke Lane	3708	42	D
AM	20	Mill Street / I-580 SB Ramps	3412	9	A
AM	21	Mill Street / I-580 NB Ramps and Grand Sierra Resort Entranc	3111	26	C
AM	22	Mill Street / Greg Street and Terminal Way	3165	33	C
AM	23	Villanova Drive / I-580 SB Ramps and Matley Lane	853	5	A
AM	24	Villanova Drive / I-580 NB Ramps	811	3	A
AM	25	Villanova Drive / Terminal Way	1653	20	B
AM	26	Plumb Lane / Harvard Way	2422	35	C
AM	27	Plumb Lane / I-580 Ramps	3640	11	B
AM	28	Plumb Lane / Terminal Way	2251	24	C
AM	29	Moana Lane / Kietzke Lane	3394	43	D
AM	30	Moana Lane / I-580 SB Ramps	3090	24	C
AM	31	Moana Lane / I-580 NB Ramps	2515	5	A
AM	32	Moana Lane and Airway Drive / Neil Road	1928	35	D
AM	33	Keystone Avenue / 7th Street	2271	28	C
AM	34	Keystone Avenue / I-80 Ramps	3453	15	B
AM	35	Keystone Avenue / 5th Street	2096	5	A
AM	36	Sierra Street / 9th Street and University Terrace	1453	16	B
AM	37	Sierra Street / 8th Street and I-80 WB on-ramp	1923	18	B
AM	38	Sierra Street / Maple Street and I-80 EB off-ramp	2400	18	B
AM	39	Sierra Street / 6th Street	2205	22	C
AM	40	Virginia Street / 9th Street	2230	15	B
AM	41	Virginia Street / 8th Street	2759	26	C
AM	42	Virginia Street / Maple Street	1745	16	B
AM	43	Virginia Street / 6th Street	1265	15	B
AM	44	Center Street / 9th Street	1358	16	B
AM	45	Center Street / 8th Street and I-80 WB off-ramp	1939	29	C
AM	46	Center Street / Maple Street and I-80 EB on-ramp	1060	16	B
AM	47	Center Street / 6th Street	973	15	B
AM	48	Wells Avenue / 9th Street	2039	21	C
AM	49	Wells Avenue / I-80 WB Ramps	2753	36	D
AM	50	Wells Avenue / I-80 EB Ramps	3275	13	B
AM	51	Wells Avenue / 6th Street	3319	27	C
AM	52	Prater Way / Victorian Avenue	845	6	A
AM	53	Prater Way / I-80 WB Ramps	1026	19	B
AM	54	Prater Way / I-80 EB Ramps	1033	17	B
AM	55	4th Street and Prater Way / Galletti Way	922	11	B
AM	56	Rock Boulevard / Victorian Avenue	1774	21	C
AM	57	Rock Boulevard / I-80 WB Ramps	2185	3	A
AM	58	Rock Boulevard / I-80 EB Ramps	2437	15	B
AM	59	Rock Boulevard / Hymer Avenue	2306	9	A
AM	61	Pyramid Way / I-80 Ramps	2134	3	A
AM	62	Pyramid Way / Nugget Avenue	446	4	A
AM	151	2nd Street / I-580 NB on-ramp	1604	3	A
AM	10001	Mills Street / I-580 NB on-ramp	2895	2	A

Air Quality Analysis - Spaghetti Bowl Project
Alternative 1 CO Hot-Spot Intersection Screening

Peak Hour	ID	Intersection	Volume Served (veh/hr)	Delay (sec/veh)	Intersection LOS
PM	1	Sutro Street / US 395 SB Ramps	1128	11	B
PM	2	Sutro Street / US 395 NB Ramps	668	4	A
PM	3	Clear Acre Lane / Selmi Drive	1528	15	B
PM	4	Clear Acre Lane / US 395 SB Ramps	2412	13	B
PM	5	Clear Acre Lane / US 395 NB Ramps	1697	34	C
PM	6	Clear Acre Lane / Epley Road	2518	1	A
PM	7	McCarran Boulevard / Clear Acre Lane	2943	36	D
PM	8	McCarran Boulevard / US 395 SB Ramps	3381	21	C
PM	9	McCarran Boulevard / US 395 NB Ramps	3809	23	C
PM	10	McCarran Boulevard / Northtowne Lane	3795	36	D
PM	11	Oddie Boulevard and Montello Street	1577	20	C
PM	12	Oddie Boulevard / US 395 SB Ramps	1902	10	B
PM	13	Oddie Boulevard / US 395 NB Ramps	2376	10	B
PM	14	Oddie Boulevard / Silverada Boulevard	2516	20	C
PM	15	2nd Street / Kietzke Lane	3388	35	D
PM	16	2nd Street / I-580 SB Ramps	2366	25	C
PM	17	2nd Street / I-580 NB Ramps	2245	15	B
PM	18	2nd Street / Grand Sierra Resort Entrance	1840	11	B
PM	**19**	**Mill Street / Kietzke Lane**	**4501**	**48.09**	**D**
PM	20	Mill Street / I-580 SB Ramps	3387	38	D
PM	21	Mill Street / I-580 NB Ramps and Grand Sierra Resort Entranc	2884	29	C
PM	**22**	**Mill Street / Greg Street and Terminal Way**	**3584**	**48.18**	**D**
PM	23	Villanova Drive / I-580 SB Ramps and Matley Lane	110	2	A
PM	24	Villanova Drive / I-580 NB Ramps	111	1	A
PM	25	Villanova Drive / Terminal Way	1279	9	A
PM	**26**	**Plumb Lane / Harvard Way**	**4220**	**47**	**D**
PM	27	Plumb Lane / I-580 Ramps	4821	13	B
PM	28	Plumb Lane / Terminal Way	2466	42	D
PM	**29**	**Moana Lane / Kietzke Lane**	**5584**	**54**	**D**
PM	30	Moana Lane / I-580 SB Ramps	4028	33	C
PM	31	Moana Lane / I-580 NB Ramps	3320	30	C
PM	**32**	**Moana Lane and Airway Drive / Neil Road**	**2349**	**92**	**F**
PM	33	Keystone Avenue / 7th Street	2908	19	B
PM	34	Keystone Avenue / I-80 Ramps	4349	20	B
PM	35	Keystone Avenue / 5th Street	3083	29	C
PM	36	Sierra Street / 9th Street and University Terrace	1724	19	B
PM	37	Sierra Street / 8th Street and I-80 WB on-ramp	2102	12	B
PM	38	Sierra Street / Maple Street and I-80 EB off-ramp	1617	13	B
PM	39	Sierra Street / 6th Street	1955	22	C
PM	40	Virginia Street / 9th Street	2704	26	C
PM	41	Virginia Street / 8th Street	3388	33	C
PM	42	Virginia Street / Maple Street	2279	14	B
PM	43	Virginia Street / 6th Street	2024	21	C
PM	44	Center Street / 9th Street	1389	18	B
PM	47	Center Street / 6th Street	2116	24	C
PM	48	Wells Avenue / 9th Street	2254	8	A
PM	49	Wells Avenue / I-80 WB Ramps	3122	33	C
PM	50	Wells Avenue / I-80 EB Ramps	3490	14	B
PM	51	Wells Avenue / 6th Street	3801	45	D
PM	52	Prater Way / Victorian Avenue	883	16	B
PM	53	Prater Way / I-80 WB Ramps	1185	11	B
PM	54	Prater Way / I-80 EB Ramps	1427	8	A
PM	55	4th Street and Prater Way / Galletti Way	1523	9	A
PM	56	Rock Boulevard / Victorian Avenue	2352	34	C
PM	57	Rock Boulevard / I-80 WB Ramps	2713	8	A
PM	58	Rock Boulevard / I-80 EB Ramps	2834	44	D
PM	59	Rock Boulevard / Hymer Avenue	2618	31	C
PM	61	Pyramid Way / I-80 Ramps	2392	5	A
PM	62	Pyramid Way / Nugget Avenue	637	4	A
PM	151	2nd Street / I-580 NB on-ramp	2257	4	A
PM	10001	Mills Street / I-580 NB on-ramp	3123	6	A

Note: Bolded intersections were selected for CO hot-spot modeling.

veh/hr = vehicles per hour; sec/veh = seconds per vehicle; LOS = level of service; SB = southbound; NB = northbound; WB = westbound; EB = eastbound

Air Quality Analysis - Spaghetti Bowl Project
Alternative 2 CO Hot-Spot Intersection Screening - DEIS Data without Southbound Airport Direct-Connect Ramp

Peak Hour	ID	Intersection	Volume Served (veh/hr)	Delay (sec/veh)	Intersection LOS
AM	1	Sutro Street / US 395 SB Ramps	837	5	A
AM	2	Sutro Street / US 395 NB Ramps	279	0	A
AM	3	Clear Acre Lane / Selmi Drive	1472	17	B
AM	4	Clear Acre Lane / US 395 SB Ramps	2575	34	C
AM	5	Clear Acre Lane / US 395 NB Ramps	1781	9	A
AM	6	Clear Acre Lane / Epley Road	1945	5	A
AM	7	McCarran Boulevard / Clear Acre Lane	2639	26	C
AM	8	McCarran Boulevard / US 395 SB Ramps	2540	10	A
AM	9	McCarran Boulevard / US 395 NB Ramps	2673	28	C
AM	10	McCarran Boulevard / Northtowne Lane	2608	30	C
AM	11	Oddie Boulevard and Montello Street	1659	30	C
AM	12	Oddie Boulevard / US 395 SB Ramps	2064	15	B
AM	13	Oddie Boulevard / US 395 NB Ramps	1758	20	C
AM	14	Oddie Boulevard / Silverada Boulevard	1678	26	C
AM	15	2nd Street / Kietzke Lane	2715	36	D
AM	16	2nd Street / I-580 SB Ramps	2021	10	A
AM	17	2nd Street / I-580 NB Ramps	2034	11	B
AM	18	2nd Street / Grand Sierra Resort Entrance	1500	12	B
AM	19	Mill Street / Kietzke Lane	3530	23	C
AM	20	Mill Street / I-580 SB Ramps	3282	20	B
AM	21	Mill Street / I-580 NB Ramps and Grand Sierra Resort Entrance	3316	47	D
AM	22	Mill Street / Greg Street and Terminal Way	3172	44	D
AM	23	Villanova Drive / I-580 SB Ramps and Matley Lane	209	9	A
AM	24	Villanova Drive / I-580 NB Ramps	209	9	A
AM	25	Villanova Drive / Terminal Way	1010	8	A
AM	26	Plumb Lane / Harvard Way	2789	21	C
AM	27	Plumb Lane / I-580 Ramps	3476	5	A
AM	28	Plumb Lane / Terminal Way	1898	25	C
AM	29	Moana Lane / Kietzke Lane	3378	40	D
AM	30	Moana Lane / I-580 SB Ramps	3086	28	C
AM	31	Moana Lane / I-580 NB Ramps	2512	19	B
AM	32	Moana Lane and Airway Drive / Neil Road	1930	32	C
AM	33	Keystone Avenue / 7th Street	2286	30	C
AM	34	Keystone Avenue / I-80 Ramps	3496	12	B
AM	35	Keystone Avenue / 5th Street	2125	11	B
AM	36	Sierra Street / 9th Street and University Terrace	1428	24	C
AM	37	Sierra Street / 8th Street and I-80 WB on-ramp	2001	27	C
AM	38	Sierra Street / Maple Street and I-80 EB off-ramp	2470	23	C
AM	39	Sierra Street / 6th Street	2319	20	B
AM	40	Virginia Street / 9th Street	2296	17	B
AM	41	Virginia Street / 8th Street	2949	27	C
AM	42	Virginia Street / Maple Street	1894	13	B
AM	43	Virginia Street / 6th Street	1325	18	B
AM	44	Center Street / 9th Street	1211	13	B
AM	45	Center Street / 8th Street and I-80 WB off-ramp	2044	19	B
AM	46	Center Street / Maple Street and I-80 EB on-ramp	1265	20	B
AM	47	Center Street / 6th Street	1205	16	B
AM	48	Wells Avenue / 9th Street	1910	6	A
AM	49	Wells Avenue / I-80 WB Ramps	2268	15	B
AM	50	Wells Avenue / I-80 EB Ramps	2868	15	B
AM	51	Wells Avenue / 6th Street	3060	28	C
AM	52	Prater Way / Victorian Avenue	378	8	A
AM	55	4th Street and Prater Way / Galletti Way	419	12	B
AM	56	Rock Boulevard / Victorian Avenue	1774	28	C
AM	57	Rock Boulevard / I-80 WB Ramps	1746	5	A
AM	58	Rock Boulevard / I-80 EB Ramps	2014	18	B
AM	59	Rock Boulevard / Hymer Avenue	1770	29	C
AM	60	Pyramid Way / Victorian Avenue	2205	36	D
AM	61	Pyramid Way / I-80 Ramps	2727	7	A
AM	62	Pyramid Way / Nugget Avenue	849	7	A
AM	164	Kietzke Street / I-80 WB Ramps	1398	5	A
AM	176	Kietzke Street / I-80 EB Ramps	1545	12	B

Air Quality Analysis - Spaghetti Bowl Project
Alternative 2 CO Hot-Spot Intersection Screening - DEIS Data without Southbound Airport Direct-Connect Ramp

Peak Hour	ID	Intersection	Volume Served (veh/hr)	Delay (sec/veh)	Intersection LOS
PM	1	Sutro Street / US 395 SB Ramps	1135	10	B
PM	2	Sutro Street / US 395 NB Ramps	667	3	A
PM	3	Clear Acre Lane / Selmi Drive	1961	28	C
PM	4	Clear Acre Lane / US 395 SB Ramps	2428	56	E
PM	5	Clear Acre Lane / US 395 NB Ramps	1690	7	A
PM	6	Clear Acre Lane / Epley Road	2532	1	A
PM	7	McCarran Boulevard / Clear Acre Lane	3356	39	D
PM	8	McCarran Boulevard / US 395 SB Ramps	2637	27	C
PM	**9**	**McCarran Boulevard / US 395 NB Ramps**	**3779**	**47**	**D**
PM	**10**	**McCarran Boulevard / Northtowne Lane**	**3786**	**44**	**D**
PM	11	Oddie Boulevard and Montello Street	1774	30	C
PM	12	Oddie Boulevard / US 395 SB Ramps	2119	16	B
PM	13	Oddie Boulevard / US 395 NB Ramps	2352	15	B
PM	14	Oddie Boulevard / Silverada Boulevard	2389	42	D
PM	15	2nd Street / Kietzke Lane	3556	36	D
PM	16	2nd Street / I-580 SB Ramps	2447	18	B
PM	17	2nd Street / I-580 NB Ramps	2649	16	B
PM	18	2nd Street / Grand Sierra Resort Entrance	1864	15	B
PM	19	Mill Street / Kietzke Lane	4493	32	C
PM	20	Mill Street / I-580 SB Ramps	3389	25	C
PM	21	Mill Street / I-580 NB Ramps and Grand Sierra Resort Entrance	3479	49	D
PM	22	Mill Street / Greg Street and Terminal Way	3648	58	E
PM	23	Villanova Drive / I-580 SB Ramps and Matley Lane	293	11	B
PM	24	Villanova Drive / I-580 NB Ramps	293	7	A
PM	25	Villanova Drive / Terminal Way	1570	10	A
PM	26	Plumb Lane / Harvard Way	4027	30	C
PM	27	Plumb Lane / I-580 Ramps	4561	11	B
PM	28	Plumb Lane / Terminal Way	2539	52	D
PM	**29**	**Moana Lane / Kietzke Lane**	**5567**	**55**	**E**
PM	30	Moana Lane / I-580 SB Ramps	4004	31	C
PM	31	Moana Lane / I-580 NB Ramps	3321	23	C
PM	**32**	**Moana Lane and Airway Drive / Neil Road**	**2349**	**94**	**F**
PM	33	Keystone Avenue / 7th Street	2962	28	C
PM	34	Keystone Avenue / I-80 Ramps	4427	22	C
PM	35	Keystone Avenue / 5th Street	3094	63	E
PM	36	Sierra Street / 9th Street and University Terrace	1694	25	C
PM	37	Sierra Street / 8th Street and I-80 WB on-ramp	2416	17	B
PM	38	Sierra Street / Maple Street and I-80 EB off-ramp	1625	19	B
PM	39	Sierra Street / 6th Street	1951	21	C
PM	40	Virginia Street / 9th Street	2473	48	D
PM	41	Virginia Street / 8th Street	3322	40	D
PM	42	Virginia Street / Maple Street	2093	37	D
PM	43	Virginia Street / 6th Street	1991	23	C
PM	44	Center Street / 9th Street	1335	16	B
PM	45	Center Street / 8th Street and I-80 WB off-ramp	2104	63	E
PM	46	Center Street / Maple Street and I-80 EB on-ramp	2057	43	D
PM	47	Center Street / 6th Street	2091	47	D
PM	48	Wells Avenue / 9th Street	1935	11	B
PM	49	Wells Avenue / I-80 WB Ramps	2657	25	C
PM	50	Wells Avenue / I-80 EB Ramps	3330	17	B
PM	**51**	**Wells Avenue / 6th Street**	**3648**	**64**	**E**
PM	52	Prater Way / Victorian Avenue	467	42	D
PM	55	4th Street and Prater Way / Galletti Way	570	17	B
PM	56	Rock Boulevard / Victorian Avenue	2268	30	C
PM	57	Rock Boulevard / I-80 WB Ramps	2405	5	A
PM	58	Rock Boulevard / I-80 EB Ramps	2595	28	C
PM	59	Rock Boulevard / Hymer Avenue	2286	53	D
PM	**60**	**Pyramid Way / Victorian Avenue**	**2850**	**70**	**E**
PM	61	Pyramid Way / I-80 Ramps	3249	12	B
PM	62	Pyramid Way / Nugget Avenue	1078	11	B
PM	164	Kietzke Street / I-80 WB Ramps	2351	11	B
PM	176	Kietzke Street / I-80 EB Ramps	1995	24	C

Note: Bolded intersections were selected for CO hot-spot modeling.
veh/hr = vehicles per hour; sec/veh = seconds per vehicle; LOS = level of service; SB = southbound; NB = northbound; WB = westbound;

Air Quality Analysis - Spaghetti Bowl Project

Alternative 2 CO Hot-Spot Intersection Screening - Updated Traffic Information (with southbound airport direct-connect ramp)

Peak Hour	ID	Intersection	Volume Served (veh/hr)	Delay (sec/veh)	Intersection LOS
AM	1	Sutro Street / US 395 SB Ramps	834	5	A
AM	2	Sutro Street / US 395 NB Ramps	279	0	A
AM	3	Clear Acre Lane / Selmi Drive	1478	16	B
AM	4	Clear Acre Lane / US 395 SB Ramps	2583	34	C
AM	5	Clear Acre Lane / US 395 NB Ramps	1781	4	A
AM	6	Clear Acre Lane / Epley Road	1942	27	D
AM	7	McCarran Boulevard / Clear Acre Lane	2639	26	C
AM	8	McCarran Boulevard / US 395 SB Ramps	2541	22	C
AM	9	McCarran Boulevard / US 395 NB Ramps	2674	15	B
AM	10	McCarran Boulevard / Northtowne Lane	2594	8	A
AM	11	Oddie Boulevard and Montello Street	1747	29	C
AM	12	Oddie Boulevard / US 395 SB Ramps	2156	20	C
AM	13	Oddie Boulevard / US 395 NB Ramps	2174	29	C
AM	14	Oddie Boulevard / Silverada Boulevard	1670	26	C
AM	15	2nd Street / Kietzke Lane	2716	36	D
AM	16	2nd Street / I-580 SB Ramps	2023	13	B
AM	17	2nd Street / I-580 NB Ramps	2038	11	B
AM	18	2nd Street / Grand Sierra Resort Entrance	1500	12	B
AM	19	Mill Street / Kietzke Lane	3534	29	C
AM	20	Mill Street / I-580 SB Ramps	3283	17	B
AM	21	Mill Street / I-580 NB Ramps and Grand Sierra Resort Entrance	3323	12	B
AM	22	Mill Street / Greg Street and Terminal Way	3182	21	C
AM	23	Villanova Drive / I-580 SB Ramps and Matley Lane	124	9	A
AM	24	Villanova Drive / I-580 NB Ramps	124	10	B
AM	25	Villanova Drive / Terminal Way	925	8	A
AM	26	Plumb Lane / Harvard Way	2908	23	C
AM	27	Plumb Lane / I-580 Ramps	NA	NA	NA
AM	28	Plumb Lane / Terminal Way	1604	24	C
AM	29	Moana Lane / Kietzke Lane	3397	40	D
AM	30	Moana Lane / I-580 SB Ramps	3116	30	C
AM	31	Moana Lane / I-580 NB Ramps	2525	19	B
AM	32	Moana Lane and Airway Drive / Neil Road	1940	31	C
AM	33	Keystone Avenue / 7th Street	2287	30	C
AM	34	Keystone Avenue / I-80 Ramps	3501	33	C
AM	35	Keystone Avenue / 5th Street	2126	11	B
AM	36	Sierra Street / 9th Street and University Terrace	1429	24	C
AM	37	Sierra Street / 8th Street and I-80 WB on-ramp	2003	29	C
AM	38	Sierra Street / Maple Street and I-80 EB off-ramp	2468	27	C
AM	39	Sierra Street / 6th Street	2330	20	B
AM	40	Virginia Street / 9th Street	2298	18	B
AM	41	Virginia Street / 8th Street	2946	28	C
AM	42	Virginia Street / Maple Street	1887	17	B
AM	43	Virginia Street / 6th Street	1328	18	B
AM	44	Center Street / 9th Street	1207	13	B
AM	45	Center Street / 8th Street and I-80 WB off-ramp	2034	20	C
AM	46	Center Street / Maple Street and I-80 EB on-ramp	1257	21	C
AM	47	Center Street / 6th Street	1204	16	B
AM	48	Wells Avenue / 9th Street	1909	7	A
AM	49	Wells Avenue / I-80 WB Ramps	2264	14	B
AM	50	Wells Avenue / I-80 EB Ramps	2860	15	B
AM	51	Wells Avenue / 6th Street	3061	29	C
AM	52	Prater Way / Victorian Avenue	378	8	A
AM	55	4th Street and Prater Way / Galletti Way	418	13	B
AM	56	Rock Boulevard / Victorian Avenue	1791	19	B
AM	57	Rock Boulevard / I-80 WB Ramps	1769	13	B
AM	58	Rock Boulevard / I-80 EB Ramps	2402	28	C
AM	59	Rock Boulevard / Hymer Avenue	2174	8	A
AM	60	Pyramid Way / Victorian Avenue	2188	36	D
AM	61	Pyramid Way / I-80 Ramps	2707	24	C
AM	62	Pyramid Way / Nugget Avenue	926	5	A
AM	164	Kietzke Street / I-80 WB Ramps	1391	18	B
AM	176	Kietzke Street / I-80 EB Ramps	1547	11	B

Air Quality Analysis - Spaghetti Bowl Project

Alternative 2 CO Hot-Spot Intersection Screening - Updated Traffic Information (with southbound airport direct-connect ramp)

Peak Hour	ID	Intersection	Volume Served (veh/hr)	Delay (sec/veh)	Intersection LOS
PM	1	Sutro Street / US 395 SB Ramps	1137	10	B
PM	2	Sutro Street / US 395 NB Ramps	667	2	A
PM	3	Clear Acre Lane / Selmi Drive	1973	29	C
PM	4	Clear Acre Lane / US 395 SB Ramps	2436	31	C
PM	5	Clear Acre Lane / US 395 NB Ramps	1688	12	B
PM	6	Clear Acre Lane / Epley Road	2535	1	A
PM	7	McCarran Boulevard / Clear Acre Lane	3365	44	D
PM	8	McCarran Boulevard / US 395 SB Ramps	2643	27	C
PM	**9**	**McCarran Boulevard / US 395 NB Ramps**	**3783**	**45**	**D**
PM	**10**	**McCarran Boulevard / Northtowne Lane**	**3800**	**39**	**D**
PM	11	Oddie Boulevard and Montello Street	1774	28	C
PM	12	Oddie Boulevard / US 395 SB Ramps	1936	21	C
PM	13	Oddie Boulevard / US 395 NB Ramps	2366	13	B
PM	14	Oddie Boulevard / Silverada Boulevard	2400	31	C
PM	15	2nd Street / Kietzke Lane	3556	37	D
PM	16	2nd Street / I-580 SB Ramps	2448	23	C
PM	17	2nd Street / I-580 NB Ramps	2649	16	B
PM	18	2nd Street / Grand Sierra Resort Entrance	1862	15	B
PM	19	Mill Street / Kietzke Lane	4503	33	C
PM	20	Mill Street / I-580 SB Ramps	3409	22	C
PM	21	Mill Street / I-580 NB Ramps and Grand Sierra Resort Entrance	3527	30	C
PM	22	Mill Street / Greg Street and Terminal Way	3683	38	D
PM	23	Villanova Drive / I-580 SB Ramps and Matley Lane	97	8	A
PM	24	Villanova Drive / I-580 NB Ramps	97	10	B
PM	25	Villanova Drive / Terminal Way	1374	9	A
PM	**26**	**Plumb Lane / Harvard Way**	**4229**	**42**	**D**
PM	27	Plumb Lane / I-580 Ramps	NA	NA	NA
PM	28	Plumb Lane / Terminal Way	2334	39	D
PM	**29**	**Moana Lane / Kietzke Lane**	**5573**	**58**	**E**
PM	30	Moana Lane / I-580 SB Ramps	4029	32	C
PM	31	Moana Lane / I-580 NB Ramps	3330	25	C
PM	**32**	**Moana Lane and Airway Drive / Neil Road**	**2363**	**92**	**F**
PM	33	Keystone Avenue / 7th Street	2916	29	C
PM	34	Keystone Avenue / I-80 Ramps	**4349**	**54**	**D**
PM	35	Keystone Avenue / 5th Street	3078	51	D
PM	36	Sierra Street / 9th Street and University Terrace	1679	26	C
PM	37	Sierra Street / 8th Street and I-80 WB on-ramp	2376	16	B
PM	38	Sierra Street / Maple Street and I-80 EB off-ramp	1601	16	B
PM	39	Sierra Street / 6th Street	1922	20	C
PM	40	Virginia Street / 9th Street	2442	44	D
PM	41	Virginia Street / 8th Street	3256	39	D
PM	42	Virginia Street / Maple Street	2079	36	D
PM	43	Virginia Street / 6th Street	1985	22	C
PM	44	Center Street / 9th Street	1317	15	B
PM	45	Center Street / 8th Street and I-80 WB off-ramp	2036	47	D
PM	46	Center Street / Maple Street and I-80 EB on-ramp	2053	34	C
PM	47	Center Street / 6th Street	2087	42	D
PM	48	Wells Avenue / 9th Street	1942	11	B
PM	49	Wells Avenue / I-80 WB Ramps	2668	27	C
PM	50	Wells Avenue / I-80 EB Ramps	3351	15	B
PM	**51**	**Wells Avenue / 6th Street**	**3670**	**53**	**D**
PM	52	Prater Way / Victorian Avenue	467	37	D
PM	55	4th Street and Prater Way / Galletti Way	570	17	B
PM	56	Rock Boulevard / Victorian Avenue	2278	28	C
PM	57	Rock Boulevard / I-80 WB Ramps	2397	2	A
PM	58	Rock Boulevard / I-80 EB Ramps	2586	29	C
PM	59	Rock Boulevard / Hymer Avenue	2367	40	D
PM	**60**	**Pyramid Way / Victorian Avenue**	**2817**	**60**	**E**
PM	61	Pyramid Way / I-80 Ramps	3368	39	D
PM	62	Pyramid Way / Nugget Avenue	1183	14	B
PM	164	Kietzke Street / I-80 WB Ramps	2302	26	C
PM	176	Kietzke Street / I-80 EB Ramps	1999	23	C

Note: Bolded intersections were selected for CO hot-spot modeling.
veh/hr = vehicles per hour; sec/veh = seconds per vehicle; LOS = level of service; SB = southbound; NB = northbound; WB = westbound;

Air Quality Analysis - Spaghetti Bowl Project
Alternative 3 CO Hot-Spot Intersection Screening

Peak Hour	ID	Intersection	Volume Served (veh/hr)	Delay (sec/veh)	Intersection LOS
AM	1	Sutro Street / US 395 SB Ramps	838	8	A
AM	2	Sutro Street / US 395 NB Ramps	278	3	A
AM	3	Clear Acre Lane / Selmi Drive	1411	18	B
AM	4	Clear Acre Lane / US 395 SB Ramps	2538	16	B
AM	5	Clear Acre Lane / US 395 NB Ramps	1798	16	B
AM	6	Clear Acre Lane / Epley Road	1950	15	B
AM	7	McCarran Boulevard / Clear Acre Lane	2472	32	C
AM	8	McCarran Boulevard / US 395 SB Ramps	2155	30	C
AM	9	McCarran Boulevard / US 395 NB Ramps	2259	47	D
AM	10	McCarran Boulevard / Northtowne Lane	2160	45	D
AM	11	Oddie Boulevard and Montello Street	1490	22	C
AM	12	Oddie Boulevard / US 395 SB Ramps	1873	21	C
AM	13	Oddie Boulevard / US 395 NB Ramps	1816	25	C
AM	14	Oddie Boulevard / Silverada Boulevard	1778	30	C
AM	15	2nd Street / Kietzke Lane	2528	41	D
AM	16	2nd Street / Frontage Road	1887	32	C
AM	17	2nd Street / I-580 NB Ramps	1763	8	A
AM	18	2nd Street / Grand Sierra Resort Entrance	1386	13	B
AM	19	Mill Street / Kietzke Lane	3451	40	D
AM	20	Mill Street / Frontage Road	3288	23	C
AM	21	Mill Street / I-580 NB Ramps and Grand Sierra Resort Entrance	2665	26	C
AM	22	Mill Street / Greg Street and Terminal Way	3196	34	C
AM	23	Villanova Drive / I-580 SB Ramps and Matley Lane	1133	15	B
AM	24	Villanova Drive / I-580 NB Ramps	862	10	B
AM	25	Villanova Drive / Terminal Way	1023	7	A
AM	26	Plumb Lane / Harvard Way	2480	34	C
AM	27	Plumb Lane / I-580 Ramps	3102	11	B
AM	28	Plumb Lane / Terminal Way	1208	24	C
AM	29	Moana Lane / Kietzke Lane	3449	45	D
AM	30	Moana Lane / I-580 SB Ramps	3184	36	D
AM	31	Moana Lane / I-580 NB Ramps	2560	6	A
AM	32	Moana Lane and Airway Drive / Neil Road	1956	38	D
AM	33	Keystone Avenue / 7th Street	2285	34	C
AM	34	Keystone Avenue / I-80 Ramps	3510	42	D
AM	35	Keystone Avenue / 5th Street	2103	29	C
AM	36	Sierra Street / 9th Street and University Terrace	1426	31	C
AM	37	Sierra Street / 8th Street and I-80 WB on-ramp	2061	31	C
AM	38	Sierra Street / Maple Street and I-80 EB off-ramp	2455	33	C
AM	39	Sierra Street / 6th Street	2217	13	B
AM	40	Virginia Street / 9th Street	2553	43	D
AM	41	Virginia Street / 8th Street	2794	43	D
AM	42	Virginia Street / Maple Street	2265	23	C
AM	43	Virginia Street / 6th Street	1197	23	C
AM	44	Center Street / 9th Street	1043	19	B
AM	47	Center Street / 6th Street	979	16	B
AM	48	Wells Avenue / 9th Street	2025	15	B
AM	49	Wells Avenue / I-80 WB Ramps	2738	18	B
AM	50	Wells Avenue / I-80 EB Ramps	3151	38	D
AM	51	Wells Avenue / 6th Street	3147	26	C
AM	52	Prater Way / Victorian Avenue	466	4	A
AM	55	4th Street and Prater Way / Galletti Way	535	5	A
AM	56	Rock Boulevard / Victorian Avenue	2346	37	D
AM	57	Rock Boulevard / I-80 WB Ramps	3072	34	C
AM	58	Rock Boulevard / I-80 EB Ramps	3433	15	B
AM	59	Rock Boulevard / Hymer Avenue	3068	9	A
AM	60	Pyramid Way / Victorian Avenue	2097	44	D
AM	61	Pyramid Way / I-80 Ramps	2107	4	A
AM	62	Pyramid Way / Nugget Avenue	406	4	A
AM	101	I-580 SB Ramps / Frontage Road	3096	25	C
AM	102	I-580 NB Ramps / Frontage Road	2285	18	B

Air Quality Analysis - Spaghetti Bowl Project
Alternative 3 CO Hot-Spot Intersection Screening

Peak Hour	ID	Intersection	Volume Served (veh/hr)	Delay (sec/veh)	Intersection LOS
PM	1	Sutro Street / US 395 SB Ramps	1134	11	B
PM	2	Sutro Street / US 395 NB Ramps	666	6	A
PM	3	Clear Acre Lane / Selmi Drive	1961	23	C
PM	4	Clear Acre Lane / US 395 SB Ramps	2429	8	A
PM	5	Clear Acre Lane / US 395 NB Ramps	1697	20	B
PM	6	Clear Acre Lane / Epley Road	2507	1	A
PM	7	McCarran Boulevard / Clear Acre Lane	3360	37	D
PM	8	McCarran Boulevard / US 395 SB Ramps	2653	8	A
PM	9	McCarran Boulevard / US 395 NB Ramps	3778	35	D
PM	10	McCarran Boulevard / Northtowne Lane	3795	38	D
PM	11	Oddie Boulevard and Montello Street	1603	20	C
PM	12	Oddie Boulevard / US 395 SB Ramps	1919	17	B
PM	13	Oddie Boulevard / US 395 NB Ramps	2417	25	C
PM	14	Oddie Boulevard / Silverada Boulevard	2547	33	C
PM	15	2nd Street / Kietzke Lane	3415	32	C
PM	16	2nd Street / Frontage Road	2502	38	D
PM	17	2nd Street / I-580 NB Ramps	2509	14	B
PM	18	2nd Street / Grand Sierra Resort Entrance	1670	13	B
PM	**19**	**Mill Street / Kietzke Lane**	**4426**	**50**	**D**
PM	20	Mill Street / Frontage Road	3477	30	C
PM	21	Mill Street / I-580 NB Ramps and Grand Sierra Resort Entrance	3405	26	C
PM	22	Mill Street / Greg Street and Terminal Way	3984	50	D
PM	23	Villanova Drive / I-580 SB Ramps and Matley Lane	1251	16	B
PM	24	Villanova Drive / I-580 NB Ramps	1483	12	B
PM	25	Villanova Drive / Terminal Way	1496	8	A
PM	26	Plumb Lane / Harvard Way	3754	35	C
PM	27	Plumb Lane / I-580 Ramps	4088	15	B
PM	28	Plumb Lane / Terminal Way	1662	22	C
PM	**29**	**Moana Lane / Kietzke Lane**	**5543**	**99**	**F**
PM	**30**	**Moana Lane / I-580 SB Ramps**	**4068**	**39**	**D**
PM	31	Moana Lane / I-580 NB Ramps	3312	11	B
PM	**32**	**Moana Lane and Airway Drive / Neil Road**	**2374**	**129**	**F**
PM	33	Keystone Avenue / 7th Street	2905	32	C
PM	34	Keystone Avenue / I-80 Ramps	4334	21	C
PM	35	Keystone Avenue / 5th Street	3059	56	E
PM	36	Sierra Street / 9th Street and University Terrace	1723	28	C
PM	37	Sierra Street / 8th Street and I-80 WB on-ramp	2201	14	B
PM	38	Sierra Street / Maple Street and I-80 EB off-ramp	1636	16	B
PM	39	Sierra Street / 6th Street	1950	20	C
PM	40	Virginia Street / 9th Street	3163	23	C
PM	41	Virginia Street / 8th Street	3381	32	C
PM	42	Virginia Street / Maple Street	3264	47	D
PM	43	Virginia Street / 6th Street	1932	24	C
PM	44	Center Street / 9th Street	1109	6	A
PM	47	Center Street / 6th Street	2083	31	C
PM	48	Wells Avenue / 9th Street	2028	10	A
PM	49	Wells Avenue / I-80 WB Ramps	3049	14	B
PM	50	Wells Avenue / I-80 EB Ramps	3596	27	C
PM	51	Wells Avenue / 6th Street	3901	61	E
PM	52	Prater Way / Victorian Avenue	722	4	A
PM	55	4th Street and Prater Way / Galletti Way	864	7	A
PM	56	Rock Boulevard / Victorian Avenue	2867	18	B
PM	57	Rock Boulevard / I-80 WB Ramps	3496	30	C
PM	58	Rock Boulevard / I-80 EB Ramps	3860	24	C
PM	59	Rock Boulevard / Hymer Avenue	3320	48	D
PM	**60**	**Pyramid Way / Victorian Avenue**	**2470**	**61**	**E**
PM	61	Pyramid Way / I-80 Ramps	2365	7	A
PM	62	Pyramid Way / Nugget Avenue	634	5	A
PM	101	I-580 SB Ramps / Frontage Road	3209	26	C
PM	102	I-580 NB Ramps / Frontage Road	2653	21	C

Note: Bolded intersections were selected for CO Hot-Spot modeling.

veh/hr = vehicles per hour; sec/veh = seconds per vehicle; LOS = level of service; SB = southbound; NB = northbound; WB = westbound; EB = eastbound