Nogales $PM_{2.5}$/PM_{10} Nonattainment Areas Analysis

Purpose and Organization

This report documents the regional emissions analysis conducted to demonstrate the conformity of Arizona's 2017–2021 State Transportation Improvement Program (STIP) and current long-range transportation plan (LRTP), *What Moves You Arizona 2010–2035*, to the U.S. Environmental Protection Agency (EPA)-approved State Implementation Plans (SIPs) for the Nogales PM_{10} and $PM_{2.5}$ Nonattainment Areas. This conformity demonstration and analysis were based on data provided by the Arizona Department of Transportation (ADOT), Arizona Department of Environmental Quality (ADEQ), and EPA's 2014 National Emissions Inventory (2014 NEI).

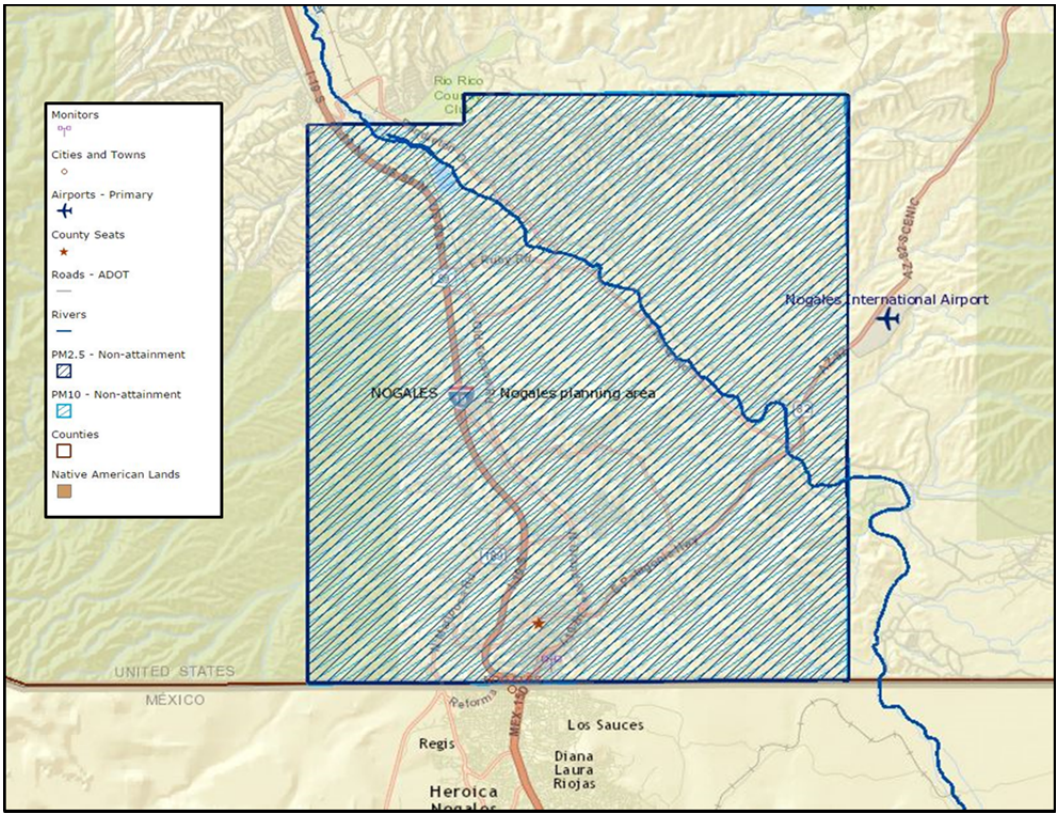
The report is organized into the following sections:

- **Introduction**: This section includes information on the two Nogales Nonattainment Areas (NNAs), the applicable National Ambient Air Quality Standards (NAAQS), transportation conformity, and ADOT's STIP and LRTP.
- **Interagency Consultation**: This section outlines interagency consultation requirements and summarizes all decisions made through consultation.
- **Analysis Methodology and Data**: This section outlines all of the technical information collected to conduct the regional emissions analysis and includes details on the Motor Vehicle Emission Simulator (MOVES) model and the data and assumptions used to estimate emissions.
- **Regional Emissions Analysis and Conformity Test Results**: Using the information and methodologies described in the previous section, this section describes the conformity "tests" given each analysis year.
- **Conformity Determination**: This section provides the final result of the conformity analysis, which includes demonstrating financial constraint, public participation, and a formal conformity statement.
- **Resources and Glossary**: These sections list informational websites and guides, particularly with regard to the MOVES model, and commonly used terms and acronyms.
- **Appendices**: These appendices contain additional details regarding on-road source assumptions, MOVES input and output files, and interagency consultation.

Introduction

Nonattainment areas are places that have experienced violations of the NAAQS for a given pollutant. The NNA is an area covering approximately 76 square miles along the international border with Mexico in Santa Cruz County, Arizona. It is designated as a nonattainment area for violating both the coarse particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) NAAQS. The NNA is 66 miles south of Tucson and includes the city of Nogales, Arizona, and portions of Rio Rico, an unincorporated community north of Nogales. Both the PM_{10} and $PM_{2.5}$ nonattainment areas are shown in Figure 1.

Figure 1. Nogales Nonattainment Areas



Source: ADEQ eMaps (https://gisweb.azdeq.gov/arcgis/emaps/?topic=nonattain)

All nonattainment areas must demonstrate that their transportation programs and long-range transportation plans conform to air quality plans that were established by the state and approved by EPA. In urban areas, this demonstration is conducted by metropolitan planning organizations (MPOs). However, Nogales does not meet the population requirements needed to establish an MPO and is, therefore, considered a rural nonattainment area. Thus, transportation planning processes in the NNA are conducted by ADOT as part of its statewide planning and programing efforts. As a result, ADOT is required to coordinate the regional transportation conformity process with ADEQ and other regulatory authorities including EPA and the Federal Highway Administration (FHWA).

Background on Transportation Conformity

Transportation conformity is required by the Clean Air Act (CAA), Section 176(c), to ensure that federal funding and approvals are given to highway and transit projects that are consistent with an area's air quality goals established in SIPs. Demonstrating conformity means verifying that planned transportation improvement projects will not cause new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS.

Regional conformity, or conformity of a plan or Transportation Improvement Program (TIP), demonstrates that the total emissions from an area's future transportation system are consistent with goals for air quality

found in the SIP. Regional conformity is demonstrated by conducting an analysis that shows future year emissions are less than or equal to a motor vehicle emission budget (MVEB) established by the SIP(s) (§ 93.118). If an area does not have an approved MVEB, other tests, known as interim emissions tests (§ 93.119), must be performed. Interim emissions tests include:

- Demonstrating that the emissions predicted for a future or "action" scenario represented by a TIP or LRTP are not greater than the emissions predicted given a no-action, or "baseline" scenario. This is often referred to as the "build-no-build" test.
- Demonstrating that the emissions predicted in the "action" scenario are not greater than the emissions in a baseline year for a given standard. This is referred to as the "no-greater-than" test.

Typically, transportation conformity demonstrations include an assessment of the first year of a TIP, the last year of a TIP, the horizon (or end year) of the LRTP, and interim analysis years between the last year of the TIP and LRTP horizon year with no more than 10 years in between. Emissions are estimated using the latest available planning assumptions and analytical tools, including EPA's latest mobile sources emissions model. The conformity demonstration includes a tabulation of the analysis results for applicable pollutants showing the required tests were met for each analysis year.

National Ambient Air Quality Standards

The CAA requires EPA to set NAAQS for pollutants considered harmful to public health and the environment. The NNA has been designated under the NAAQS for $PM_{2.5}$ and PM_{10}. *Particle pollution* (also called particulate matter, or PM) is the term describing a mixture of solid particles and liquid droplets found in the air. Some particles—such as dust, dirt, soot, or smoke—are large or dark enough to be seen with the naked eye. Others are so small they can be detected only by using an electron microscope.

Particle pollution includes "inhalable coarse particles," with diameters larger than 2.5 microns and smaller than 10 microns (PM_{10}), and "fine particles," with diameters 2.5 microns and smaller ($PM_{2.5}$). Some particles, known as primary particles, are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks, or fires. Others form through complicated reactions in the atmosphere and are known as secondary particles.

$PM_{2.5}$

The NNA was designated under the 2006 $PM_{2.5}$ 24-hour NAAQS. Effective February 6, 2013, EPA took final action to determine that the NNA attained the 2006 $PM_{2.5}$ standard (Table 1). The finding did not constitute a redesignation of the NNA to attainment. The nonattainment classification and designation status remain in place until EPA determines that ADEQ has met the CAA requirements for requesting a redesignation of the NNA to attainment.

At this time, the Nogales $PM_{2.5}$ area does not have approved MVEBs and will, therefore, use one of the interim conformity tests. According to EPA's Final Rule for the 24-hour $PM_{2.5}$ standard, $PM_{2.5}$ areas without MVEBs may use either the "build-no-build" test or the "no-greater-than 2008" test. Following interagency consultation, ADOT decided on the "no-greater-than 2008" test for both primary $PM_{2.5}$ and oxides of nitrogen (NO_x), which is considered a precursor pollutant contributing to formation of secondary $PM_{2.5}$ in the NNA.

EPA did not make a finding in the $PM_{2.5}$ SIP emissions inventory that on-road mobile fugitive dust emissions (unpaved and paved sources) were significant. Therefore, they are not included as part of the "no-greater-than 2008" test.[1]

Table 1. Nogales Nonattainment and Maintenance Areas and current SIP status, by pollutant

County	Current SIP status	Notes (as of February 1, 2013)
Nogales, Arizona 24-hour $PM_{2.5}$ Nonattainment Area		
Santa Cruz (Partial)	Attainment finding Effective 2/6/2013 78 *Federal Register* 887	Area remains in nonattainment until a maintenance plan is submitted and approved. Regional transportation conformity applies.
Nogales, Arizona 24-hour PM_{10} Moderate Nonattainment Area		
Santa Cruz (Partial)	2012 SIP Approval effective 10/25/2012 77 *Federal Register* 58962	EPA approved the SIP demonstrating that the Nogales Nonattainment Area is attaining the NAAQS for PM_{10}, but for international emissions sources in Nogales, Mexico.

Notes: NAAQS = National Ambient Air Quality Standards, SIP = State Implementation Plan

PM_{10}

The Nogales area was designated as a nonattainment area under the 1987 24-hour PM_{10} standard, which was retained under EPA's 2006 PM NAAQS review (effective December 18, 2006). EPA approved the Nogales 2012 PM_{10} nonattainment area SIP, *2012 State Implementation Plan, Nogales PM_{10} Nonattainment Area*, accepted by EPA on October 25, 2012. As part of that process, EPA approved an MVEB and an attainment demonstration showing the NNA would meet the 24-hour PM_{10} NAAQS but for emissions sources in Nogales, Mexico. Table 2 provides the EPA-approved PM_{10} MVEB, which must be used for transportation conformity determinations.

Table 2. 2011 Nogales Nonattainment Area motor vehicle emissions budgets for PM_{10}

Sector	PM_{10} (tons per year)
Dust – unpaved road	864.9
Dust – paved road	121.4
Dust – road construction	26.0
Mobile – gasoline and diesel (including exhaust and brake and tire wear)	21.0
2011 motor vehicle emission budget	1,274.3

Source: Table 7.1 in the *2012 State Implementation Plan Nogales PM_{10} Nonattainment Area*; August 24, 2012

[1] email from Jerry Wamsley, EPA Region 9, to Beverly Chenausky, ADOT, January 31, 2017

Status of the Fiscal Year 2017–2021 State Transportation Improvement Program and 2035 Long-Range Transportation Plan

The 2017–2021 STIP was approved by FHWA on December 21, 2016, and ADOT's LRTP was adopted by the Arizona State Transportation Board on November 18, 2011. Both the STIP and LRTP are fiscally constrained and identify only one regionally significant, federally funded transportation project in the NNA between 2017 and 2035 (the horizon of the LRTP).

The State Route (SR) 189, International Border to Grand Avenue project (ADOT Project No.: 189 SC 000 H8045 01L) will improve SR 189, also known as Mariposa Road, and the existing Interstate 19 (I-19)/Mariposa Road Traffic Interchange (TI) by increasing speeds, reducing delay, and decreasing travel time through the area. SR 189/Mariposa Road conveys heavy truck traffic, along with passenger vehicle traffic, from the international port of entry between Mexico and the United States to I-19 and its northern terminus with Grand Avenue in Nogales, Arizona.

This project will be constructed in two phases. The first phase, referred to as the interim phase, will improve traffic flow on the existing SR 189/Mariposa Road through intersection improvements, elimination/ consolidation of existing driveways, and construction of a eastbound-to-northbound flyover ramp at the I-19 TI. The second phase (or ultimate phase) will add a southbound-to-westbound flyover ramp. The interim phase is programmed to begin construction in 2019 and be completed by 2020. The ultimate phase is not yet funded but is included in the last year of the STIP (2021).

Interagency Consultation

As required by the federal transportation conformity rule (§ 93.105), the conformity process includes a significant level of cooperation among federal, state, and local agencies. For this air quality conformity analysis, interagency consultation was conducted as required by the Arizona Conformity SIP. The regional conformity analysis and demonstration assumptions were distributed to ADOT, ADEQ, EPA, and FHWA for consultation on December 8, 2016. A follow-up conference call was conducted on January 25, 2017, to review all input planning assumptions, methodologies, and analysis years. Table 3 summarizes the key planning decisions made by the interagency consultation group. Appendix C contains documentation regarding the consultation conducted.

Table 3. Planning decisions made through interagency consultation

Item	Decision
Vehicle miles traveled data	Use the most representative dataset between the 2014 National Emissions Inventory, Highway Performance Monitoring System, and ADOT's Statewide Travel Demand Model.
EPA emission model(s)	MOVES2014a and EPA's 2014 National Emissions Inventory
Regionally significant projects, projects with a significant change in design concept and scope	As shown in the *Statewide Transportation Improvement Program* and *Long-Range Transportation Plan*.
Transportation control measures progress	EPA has not approved any transportation control measures for the Nogales Nonattainment Area in the Arizona State Implementation Plan. Consequently, there is no need to address transportation control measures.[2]
Triggers for conformity	Federally funded, regionally significant traffic project: State Route 189, International Border to Grand Avenue, ADOT Project No.: 189 SC 000 H8045 01L.
24-hour $PM_{2.5}$ conformity test	No-greater-than 2008 Analysis years: • 2017 – first year of *Statewide Transportation Improvement Program* • 2021 – last year *Statewide Transportation Improvement Program* • 2030 – interim year • 2035 – horizon year of *Long-Range Transportation Plan*
24-hour PM_{10} conformity test	Budget test; compare with EPA-approved PM_{10} State Implementation Plan motor vehicle emissions budget Analysis years: • 2017 – first year of *Statewide Transportation Improvement Program* • 2021 – last year *Statewide Transportation Improvement Program* • 2030 – interim year • 2035 – horizon year of *Long-Range Transportation Plan*
Project identification	No regionally significant, nonexempt projects, regardless of funding source, were identified other than the State Route 189 project.
Latest planning assumptions	MOVES inputs will include recent information for Santa Cruz County, where available. See *Analysis Methodology and Data* section of this report for specific information used in the analysis.
Pollutants and emissions sources	PM_{10} – sources dictated by MVEB $PM_{2.5}$ – on-road only NO_x – on-road

Notes: ADOT = Arizona Department of Transportation, EPA = U.S. Environmental Protection Agency

[2] email from Jerry Wamsley, EPA Region 9, to Beverly Chenausky, ADOT, January 31, 2017

Analysis Methodology and Data

The regional emissions analysis developed to support this conformity demonstration was conducted using the latest version of EPA's MOVES (version 2014a) model and 2014 NEI. The pollutant and emissions sources included in the emissions analysis are:

- PM_{10} from re-entrained paved road dust
- PM_{10} from unpaved road dust
- PM_{10} from road construction
- on-road PM_{10} (exhaust emissions, brake and tire wear)
- on-road $PM_{2.5}$ (exhaust emissions, brake and tire wear)
- on-road NO_x

The MOVES model was used to develop annual emissions estimates for on-road emissions (PM_{10}, $PM_{2.5}$, and NOx), while the 2014 NEI was used to estimate annual PM_{10} dust emissions. These are the same approaches used to develop the emissions inventories for the PM_{10} and $PM_{2.5}$ SIPs. Both SIPs relied on the 2008 NEI and a previous version of MOVES (MOVES2010) to develop emissions inventories and the PM_{10} MVEB. Because no formal request was received from EPA, ADEQ, or FHWA to include dust emissions sources of $PM_{2.5}$, only on-road $PM_{2.5}$ emissions and NO_x were analyzed for the $PM_{2.5}$ nonattainment area (§ 93.119).

The only regionally significant, federally funded road construction projects planned in the NNA are the interim and ultimate phases of the SR 189, International Border to Grand Avenue, project. Estimates of the construction dust for this project are included in the appropriate analysis year and represent a conservative, worst-case scenario for the NNA.

National Emissions Inventory

The NEI is a periodic, comprehensive, and detailed estimate of air emissions conducted by EPA. The NEI is released every 3 years based primarily on data provided by state and local air agencies for sources in their jurisdictions, supplemented with data developed by EPA. It uses MOVES to estimate on-road emissions in every state except California given information provided by state and local air agencies. It also estimates emissions from point, nonpoint (area), and nonroad sources using the methodologies provided in AP-42, EPA's compilation of emissions factors. NEI data are available on EPA's website (https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei).

Both the PM_{10} and $PM_{2.5}$ SIPs for the NNA used the 2008 NEI as the basis for their emissions inventories and subsequent PM_{10} MVEB. Data for the 2008 NEI were collected in 2009 and finalized in 2010. Since then, EPA has updated the NEI twice, once for 2011 and again for 2014. Data for the 2014 NEI were collected and processed by EPA in 2015. Thus, the 2014 NEI represents a more current set of assumptions than those used to develop the 2008 NEI and was used as the basis for estimating fugitive dust sources for the conformity demonstration.

On-Road Analysis

MOVES is the EPA-approved model required for estimating emissions from on-road vehicles. EPA first released MOVES in March 2010 (75 *Federal Register* [FR] 9411). In October 2014, EPA released a major revision

to the model (MOVES2014) and gave jurisdictions a 2-year grace period for its use and implementation (79 FR 60343). The most current version of the model (MOVES2014a) is a minor model revision released in November 2015.

MOVES uses a variety of local and/or national data to estimate emissions. Regional emissions analyses are required to use the most current planning assumptions available when the analysis begins. Nonattainment areas are encouraged to review and update their planning assumptions on a regular basis, especially population, employment, and vehicle registration information. MPOs often collect and maintain the planning assumptions needed to conduct a conformity demonstration for a given nonattainment area. However, given the NNA is rural and does not have an MPO, this demonstration must rely on readily available data from ADOT, ADEQ, and EPA (via the NEI).

The on-road emissions analysis was developed using EPA guidance documents, including:

- *Policy Guidance on the Use of MOVES2014 and Subsequent Minor Revisions for State Implementation Plan Development, Transportation Conformity, and Other Purposes*, EPA Office of Air and Radiation, EPA-420-B-14-008, July 2014
- *MOVES2014 and 2014a Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity*, EPA Office of Air and Radiation and Office of Transportation and Air Quality, EPA-420-B-15-093, November 2015
- *MOVES2014a User Guide*, EPA-420-B-15-095, November 2015

Data for the on-road emissions analysis were obtained from a variety of sources, including previous MOVES runs conducted for the PM_{10} and $PM_{2.5}$ SIPs. ADOT provided current data on vehicle population and vehicle type mix for Santa Cruz County. Additionally, ADOT provided MOVES data generated from its statewide travel demand model (TDM). The model is based on 2010 traffic volumes and was validated using a series of screen lines and port of entry data. ADOT has a Microsoft Excel-based MOVES conversion spreadsheet that translates its TDM data into formats used by MOVES. This information was supplemented with activity data used to develop the 2014 NEI, when appropriate. The following sections describe the source of the information used to create the County Data Manager (CDM) input databases used by MOVES to estimate on-road emissions for the regional emissions analysis. Appendix A provides additional information on the data used to develop the on-road emissions estimates.

Meteorology – The same MOVES dataset used for the PM_{10} and $PM_{2.5}$ SIPs was used for this analysis. It provides average hourly temperature and relative humidity values for each month over an average year. This dataset was selected to maintain consistency with the SIP and MVEB. The analysis assumed that meteorological conditions in the NNA have not changed significantly since the SIPs were developed. The analysis of each forecast year assumed the meteorology did not change over time.

Vehicle Population – Vehicle population data for Santa Cruz County (as of January 2017) were provided by ADOT and were used to develop vehicle population data for the analysis. The vehicle categories reported by ADOT were mapped to the 13 MOVES model types using ADOT's MOVES data converter spreadsheet tool. Vehicle populations were then grown to each analysis year using current county-wide population forecasts

obtained from the Arizona Department of Administration, Employment and Population Statistics, Office of Economic Opportunity.

Vehicle Age Distribution – Vehicle age distribution data for Santa Cruz County (as of January 2017) were provided by ADOT and used to develop MOVES input files for the analysis. MOVES requires each of the 13 vehicle types have an age distribution starting with new vehicles through 30-year-old vehicles. Vehicles older than 30 years were aggregated into the oldest (30-year) fraction. For this analysis, it was assumed the vehicle age distribution did not change in the future.

Annual Vehicle Miles Traveled – Two sources of annual vehicle miles traveled (VMT) were evaluated to determine which resulted in the most conservative regional emission estimate. The sources included VMT used by the 2014 NEI to estimate paved road dust for Santa Cruz County and the county-level 2013 VMT estimate developed from ADOT's statewide TDM. 2014 NEI data were obtained from FHWA's Highway Performance Monitoring System (HPMS). The HPMS is a national database of highway information. Roadway extent, use, condition, and performance data are collected by and for ADOT and are submitted to FHWA annually as part of the HPMS program.

According to EPA guidance, baseline inventory VMT computed by the statewide model must be adjusted (or calibrated) to HPMS VMT totals. Therefore, ADOT's base year (2010) network is calibrated using factors based on HPMS data. These factors are applied to roadway group combinations within each county and are important for accounting for local roadway VMT not represented in the model.

Both sources of data were compared with three other sources of VMT: VMT used for SIP development (that is, the 2008 NEI), VMT used for the 2011 NEI, and VMT reported by ADOT on October 10, 2016, as part of its HPMS data submittal. The comparison was conducted to ensure that the 2014 NEI and ADOT's TDM data were appropriate for use in the regional emissions analysis. The comparison is summarized in Table 4. VMT data from each source are comparable—despite representing a 7-year span. The 2008 NEI/SIP VMT dataset had the highest total for the county, while the 2011 NEI had the lowest. Both the 2014 NEI and the ADOT TDM VMT datasets showed higher annual totals than the 2015 HPMS data submittal, but were slightly lower than the 2008 NEI estimate. As a result, it was determined that either dataset (the 2014 NEI or the ADOT TDM) was reasonable to use for the regional emissions analysis.

Table 4. Comparison of annual vehicle miles traveled datasets

Data source	Annual vehicle miles traveled estimate
2008 National Emissions Inventory and State Implementation Plan	471,074,100
2011 National Emissions Inventory	424,265,260
2014 National Emissions Inventory	460,577,964
2013 ADOT Travel Demand Model	447,274,054
2015 Highway Performance Monitoring System data submitted by ADOT	435,810,000

Note: ADOT = Arizona Department of Transportation

MOVES requires that annual county-wide VMT estimates be distributed amongst five HPMS vehicle (or source) types. Both the 2014 NEI and ADOT TDM provided datasets broken out into the required source types. ADOT's MOVES converter tool was used to apportion county-level VMT forecasts from the statewide TDM into each of five HPMS vehicle types. A comparison of the two datasets revealed a significant difference. The ADOT TDM VMT had a smaller percentage of light-duty passenger vehicle VMT and a larger percentage of heavy vehicle VMT than the 2014 NEI. Table 5 displays the difference in apportionment between the two datasets. As a result of attributing more VMT to diesel vehicle types, activity data (VMT) from ADOT's statewide TDM yielded more conservative on-road emissions estimates of PM_{10}, $PM_{2.5}$, and NO_x.

Table 5. Comparison of annual vehicle miles traveled, by vehicle type

Vehicle type		Percentage of vehicle miles traveled	
HPMS vehicle type	Source type ID	2014 NEI	ADOT TDM
Motorcycles	10	0.6	0.7
Light-duty vehicles	25	94.1	86.9
Buses	40	0.3	0.5
Single-unit trucks	50	1.7	5.1
Combination trucks	60	3.3	6.8

Notes: ADOT = Arizona Department of Transportation, HPMS = Highway Performance Monitoring System, NEI = National Emissions Inventory, TDM = Travel Demand Model

Both of the evaluated VMT data sets (2014 NEI and ADOT TDM) represent county-wide activity. The $PM_{10}/PM_{2.5}$ SIPs used population data to apportion county-level emissions estimates to the NNA. To verify that this method of apportionment was conservative, an NNA-specific VMT estimate was developed using each of the county-wide datasets and geographic information system (GIS) data for the 2013 HPMS roadway network in Santa Cruz County obtained from FHWA. ArcMap software was used to identify HPMS roadway segments within the NNA boundaries. The HPMS dataset contained information on roadway length (in miles) and annual average daily traffic (AADT) for each roadway segment. AADT was multiplied by the segment length to estimate average daily VMT for each segment. Daily VMT estimates for each segment were then multiplied by 365 days per year and summed to estimate annual VMT for the NNA. The resulting annual VMT estimate for the NNA was approximately 181,135,500. This represents 38.5 percent of the county-wide VMT. The population apportionment method used to develop the $PM_{10}/PM_{2.5}$ SIPs resulted in 55.1 percent of county-wide on-road mobile emissions being apportioned to the NNA for 2008 and 56.9 percent for 2011 (the year on which the MVEB was based).

Both the GIS-based and population-based apportionment methods were used given the 2014 NEI and ADOT TDM annual VMT datasets. Tables 12a and 12b in the *Regional Emissions Analysis and Conformity Test Results* section of this report show the emissions estimates developed using the different VMT datasets and NNA apportionment methods.

Each VMT dataset was grown to each analysis year using growth factors derived from ADOT's TDM forecast for 2030, with the exception of the 2017 analysis year. It was assumed, based on ADOT's most recent HPMS data submittal, that each of the preferred datasets (2014 NEI and ADOT TDM) was representative of current conditions (2017). Two growth factors were developed, based on ADOT's TDM forecast, to prevent overestimating growth on high-volume, higher-speed roadways and underestimating growth on low-volume, lower-speed roadways. A factor of 0.49 percent annual VMT growth was calculated for restricted access roadways (for example, I-19), and a factor of 0.68 percent was calculated for unrestricted access roadways (for example, SR 189). VMT forecasts were apportioned to each of the five HPMS vehicle types using the VMT fractions provided in Table 5. Table 6 shows the VMT forecast by vehicle type developed for each of the two preferred VMT datasets. Additional documentation related to developing VMT estimates for the regional conformity analysis (RCA) is provided in Appendix A.

Table 6. Annual county-wide vehicle miles traveled forecasts, by vehicle type

Highway Performance Monitoring System vehicle type ID	2014 National Emissions Inventory annual vehicle miles traveled estimate				Arizona Department of Transportation Travel Demand Model annual vehicle miles traveled estimate			
	2017	2021	2030	2035	2017	2021	2030	2035
10	2,864,148	2,932,414	3,046,594	3,116,766	2,713,711	2,780,294	2,930,107	3,013,337
25	433,295,425	443,622,886	460,896,344	471,512,081	388,815,432	398,355,413	419,820,369	431,745,344
40	1,127,893	1,154,776	1,199,740	1,227,373	2,171,583	2,224,865	2,344,750	2,411,352
50	7,933,645	8,122,741	8,439,018	8,633,392	22,974,024	23,537,715	24,806,020	25,510,634
60	15,356,853	15,722,879	16,335,085	16,711,327	30,599,303	31,350,088	33,039,354	33,977,835
Total (County)	**460,577,964**	**471,555,696**	**489,916,780**	**501,200,940**	**447,274,054**	**458,248,375**	**482,940,600**	**496,658,502**

Monthly/Daily/Hourly VMT Fractions

Vehicle speeds and emissions vary considerably depending on the time of day. Therefore, it is important to estimate the pattern by which the roadway volume varies by month, day, and hour. MOVES requires annual VMT by HPMS vehicle class as an input. However, to further refine emissions specific to month, day, and hour, VMT fractions for a given roadway type and source (that is, vehicle type) can be input for every hour of the day (weekday or weekend), day of the month, and/or month of the year. Both the SIPs and the 2014 NEI relied on national data for monthly, daily, and hourly VMT fractional distributions by roadway type and vehicle type. However, ADOT's TDM conversion tool produces a VMT distribution by hour based on TDM-generated activity data for Santa Cruz County. Therefore, this hourly distribution was used with the ADOT TDM dataset, while national distribution data were used for the 2014 NEI dataset. National data for daily VMT were used to estimate emissions for both the 2014 NEI and ADOT TDM datasets.

A county-specific monthly VMT distribution was developed for both datasets using traffic count data collected by an ADOT automated traffic recorder located in the NNA. Daily traffic volumes recorded during 2015 at ADOT's traffic recorder site 101763 [State Route 19B(1)] were aggregated for each month of the year and divided by the total traffic volume recorded for the year. Because no information regarding how the VMT related to specific source types was available, it was assumed the monthly VMT fraction remained consistent for each of the 13 MOVES vehicle types. Table 7 shows the monthly VMT fractions generated using ADOT traffic volume data at site 101763 for 2015.

Table 7. Monthly vehicle miles traveled fractions, by vehicle type, for the Nogales Nonattainment Area

Month	Vehicle miles traveled fraction	
	Typical year	Leap year
1	0.0852	0.0850
2	0.0813	0.0840
3	0.0882	0.0880
4	0.0872	0.0870
5	0.0901	0.0898
6	0.0806	0.0804
7	0.0747	0.0744
8	0.0803	0.0801
9	0.0793	0.0791
10	0.0834	0.0832
11	0.0817	0.0815
12	0.0880	0.0877

Analysis year forecasts assumed VMT fractions did not change from year to year. Thus the same monthly, daily, and hourly VMT fractions used to estimate 2017 on-road emissions were used for analysis years 2021, 2030, and 2035.

Average Speed Distribution

MOVES uses average speed distributions by road type, source type, and hour of the day to calculate operating mode distributions. The operating mode distributions, in turn, determine the calculated emission rates. MOVES provides an average speed distribution based on national data for use in areas where specific speed distribution data are either unavailable or unreliable. Both the PM_{10} and $PM_{2.5}$ SIPs used MOVES average speed distribution data to estimate emissions.

Two types of average speed distributions were needed for this regional emissions analysis: one for existing conditions and one for "build" conditions. Existing conditions reflect travel speeds on the roadway network as it currently exists. The "build" condition represents speeds on an "improved" roadway network, as identified in both the STIP and LRTP for the NNA. The current STIP and LRTP identify only one regionally significant roadway project being constructed between 2017 and 2035, the SR 189, International Border to Grand Avenue, project. Therefore, the "build" distribution was based on travel speed information provided by the traffic study for the SR 189 project (*Year 2040 Traffic Operations Analysis Report, SR 189/Mariposa Road: International Border to Grand Avenue*, revised October 2016).

Tables 2-1 and 5-1 of the project's traffic study provided the current and future traffic conditions for specific roadway segments along the 3.4-mile-long project. AADT was aggregated and multiplied by the project length to estimate average daily VMT in the project area. Given the amount of access and the rural setting of the project area, it was assumed the project would only affect unrestricted, rural roadways (MOVES road type 5) and improve travel time for only 12 hours of the day (from 7 a.m. to 7 p.m.). Comparing the daily project area VMT with that estimated for Santa Cruz County and the NNA, it was estimated that approximately 12 percent of the county's VMT would increase in speed as a result of the project and 30 percent of the NNA VMT would increase speed. Based on the travel time estimates presented in Table 5-1 of the traffic study, it was estimated that average speeds in the area would go from 13.55 miles per hour (mph) to almost 25 mph as a result of the project. Thus, adjustments were made to the average speed distributions to reflect more VMT in MOVES speed bin 6 and less in MOVES speed bin 4:

$SB4_a = SB4_i – (SB4_i * F_{VMT})$

$SB6_a = SB6_i + (SB4_i - SB4_a)$

Where:

$SB4_a$ = the adjusted fraction of VMT in speed bin 4 for the appropriate roadway type and time of day

$SB4_i$ = the initial fraction of VMT in speed bin 4 for the appropriate roadway type and time of day

F_{VMT} = the fraction of VMT changing speed bin as a result of the project (12% county or 30% NNA)

$SB6_a$ = the adjusted fraction of VMT in speed bin 6 for the appropriate roadway type and time of day

$SB6_i$ = the initial fraction of VMT in speed bin 6 for the appropriate roadway type and time of day

Minor adjustments were made as needed to ensure the VMT fractions for each hour of the day across all 16 speed bins summed to 1.0000000. It was assumed that average speed distributions would not change between 2021 and 2035 because no other regionally significant roadway projects are planned for construction in the NNA between 2021 and 2035.

MOVES average distributions were used as the basis for both the existing and build conditions for the 2014 NEI activity data. However, the ADOT TDM produces a speed distribution for Santa Cruz County. Therefore, estimates developed using VMT from the ADOT TDM used model-based average speed distributions as the basis for both existing and build average speed distributions.

Road Type Distribution

Typical drive cycles and associated operating conditions vary by roadway type. Therefore, MOVES requires a VMT fraction for each roadway type by source type. MOVES includes five different road types:

1) Off-network (related to emissions from parked vehicles and refueling)
2) Rural restricted access
3) Rural unrestricted access
4) Urban restricted access
5) Urban unrestricted access

Two sets of road type distributions were created based on the two VMT datasets considered. One is the same distribution used to develop the $PM_{10}/PM_{2.5}$ SIPs and is based on county-wide HPMS data. It was applied to the 2014 NEI VMT estimates. The other distribution was developed using county-level output from ADOT's TDM and was applied to the VMT estimates produced by the TDM.

The primary difference between the two is that the SIP/NEI distribution has a greater fraction of light-duty vehicles and heavy-duty vehicles using restricted access rural roads than the TDM distribution. The TDM distribution has more VMT on urban roadway types, both restricted and unrestricted. Table 8 shows the VMT fractions used to create the road type distributions used. It was assumed road type distributions remained consistent between each of the analysis years given that no new roadways were planned to be constructed in the area between 2017 and 2035.

Table 8. Roadway type vehicle miles traveled fractions, by vehicle type, for the Nogales Nonattainment Area

MOVES vehicle type	MOVES roadway type							
	Travel Demand Model vehicle miles traveled fraction				State Implementation Plan/ National Emissions Inventory vehicle miles traveled fraction			
	2	3	4	5	2	3	4	5
11, 21, 31, 32	0.101631	0.240321	0.244767	0.413280	0.188277	0.216653	0.243867	0.351204
41	0.140927	0.281196	0.219592	0.358285	0.140927	0.281196	0.219592	0.358285
42	0.138444	0.281313	0.219602	0.360642	0.138444	0.281313	0.219602	0.360642
43	0.138391	0.281315	0.219602	0.360692	0.138391	0.281315	0.219602	0.360692
51, 52, 53, 54	0.124394	0.257200	0.244664	0.373742	0.326072	0.214565	0.228626	0.230737
61 and 62	0.149949	0.297081	0.239249	0.313721	0.438430	0.184483	0.223676	0.153411

Ramp Fraction – EPA's average ramp fraction was used. It is 8 percent of vehicle hours traveled on both rural and urban interstates (road types 2 and 4). Forecasts assume the ramp fraction would not change in the future.

Fuel – The current local fuel supply and fuel formulation data for Santa Cruz County provided by EPA with MOVES were used. It is assumed EPA's data for Santa Cruz County were used to develop the 2008 NEI and 2014 NEI. Additionally, it is assumed fuel properties will not significantly change in the future.

Inspection/Maintenance Programs – No inspection/maintenance programs exist in Santa Cruz County or the NNA. This is assumed to continue in the future.

Vehicle Starts – EPA average values provided with MOVES were used.

Retrofit Data – None. These data are not required unless a vehicle retrofit program exists that needs to be modeled. No program exists in the NNA. This is assumed to continue in the future.

Hoteling – Hoteling is a nondriving activity associated with long-haul combination trucks. Four operating modes are associated with hoteling: extended idle, diesel auxiliary power, battery power, and engine-off. Detailed, local data regarding hoteling hours and operating mode fractions do not exist for the NNA. Therefore, EPA's national data were used to estimate emissions.

MOVES Runs

MOVES takes the data (described above) and creates an "input" database referenced by a run specification file (*.mrs). The file also specifies key data options for the run, output options, and the name of an "output" database. A summary of key MOVES run specification settings is shown in Table 9. For this analysis, MOVES is applied using the *inventory-based* approach where actual VMT and vehicle populations are provided as inputs to the model and MOVES produces a total emissions estimate for the selected time period.

Table 9. MOVES run specification file parameter settings

Parameter	Setting
Scale	County
Calculation type	Inventory
Time span	Annual runs: 12 months, weekday and weekend, 24 hours
Time aggregation	Hour
Geographic selection	Santa Cruz County
Vehicle selection	All 13 vehicle (source) types Gasoline, diesel, compressed natural gas, electricity, ethanol (E-85)
Road type	All road types (2, 3, 4, 5) and off-network (1)
Pollutants and processes	$PM_{2.5}$, PM_{10}, and NO_x PM includes exhaust, tire, and brake
General output	Units: emission = pounds, distance = miles, time = hours, energy = million British thermal units

For this analysis, an annual emissions estimate for on-road PM_{10}, $PM_{2.5}$, NO_x was produced. Four sets of MOVES input files were generated to assess the differences between using 2014 NEI/SIP VMT data versus ADOT TDM data and the difference between apportioning county-wide emissions using population estimates versus using VMT estimates for the NNA based on HPMS shape files. An output database was generated for each MOVES run. Emissions tables produced by MOVES were exported to Microsoft Excel and are provided in Appendix B. The run specification files and CDM databases are provided in Appendix D.

Fugitive Dust Analyses

The arid conditions and soil composition in many areas of Arizona makes fugitive dust a major contributor to ambient concentrations of PM_{10} and, to a lesser extent, $PM_{2.5}$. MVEBs for PM_{10} include fugitive dust from paved roads, unpaved roads, and roadway construction activities. The methods used to calculate fugitive dust

emissions for this regional emissions analysis are consistent with those used to develop the MVEB contained in the PM_{10} SIP and with EPA's AP-42 methodologies.

EPA did not make a formal finding that fugitive dust sources of $PM_{2.5}$ were significant to the NNA. Additionally, ADOT has not received any requests to include fugitive sources of $PM_{2.5}$ as part of the RCA. Therefore, this analysis does not include $PM_{2.5}$ emissions from fugitive dust sources.

Paved Roadway Emissions

Paved road dust emissions were estimated for Santa Cruz County using the 2014 NEI and were then apportioned to the NNA using population. Uncontrolled emissions were first calculated at the county level by roadway type and year. This was done by multiplying VMT by an appropriate emission factor generated using the AP-42 emissions factor equation:

$$EF_{RT} = [k\ (sL)^{0.91} \times (W)^{1.02}]$$

$$E_{RT} = VMT_{RT} * EF_{RT}$$

Where:
EF_{RT} = annual average emission factor for a given FHWA roadway type in grams per VMT (g/VMT)
E_{RT} = annual emission for a given FHWA roadway type in grams per year (g/year)
VMT_{RT} = annual vehicle miles of travel for a given FHWA roadway type in Santa Cruz County
k = particle size multiplier for particle size range and units of interest (PM_{10} = 1.0 g/VMT)
sL = road surface silt loading (ranged between 0.0105 g/m^2 and 0.6 g/m^2, based on road type)
W = average weight (tons) of the vehicles traveling a given roadway type (ranged between 3.68 and 2.19 tons, based on roadway type)

The 2014 NEI did not adjust emissions to account for precipitation days. However, it did include control factors. These were applied to the uncontrolled paved road dust emissions in counties with serious and/or moderate PM_{10} nonattainment areas. Because the NNA is a moderate nonattainment area, controls representing vacuum sweeping of paved roads twice per month were applied to urban roadway types in Santa Cruz County. A control efficiency of 79 percent was assumed with a rule penetration between 64 and 88 percent, depending on roadway class (that is, freeway, minor arterial, collector, or local). Rule effectiveness was assumed to be 100 percent. Controlled emissions by roadway class were then totaled for each county. The difference between uncontrolled and controlled emissions for Santa Cruz County was 18.8 percent.

Controlled county-level emissions were apportioned to the NNA using the relationship between county population and the estimated NNA population. The PM_{10} SIP used GIS data to establish a methodology to estimate the NNA population. It assumed 88.7 percent of Rio Rico's southeast census designated place and 19.1 percent of Rio Rico's southwest census designated place are in the NNA. Each of these census designated places represents 18 and 28 percent of Rio Rico's population, respectively.

Thus, the population of the NNA was estimated:

$$POP_{NNA} = POP_N + ((POP_{RR} * .28)*.191) + ((POP_{RR} * .18)*.887)$$

Where:
POP_{NNA} = population of the NNA
POP_N = population of Nogales
POP_{RR} = population of Rio Rico

The PM_{10} SIP used U.S. Census Bureau data instead of data from the Arizona Department of Administration, Employment and Population Statistics, Office of Economic Opportunity. U.S. Census data show a -2 percent annual growth rate between when the SIP inventory was done (2010) and 2014. However, State statistics show a 1.1 percent annual increase in population over that same period. Therefore, paved road dust allocations to the NNA were adjusted to account for the differences between the two sources of population data. This resulted in the emissions allocated to the NNA increasing by 16.1 percent.

2014 NNA emissions were forecast to each analysis year (that is, 2017, 2021, 2030, and 2035) using county-wide population growth estimates developed using forecasts provided by the Arizona Department of Administration, Employment and Population Statistics, Office of Economic Opportunity.

Unpaved Roadways
The main contributor to PM_{10} emissions in the NNA is dust emissions from unpaved roads. Emissions estimates for unpaved road dust in the NNA were developed using the 2014 NEI for Santa Cruz County and recent population estimates/forecasts from the Arizona Department of Administration, Employment and Population Statistics, Office of Economic Opportunity. The 2014 NEI estimated unpaved road dust emissions at the county level by roadway type by multiplying annual VMT estimates by an emissions factor generated using the AP-42 emissions factor equation:

$$EF = ([k(s/12)^1(S/30)^{0.5}] / [(M/0.5)^{0.2}]) - C$$

Where:
EF = PM_{10} emission factor (lb/VMT), calculated for each of 9 unpaved roadway types
k = empirical constant = 1.8 lb/VMT; from AP-42
s = surface material silt content (%) = 3.0%; average state value based on samples taken as part of the 1985 NAPAP Inventory
M = surface material moisture content (%) = 0.5% (conservative national default value used for the NEI)
S = mean vehicle speed (mph) = varied between 39 mph and 20 mph based on roadway type
C = 0.00047 lb/VMT; PM_{10} emission factor for 1980s vehicle fleet exhaust, brake wear, and tire wear (EPA AP-42 Chapter 13.2.2, 2006)

Emissions factors were multiplied by specific VMT estimates for each unpaved roadway type in the county. No controls were applied to the emissions estimate given the rural nature of Santa Cruz County and the fact

that the NNA is a moderate PM_{10} area. The 2014 NEI also did not adjust county-level unpaved road dust emissions to account for precipitation days.

State-level FHWA data on length of unpaved roads by road type (in miles) and AADT were used to estimate annual VMT on unpaved roads. These state-level annual VMT estimates were allocated to each county for the 2014 NEI based on the proportion of rural population in the county per the 2010 U.S. Census.

As with paved road dust emissions, unpaved road dust emissions were allocated from the county level to the NNA using population. Emissions were then forecast to each analysis year using population forecasts provided by the Arizona Department of Administration, Employment and Population Statistics, Office of Economic Opportunity.

Road Construction

The PM_{10} SIP relied on the 2008 NEI to estimate road construction dust emissions for Santa Cruz County. The 2008 NEI used ADOT's overall roadway program value (in dollars) apportioned to six roadway types (urban interstates, rural interstates, urban arterials, rural arterials, urban collectors, and rural collectors) to estimate emissions for each county in the state. General cost per mile factors were used to convert dollars to lane-miles constructed, and acres per lane mile factors were used to estimate acres of land under construction. Acres disturbed for the state were then apportioned to each county using housing starts information.

The method used to estimate PM_{10} road construction dust in the NNA was similar to the one used for SIP development. However, more recent 2014 NEI data were used to estimate emissions for both general roadway construction (not associated with a specific project) and for specific roadway projects listed in the STIP or LRTP. The 2014 NEI used the same methodology as the 2008 NEI. The amount of land (in acres) disturbed at the state level was estimated using ADOT construction expenditure data and unit cost estimates for each roadway type. Total statewide acres of construction were then estimated and apportioned to each county using building permit information. A ratio of the number of building starts in each county to the total number of building starts in Arizona was applied to the state-level acres disturbed estimate to develop the total number of acres disturbed by road construction in each county. An emissions factor of 0.42 tons PM_{10}/acre-month was applied to the estimated amount of land under construction to reflect the high level of cut and fill activity associated with road construction. The emissions factor was then corrected to account for state-specific soil silt content values and average precipitation/evaporation values. The equation used by the 2014 NEI to adjust the emissions factors is:

$EFc = 0.42 \text{ tons } PM_{10}/\text{acre-month} * (24/PE) * (S/9\%)$

Where:

EFc = corrected emissions factor

PE = precipitation-evaporation value (in hours)

S = dry silt content in soil (%)

Construction was assumed to occur over a 12-month period. Table 10 provides the total number of acres, soil silt content, and average precipitation/evaporation values applied to develop the 2014 NEI emissions estimate for Santa Cruz County.

Table 10. 2014 National Emissions Inventory road construction dust activity and assumptions

Parameter	Value
State building starts (2015)	26,997
Total state acres	921.84
County building starts (2015)	44
Total county acres	1.5
State average precipitation/evaporation (in hours)	25.1
County soil silt percentage	22.33

County-level emissions were apportioned to the NNA using population data obtained from the Arizona Department of Administration, Employment and Population Statistics, Office of Economic Opportunity. Since specific housing start forecasts for the area were not available, population forecasts were used as a surrogate to estimate emissions for each analysis year.

Construction dust for specific roadway projects identified in the STIP and LRTP were estimated based on the identified number of acres disturbed for each project. The only regionally significant project programmed or planned in the NNA through 2035 is the SR 189, International Border to Grand Avenue, project. The currently funded interim project design will disturb approximately 56 acres between 2019 and 2020. In 2021, the ultimate configuration of the project will be constructed and is estimated to disturb approximately 12 acres. A corrected emissions factor (0.9963 ton PM_{10}/acre-month) was applied to the appropriate construction activity to estimate construction emissions from the project, assuming a 12-month project duration. These emissions were included only in the analysis year for which the project was programmed or planned and was not included in future-year analyses.

Transportation Control Measures

EPA has not approved any transportation control measures for the NNA. Therefore, there is no need to address them as part of this analysis. Emission reduction credits for road paving projects included in the STIP and/or LRTP can be applied as appropriate. However, ADOT does not have any paving projects programmed or planned in the NNA other than the SR 189 project. Likewise, not enough local data on which to base emission reduction credits are readily available.

Regional Emissions Analysis and Conformity Test Results

A regional emissions analysis of the current STIP and LRTP was completed for the NNA using the methodologies, assumptions, and data as presented in the previous sections. Results from the emissions analysis were used to perform the regional conformity tests according to the requirements of the federal

transportation conformity rule (40 Code of Federal Regulations [CFR] Part 93, Subpart A). The PM_{10} RCA was performed in accordance with 40 CFR § 93.118 (Criteria and procedures: Motor vehicle emissions budget), while the $PM_{2.5}$ analysis was conducted pursuant to 40 CFR § 93.119 (Criteria and procedures: Interim emissions in areas without motor vehicle budgets). Interagency consultation was conducted to identify applicable emission analysis methodologies, assumptions, analysis years, and conformity tests.

Analysis Years

EPA regulations, as outlined in § 93.118(b) and § 93.119(g) of the Final Transportation Conformity Rule, require that emissions analyses be conducted for specific analysis years:

- the first year of a transportation program
- the last year of a transportation program
- the horizon year of the LRTP
- each year for which the applicable SIP specifically establishes an MVEB(s)
- attainment year of the applicable standard, if within the timeframe of the STIP and LRTP
- an intermediate year or years, such that each analysis year is no more than 10 years apart

The inventory years identified through the interagency consultation process for the RCA are:

- 2017 – first year of the STIP
- 2021 – last year of the STIP
- 2030 – interim year
- 2035 – horizon year of the LRTP

A budget test is required for PM_{10} because the SIP contains an approved MVEB for one year (2011) and does not include an attainment year. An interim test is required for $PM_{2.5}$ because no MVEB was included or approved as part of the SIP. Similarly, the $PM_{2.5}$ SIP does not include an attainment year.

Regionally Significant Transportation Projects

Projects that could have a significant impact on emissions were included in the regional emissions analysis in accordance with 40 CFR Parts 51 and 93. Essentially, only those projects that would increase capacity or significantly affect vehicular speeds were considered. Projects such as bridge replacements and roadway restoration projects have been excluded from consideration because they are not expected to significantly alter the volume or speed of traffic.

The only regionally significant transportation project identified in the STIP or LRTP that could affect regional emissions in the NNA is the SR 189 project. This project is programmed in two phases: an interim configuration programmed for construction in fiscal year 2019 and an ultimate configuration that is included in the last year of the STIP (2021). The interim configuration consists of intersection improvements and median installation along SR 189, a flyover ramp from eastbound SR 189 to northbound I-19, and widening SR 189 in the eastbound direction west of the Mariposa TI to add a third through lane. The ultimate configuration consists of constructing a southbound to westbound right exit flyover ramp from I-19 to SR 189 with a grade separation over Frank Reed Road.

Emissions impacts from both fugitive dust and on-road mobile sources were included. Construction dust emissions were estimated as described in the previous section and assigned to the 2021 analysis year. On-road emissions were estimated for 2017 and beyond using MOVES and an average roadway speed distribution representing the "build" condition for the ultimate configuration (that is, emissions in the NNA after the project has been completed).

Emissions Analysis Results

A PM_{10}, $PM_{2.5}$ and NO_x regional emissions analysis was completed for the NNA. PM_{10} emissions sources include paved road dust, unpaved road dust, road construction dust, and on-road mobile emissions (tailpipe, tire wear, and break wear). $PM_{2.5}$ and NO_x emission include only on-road mobile sources (tailpipe, tire wear, and break wear). The results of the analysis are summarized in Tables 11, 12a, 12b, and 12c. Table 11 presents the PM_{10} emission analysis for fugitive dust sources. Tables 12a to 12c present on-road mobile emissions estimated using MOVES, given the two sources of data and two VMT apportionment methodologies. Emissions were estimated for each pollutant given the methodologies described in previous sections of this report. A summary of MOVES input parameters is provided in Appendix B. All of the MOVES files generated for the analysis are provided in Appendix D.

Table 11. Annual PM_{10} fugitive dust emission analysis results

Pollutant	2017 (tons/year)	2021 (tons/year)	2030 (tons/year)	2035 (tons/year)
Unpaved road dust	843.94	891.11	989.93	1,038.10
Paved road dust	52.07	54.99	61.08	64.05
Road construction dust	10.09	154.12	11.83	12.41
Total fugitive dust	**906.10**	**1,100.21**	**1,062.85**	**1,114.56**

Table 12a. Annual PM_{10} emissions from on-road sources (MOVES analysis)

Analysis year	County-level VMT estimates allocated to Nogales Nonattainment Area by population		Nogales Nonattainment Area volumes based on geographic information system data	
	2014 NEI data (ton/year)	TDM data (ton/year)	2014 NEI data (ton/year)	TDM data (ton/year)
2017	17.38	***20.24***	14.10	16.27
2021	14.59	***15.68***	11.77	12.59
2030	***11.82***	11.32	9.43	9.08
2035	***11.41***	10.78	9.01	8.57

Notes: NEI = National Emissions Inventory, TDM = Travel Demand Model, VMT = vehicle miles traveled

Table 12b. Annual $PM_{2.5}$ emissions from on-road sources (MOVES analysis)

Analysis year	County-level VMT estimates allocated to Nogales Nonattainment Area by population		Nogales Nonattainment Area volumes based on geographic information system data	
	2014 NEI data (ton/year)	TDM data (ton/year)	2014 NEI data (ton/year)	TDM data (ton/year)
2017	9.29	***12.73***	7.99	10.60
2021	6.61	***8.43***	5.76	7.15
2030	3.82	***4.16***	3.45	3.71
2035	3.30	***3.51***	2.96	3.12

Notes: NEI = National Emissions Inventory, TDM = Travel Demand Model, VMT = vehicle miles traveled

Both paved and unpaved road dust emissions grow each analysis year as a function of VMT growth within the county and within the nonattainment area. Road construction dust emissions peak in 2021 because of the construction of the programmed SR 189 project. After the project is complete, road construction dust in the NNA grows as a result of the forecast population growth in Santa Cruz County.

Table 12c. Annual NO_x emission from on-road sources (MOVES analysis)

Analysis year	County-level VMT estimates allocated to Nogales Nonattainment Area by population		Nogales Nonattainment Area volumes based on geographic information system data	
	2014 NEI data (ton/year)	TDM data (ton/year)	2014 NEI data (ton/year)	TDM data (ton/year)
2017	411.2	***522.1***	415.4	497.4
2021	277.0	***342.1***	288.1	336.4
2030	134.7	155.3	147.2	***162.5***
2035	94.7	109.4	100.6	***111.8***

Notes: NEI = National Emissions Inventory, TDM = Travel Demand Model, VMT = vehicle miles traveled

The analysis of on-road emissions found:

- More emissions are estimated when allocating county-wide emissions to the NNA using population versus using estimates of VMT specific to the nonattainment area.
- In general, estimates produced using 2014 NEI sources of activity data were lower than estimates produced using activity data from ADOT's statewide TDM.
- Emissions estimates produced for the NNA using MOVES were comparable regardless of the method used to allocate county-level activity data to the nonattainment area or the source of the activity data (that is, 2014 NEI versus TDM).
- Emissions estimates decrease between 2017 and 2035 despite increasing VMT as a result of EPA vehicle fleet emissions standards built into the MOVES model.

The highest on-road emissions estimate generated by the analysis (in bold and italicized text in Tables 12a to 12c) was used for the applicable conformity test to ensure it was a conservative result.

Emission Tests

Two emissions tests were required for this RCA: a budget test for PM_{10} and a no-greater-than 2008 test for on-road $PM_{2.5}$ and NO_x. Table 13 and Figure 2 show the budget test for PM_{10} for the NNA. Table 14 and Figures 3 and 4 show the results of the no-greater-than test for $PM_{2.5}$ and NO_x. These tables and figures illustrate that all analysis years satisfy the regional conformity tests applicable to the NNA. As previously stated, only on-road emissions were included in the no-greater-than 2008 tests for $PM_{2.5}$ and NO_x. Neither EPA nor ADEQ has concluded that fugitive dust emissions are a significant contributor to $PM_{2.5}$ in the NNA.

Table 13. Nogales Nonattainment Area PM_{10} motor vehicle emissions budget test

Source	2011 (tons/year)	2017 (tons/year)	2021 (tons/year)	2030 (tons/year)	2035 (tons/year)
Unpaved road dust	864.9	843.94	891.11	989.93	1,038.10
Paved road dust	121.4	52.07	54.99	61.08	64.05
Road construction dust	267.0	10.09	154.12	11.83	12.41
On-road emissions (exhaust brake and tire wear included)	21.0	20.24	15.68	11.82	11.41
Total (motor vehicle emissions budget)	**1,274.3**	**926.34**	**1,115.89**	**1,074.66**	**1,125.97**
Conformity test results		**Pass**	**Pass**	**Pass**	**Pass**

Figure 2. Nogales Nonattainment Area PM_{10} motor vehicle emissions budget test

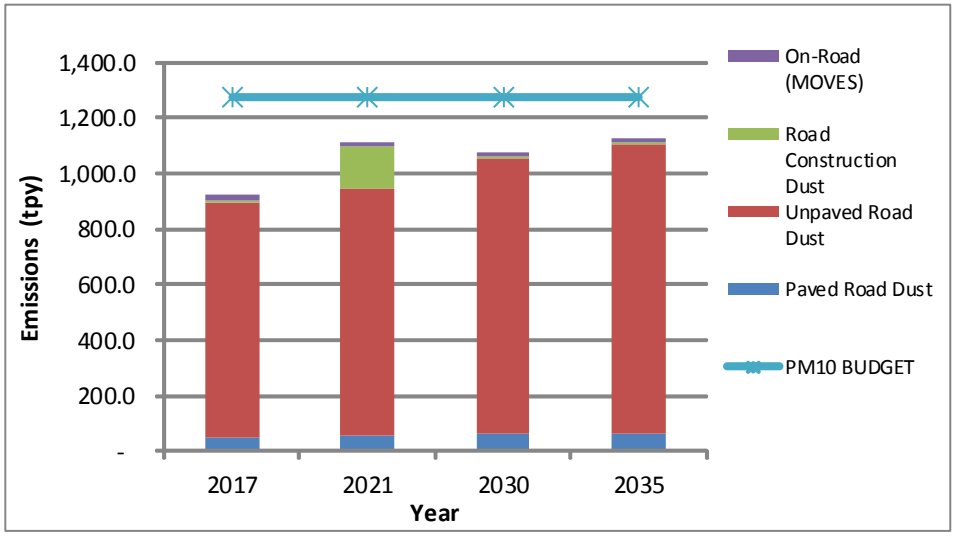


Table 14. Nogales Nonattainment Area $PM_{2.5}$ and NO_x no-greater-than 2008 test

Source	2008 (tons/year)	2017 (tons/year)	2021 (tons/year)	2030 (tons/year)	2035 (tons/year)
On-road NO_x	912.9	522.1	342.1	162.5	111.8
Conformity test results		**Pass**	**Pass**	**Pass**	**Pass**
On-road $PM_{2.5}$ (exhaust brake and tire wear included)	25.10	12.73	8.43	4.16	3.51
Conformity test results		**Pass**	**Pass**	**Pass**	**Pass**

Figure 3. Nogales Nonattainment Area $PM_{2.5}$ test

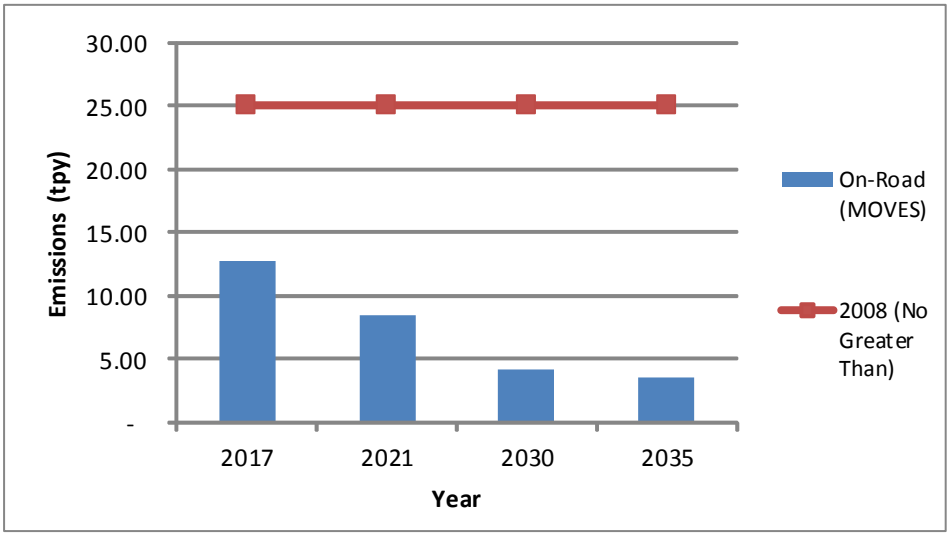
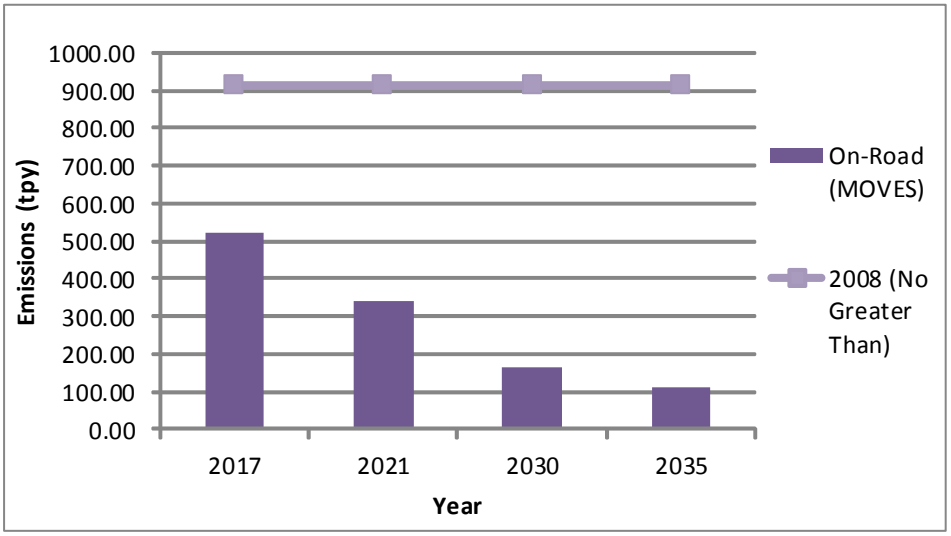


Figure 4. Nogales Nonattainment Area NO_x test



Conformity Determination

Financial Constraint

The federal planning regulations, Sections 450.322(b)(11) and 450.324(e), require ADOT's STIP and LRTP to be financially constrained and include only projects for which construction and operating funds are reasonably expected to be available. Both ADOT's STIP and LRTP have been determined to be financially constrained by FHWA. As part of its STIP and LRTP, ADOT has developed estimates of the cost to maintain and operate the existing interstates, highways, and bridges in Santa Cruz County and compared that cost with the estimated revenues and maintenance needs across the state.

Public Participation

The STIP and LRTP have undergone the public participation requirements and the comment and response requirements set forth in the Final Conformity Rule, the Final Statewide/Metropolitan Planning Rule, and Arizona's Conformity SIP. The Fiscal Year 2017–2021 STIP was made available for a 30-day public review and comment from September 10, 2016, through October 10, 2016. Likewise ADOT's current LRTP (*What Moves you Arizona, Long-Range Transportation Plan 2010–2035*) offered many opportunities for public comment and input between 2009 and 2011. The specific public outreach opportunities are described in Section 2.4 of the LRTP and include:

- outreach videos
- email campaigns
- Facebook
- meeting-in-a-box and surveys
- advertising campaigns
- common interest group workshops on goals and objectives
- investment choice workshops
- presentations

Conformity Statement

Based on the quantitative assessment of the ADOT STIP and LRTP as it applies to the NNA, it has been determined that the project elements and programmatic strategies of the STIP and LRTP conform to both the Nogales PM_{10} SIP and the Nogales $PM_{2.5}$ SIP.

Resources

MOVES Model

The MOVES webpage within EPA's Office of Mobile Sources website contains access to the MOVES model, a user guide, and other guidance information (https://www.epa.gov/moves/moves2014a-latest-version-motor-vehicle-emission-simulator-moves).

EPA. 2015. *MOVES2014 Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity*. Transportation and Climate Division, Office of Transportation and Air Quality. January (EPA-420-B-15-007).

EPA. 2015. *MOVES2014a User Guide*. Assessment and Standards Division, Office of Transportation and Air Quality. November (EPA-420-B-15-095).

National Emissions Inventory

The 2008, 2011, and 2014 NEIs and documentation are accessible from EPA's website, accessed January 2017 (https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei).

The supporting information and data files used for this analysis are available through an EPA ftp site, accessed January 2017 (ftp://ftp.epa.gov/EmisInventory/2014/doc).

Population Data and Forecasts

The demographic information used for the analysis was obtained from the Arizona Department of Administration, Employment and Population Statistics, Office of Economic Opportunity website, accessed January 2017 (https://population.az.gov/population-estimates). Population estimates are published once a year near the end of the calendar year for the state, counties, and incorporated places. Population projections (or forecasts) are made for July 1 of each year in the projection period. The most recent forecasts of population for Santa Cruz County are dated December 2015. The baseline projections (that is, medium series), were used for the analysis.

Highway Performance Monitoring System Geospatial Data

Shape files used to estimate VMT in the NNA were obtained from FHWA's Office of Highway Policy Information, HPMS Public Release of Geospatial Data Shapefile Format website, accessed January 2017 (https://www.fhwa.dot.gov/policyinformation/hpms/shapefiles.cfm).

Arizona Department of Transportation Information Sources

ADOT Statewide TDM data were provided with the MOVES Converter Tool. Data were provided in December 2016.

The ADOT website was used to access the current STIP and LRTP:

STIP website (accessed January 2017): http://azdot.gov/planning/transportation-programming/state-transportation-improvement-program

LRTP website (accessed January 2017): http://azdot.gov/docs/default-source/planning/lrtp-2011-1129.pdf?sfvrsn=4

ADOT traffic counts and forecasts for I-19 and SR 189 are available from the Transportation Data Management System website, accessed February 2017 (http://adot.ms2soft.com/tcds/tsearch.asp?loc=Adot&mod=).

SR 189 traffic study report:

Wilson & Company Engineers & Architects. 2016. *Year 2040 Traffic Operations Analysis Report, SR 189/ Mariposa Road: International Border to Grand Avenue*. Revised October 2016.

AP-42 References

Paved road dust:

EPA Office of Air Quality Planning and Standards. 2011. *Compilation of Air Pollutant Emission Factors, AP-42*, Fifth Edition. Volume I: Stationary Point and Area Sources, Section 13.2.1, Paved Roads. Research Triangle Park, North Carolina. January.

Unpaved road dust:

EPA Office of Air Quality Planning and Standards. 2011. *Compilation of Air Pollutant Emission Factors, AP-42*, Fifth Edition. Volume I: Stationary Point and Area Sources, Section 13.2.2, Unpaved Roads. Research Triangle Park, North Carolina. January.

Glossary

AADT: average annual daily traffic, average of all days

ADEQ: Arizona Department of Environmental Quality

ADOT: Arizona Department of Transportation

CAA: Clean Air Act, as amended

CDM: County Data Manager. User interface developed to simplify importing specific local data for a single county or a user-defined custom domain without requiring direct interaction with the underlying MySQL database.

CFR: Code of Federal Regulations

Emission rate or factor: Expresses the amount of pollution emitted per unit of activity, usually in grams of pollutant emitted per mile driven for highway vehicles.

EPA: U.S. Environmental Protection Agency

FHWA: Federal Highway Administration

Final Rule: Current conformity guidance under CAA

FR: *Federal Register*

GIS: geographic information system

Growth factor: Factor used to convert volumes to future years.

HPMS: Highway Performance Monitoring System

I-19: Interstate 19

LRTP: ADOT's Long-Range Transportation Plan, *What Moves You Arizona 2010–2035*

MOVES: The latest model EPA has developed to estimate emissions from highway vehicles.

MPO: metropolitan planning organization

MVEB: motor vehicle emissions budget

NAAQS: National Ambient Air Quality Standards

NEI: National Emissions Inventory

NNA: Nogales Nonattainment Area

NO_x: oxides of nitrogen, precursor pollutant to $PM_{2.5}$

PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less

$PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less

RCA: regional conformity analysis

Road type: Functional code applied in data management to road segments to identify their type (rural/urban highways, rural/urban arterials, etc.)

SIP: State Implementation Plan, air quality plan for a nonattainment area

STIP: ADOT's *Statewide Transportation Improvement Program, 2017-2021*

Source type: One of 13 vehicle types used in MOVES modeling.

SR 189: Arizona State Route 189

TDM: ADOT's statewide travel demand model

TI: traffic interchange

TIP: Transportation Improvement Program

VMT: Vehicle miles traveled. In modeling terms, it is the simulated traffic volume multiplied by the link length.

APPENDIX A

On-Road Supporting Information and Data

April 2017

Appendix A: ADOT Vehicle Population Report; Santa Cruz County

MVD Report 1/7/2017

County	Year	Veh. Year	Light Duty Veh.		Light Duty Truck			Heavy Duty Veh.		Bus	Motorcycles	Alternate Fuels	Electric
		Subtotal	Gas	Diesel	Gas Tk1	Gas Tk2	Diesel	Gas	Diesel				
SAN	2017	216	158	0	31	1	1	1	10	10	4	0	0
SAN	2016	1,803	1,369	9	270	14	20	2	74	6	39	0	0
SAN	2015	2,281	1,758	11	334	19	44	5	51	10	47	1	1
SAN	2014	2,157	1,637	23	340	7	24	0	78	0	48	0	0
SAN	2013	1,883	1,485	17	243	6	20	2	64	13	30	0	3
SAN	2012	1,804	1,414	14	223	10	34	7	44	4	51	0	3
SAN	2011	1,508	1,152	10	225	8	24	5	37	5	40	0	2
SAN	2010	1,556	1,181	11	244	10	11	2	52	3	34	0	8
SAN	2009	1,356	984	11	181	10	15	3	70	5	72	0	5
SAN	2008	2,368	1,665	18	455	22	56	9	58	11	72	0	2
SAN	2007	3,042	2,208	12	587	13	63	10	69	2	77	0	1
SAN	2006	3,155	2,198	29	619	14	94	12	79	12	96	0	2
SAN	2005	3,307	2,410	27	608	13	64	9	108	4	59	2	3
SAN	2004	3,353	2,381	15	719	14	83	9	56	8	66	1	1
SAN	2003	3,094	2,241	17	616	15	64	10	53	5	72	0	1
SAN	2002	3,149	2,283	10	651	17	53	8	56	12	53	2	4
SAN	2001	3,015	2,059	20	718	13	53	11	85	5	44	4	3
SAN	2000	3,054	2,061	19	713	20	40	11	132	7	38	5	8
SAN	1999	2,452	1,609	12	579	22	57	12	118	7	32	2	2
SAN	1998	1,962	1,261	9	540	10	19	6	90	1	23	1	2
SAN	1997	1,761	1,051	15	557	14	37	8	54	2	21	1	1
SAN	1996	1,348	802	5	395	15	27	4	85	2	12	0	1
SAN	1995	1,330	734	4	430	23	25	5	88	3	17	0	1
SAN	1994	1,071	562	7	392	16	22	4	50	1	13	2	2
SAN	1993	793	439	4	250	16	16	5	49	2	12	0	0
SAN	1992	613	330	9	201	12	7	3	37	4	10	0	0
SAN	1991	533	305	0	183	13	6	6	14	0	5	0	1
SAN	1990	528	278	3	198	10	8	6	17	2	5	0	1
SAN	1989	472	244	8	167	17	10	2	22	1	1	0	0
SAN	1988	389	193	4	150	12	2	2	17	3	6	0	0
SAN	1987	337	175	5	121	5	5	4	15	0	7	0	0
SAN	1986	357	148	2	166	6	4	7	10	2	11	0	1
SAN	1985	321	130	9	148	4	3	3	14	1	9	0	0
SAN	1984	251	112	3	106	10	5	4	7	0	4	0	0
SAN	1983	125	60	4	44	3	4	1	3	0	5	0	1
SAN	1982	133	57	3	52	1	5	0	6	2	7	0	0
SAN	1981	152	53	5	66	6	3	3	2	0	14	0	0
SAN	1980	130	40	3	64	5	1	5	2	0	10	0	0
SAN	1979	200	89	0	85	13	3	3	1	0	5	1	0
SAN	1978	180	64	1	96	8	1	2	2	1	5	0	0
SAN	1977	113	42	0	65	3	0	1	0	1	1	0	0
SAN	1976	110	45	1	56	3	0	1	0	0	4	0	0
SAN	1975	67	25	1	32	2	1	0	0	1	5	0	0
SAN	1974	93	44	3	37	5	0	0	0	2	2	0	0
SAN	1973	110	47	1	48	4	3	2	0	3	2	0	0
SAN	1972	107	54	0	43	7	1	0	0	1	1	0	0
SAN	1971	921	529	1	352	16	0	6	2	2	13	0	0

ADOT MOVES Conversion Tool Description

Emission rates within MOVES vary significantly by the type of vehicle. ADOT's statewide travel demand model splits total volume into the following vehicle groups by facility (roadway) type and time period:

- Autos
- Single Unit Trucks (SUT)
- Multiple Unit Trucks (MUT)

ADOT's MOVES conversion tool (spreadsheet) uses EPA's national VMT by HPMS vehicle type distribution to split the above vehicle groups (autos, SUT and MUT) into the six HPMS vehicle classes required for MOVES. **The figure below** illustrates how the statewide model traffic is used to develop vehicle type mix.

ADOT MOVES Conversion Tool

VMT Data Source		MOVES Source Type Mapping	Calculate Vehile Mix Distribution
AZ Statewide Model	Auto	**Auto by MOVES Source Type** 11_Motorcycle 21_ Passenger Car 31_Passenger Truck 32_Light Commercial Truck	**Auto VMT Mix** Based on MOVES Default VMT Mix (AZ Statewide 2008 Total) Normalized by Auto Grouping [Do not vary by county & road type]
	SUT	**SUT by MOVES Source Type** 42_Transit Bus 43_School Bus 41_Intercity Bus 51_Refuse Truck 52_Single Unit Short-haul Truck 53_Single Unit Long-haul Truck 54_Motor Home	**SUT VMT Mix** Based on MOVES Default VMT Mix (AZ Statewide 2008 Total) Normalized by SUT Grouping [Do not vary by county & road type]
	MUT	**MUT by MOVES Source Type** 61_Combination Short-haul Truck 62_Combination Long-haul Truck	**MUT VMT Mix** Based on MOVES Default VMT Mix (AZ Statewide 2008 Total) Normalized by MUT Grouping [Do not vary by county & road type]

Appendix A: Population Data;
Arizona Department of Administration – Employment & Population Statistics, Office of Economic Opportunity

SANTA CRUZ COUNTY*	Census 2010	2010**	2011**	2012**	2013	2014	2015	2016	2017	2018	2019
	47,420	**47,539**	**48,088**	**48,724**	**49,218**	**49,554**	**50,270**	**50,999**	**51,728**	**52,455**	**53,181**
Incorporated Places											
Nogales	20,837	20,880	21,063	21,392	21,580	21,647	21,910	22,391	22,711	23,030	23,349
Patagonia	913	909	924	936	947	953	963	980	993	1,008	1,022
Unincorporated Balance of County	25,670	25,750	26,101	26,396	26,691	26,954	27,397	27,628	28,023	28,417	28,810
Census Designated Places (Census 2010 population >=500)											
Rio Rico CDP	18,962	19,021	19,280	19,498	19,716	19,910	20,238	20,409	20,700	20,991	21,282
Sonoita CDP	818	821	832	841	851	859	873	880	893	906	918
Tubac CDP	1,191	1,195	1,211	1,225	1,238	1,251	1,271	1,282	1,300	1,318	1,337

* Projections for 2016 and beyond refer to July 1 of each year.

** For incorporated places, these are previously published estimates for July 1 of each year; for CDPs and reservations, these are estimates produced in the projection process.

2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
53,903	**54,618**	**55,326**	**56,027**	**56,720**	**57,404**	**58,080**	**58,745**	**59,399**	**60,044**	**60,677**	**61,298**	**61,905**	**62,496**	**63,071**	**63,629**
23,666	23,980	24,291	24,599	24,903	25,203	25,500	25,792	26,079	26,362	26,640	26,913	27,179	27,439	27,691	27,936
1,035	1,049	1,063	1,076	1,090	1,103	1,115	1,128	1,141	1,153	1,166	1,178	1,189	1,201	1,212	1,222
29,202	29,589	29,973	30,352	30,727	31,098	31,465	31,825	32,179	32,529	32,871	33,207	33,537	33,857	34,168	34,471
21,571	21,857	22,140	22,421	22,698	22,972	23,242	23,509	23,770	24,029	24,282	24,530	24,773	25,009	25,239	25,463
931	943	955	967	979	991	1,003	1,014	1,025	1,037	1,047	1,058	1,069	1,079	1,089	1,098
1,355	1,373	1,391	1,408	1,426	1,443	1,460	1,477	1,493	1,509	1,525	1,541	1,556	1,571	1,585	1,599

2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
64,170	**64,695**	**65,200**	**65,688**	**66,157**	**66,609**	**67,047**	**67,472**	**67,886**	**68,289**	**68,682**	**69,069**	**69,449**	**69,824**	**70,194**
28,173	28,404	28,626	28,840	29,046	29,244	29,437	29,623	29,805	29,982	30,155	30,324	30,491	30,656	30,818
1,233	1,243	1,252	1,261	1,271	1,280	1,288	1,296	1,304	1,312	1,319	1,327	1,334	1,341	1,348
34,764	35,048	35,322	35,586	35,841	36,085	36,322	36,553	36,777	36,995	37,208	37,418	37,623	37,827	38,027
25,679	25,890	26,092	26,287	26,475	26,655	26,830	27,001	27,166	27,327	27,485	27,640	27,792	27,942	28,090
1,108	1,117	1,126	1,134	1,142	1,150	1,157	1,165	1,172	1,179	1,186	1,192	1,199	1,205	1,212
1,613	1,626	1,639	1,651	1,663	1,674	1,685	1,696	1,706	1,716	1,726	1,736	1,746	1,755	1,764

SANTA CRUZ POPULATION PROJECTIONS: 2015 TO 2050, MEDIUM SERIES

TABLE 1: TOTAL POPULATION & COMPONENTS OF POPULATION CHANGE

Year	Population	Population Change	Population % Change	Births	Deaths	Natural Change *	Net Domestic Migration	Net Foreign Migration	Total Net Migration **	Special Population Change
2015	50,270	-----	-----	620	279	341	236	138	374	-----
2016	50,999	729	1.4%	648	298	349	252	128	380	0
2017	51,728	729	1.4%	656	309	347	263	120	383	0
2018	52,455	728	1.4%	665	322	343	259	126	385	0
2019	53,181	725	1.4%	674	333	341	228	157	385	0
2020	53,903	722	1.4%	682	344	338	202	182	384	0
2021	54,618	716	1.3%	690	357	334	193	190	382	0
2022	55,326	708	1.3%	698	369	328	183	197	381	0
2023	56,027	700	1.3%	704	383	321	175	205	380	0
2024	56,720	693	1.2%	710	396	314	167	213	379	0
2025	57,404	684	1.2%	715	410	305	159	221	380	0
2026	58,080	676	1.2%	719	423	295	152	229	381	0
2027	58,745	665	1.1%	721	437	284	146	237	383	0
2028	59,399	655	1.1%	723	452	270	140	245	386	0
2029	60,044	644	1.1%	723	466	256	135	254	389	0
2030	60,677	634	1.1%	721	479	242	131	263	393	0
2031	61,298	620	1.0%	719	495	224	132	266	398	0
2032	61,905	607	1.0%	716	509	206	132	270	402	0
2033	62,496	591	1.0%	712	525	187	132	274	406	0
2034	63,071	575	0.9%	708	540	168	131	277	408	0
2035	63,629	559	0.9%	703	553	149	129	281	410	0
2036	64,170	541	0.9%	698	567	131	127	285	411	0
2037	64,695	524	0.8%	693	580	114	124	288	412	0
2038	65,200	505	0.8%	689	595	94	120	292	412	0
2039	65,688	488	0.7%	685	607	78	115	295	411	0
2040	66,157	470	0.7%	682	620	62	110	299	409	0
2041	66,609	452	0.7%	679	634	45	105	303	408	0
2042	67,047	438	0.7%	677	646	31	101	306	408	0
2043	67,472	424	0.6%	675	656	18	98	310	408	0
2044	67,886	414	0.6%	673	665	8	94	314	408	0
2045	68,289	403	0.6%	672	674	-3	90	317	408	0
2046	68,682	393	0.6%	671	684	-13	87	321	408	0
2047	69,069	386	0.6%	671	691	-20	83	325	408	0
2048	69,449	380	0.6%	671	697	-26	79	328	408	0
2049	69,824	375	0.5%	672	704	-31	76	332	408	0
2050	70,194	370	0.5%	673	709	-36	72	336	408	0

*** Natural Change = Births - Deaths**

**** Total Net Migration = Net Domestic Migration + Net Foreign Migration**

***** Population Change = Natural Change + Total Net Migration + Special Population Change**

Arizona Department of Administration, Office of Employment & Population Statistics, 12/11/2015
Telephone: 602-771-2222
Fax: 602-771-1207

Appendix A: Population Data Comparison

US Census Data:

	Santa Cruz County	Nogales	Rio Rico	NNA	% NNA
2010	47,420	20,837	18,962	24,879	52.47%
2014	46,653	20,251	17,154	21,627	46.36%
2015	46,461	20,252	17,158	21,629	46.55%

Arizona Department of Administration – Employment & Population Statistics, Office of Economic Opportunity data:

	Santa Cruz County	Nogales	Rio Rico	NNA	% NNA
2010	47,539	20,880	19,010	24,932	52.45%
2014	49,554	21,674	19,815	25,769	52.00%
2015	50,270	21,910	20,102	26,149	52.02%

Comparison: US Census vs. ADoA -EPS

	Santa Cruz County	Nogales	Rio Rico	NNA
2010	0.3%	0.2%	0.3%	0.2%
2014	5.9%	6.6%	13.4%	16.1%
2015	7.6%	7.6%	14.6%	17.3%

ADoD - EPS Population Forecast

	Santa Cruz County	Nogales	Rio Rico	NNA
2017	51,728	22,711	20,700	27,123
2021	54,618	23,980	21,857	28,639
2025	57,404	25,203	22,972	30,099
2030	60,677	26,640	24,282	31,815
2035	63,629	27,936	25,463	33,363

Appendix A: HPMS Roadway VMT in the NNA 2013 HPMS NAA

ROUTE_ID			BEG_POINT	END_POINT	SECTION_ LENGTH	AADT	Daily VMT	Annual VMT	COMMENTS
I 019			0.00000000000	1.17200000000	1.172	9437	11060	4036960	Source: AADT TimeStamp: 2014-06-20_045602
I 019			1.17200000000	2.95400000000	1.783	11954	21314	7779603.43	Source: AADT TimeStamp: 2014-06-20_045602
I 019			2.95400000000	5.30300000000	2.349	21359	50172	18312886.22	Source: AADT TimeStamp: 2014-06-20_045602
I 019			5.30300000000	7.71700000000	2.414	31966	77166	28165562.26	Source: AADT TimeStamp: 2014-06-20_045602
I 019			7.71700000000	10.88000000000	3.163	24225	76624	27967641.38	Source: AADT TimeStamp: 2014-06-20_045602
I 019	2		0.06700000000	3.34200000000	3.275	3000	9825	3586125	Source: AADT TimeStamp: 2014-06-20_045602
		I 019			**14.156**	**101941**	**246161**	**89848778**	
I 019001E			0.00000000000	0.01100000000	0.011	7192	79	28875.88	Source: AADT TimeStamp: 2014-06-20_045602
I 019001E			0.01100000000	0.08600000000	0.076	6432	489	178423.68	Source: AADT TimeStamp: 2014-06-20_045602
I 019017E			0.00000000000	0.06900000000	0.069	9692	669	244093.02	Source: AADT TimeStamp: 2014-06-20_045602
		I 019017E			**0.156**	**23316**	**1237**	**451392.58**	
S 082			0.00000000000	0.54000000000	0.540	6416	3465	1264593.6	Source: AADT TimeStamp: 2014-06-20_045602
S 082			0.54300000000	0.55600000000	0.014	6416	90	32785.76	Source: AADT TimeStamp: 2014-06-20_045602
S 082			0.55600000000	1.84700000000	1.291	4399	5679	2072874.785	Source: AADT TimeStamp: 2014-06-20_045602
S 082			1.84700000000	4.62200000000	2.775	2681	7440	2715517.875	Source: AADT TimeStamp: 2014-06-20_045602
S 082			4.62200000000	6.72200000000	2.100	1724	3620	1321446	Source: AADT TimeStamp: 2014-06-20_045602
		S 082			**6.720**	**21636**	**20294**	**7407218.02**	
S 189			0.00000000000	0.34400000000	0.344	99	34	12430.44	Source: AADT TimeStamp: 2014-06-20_045602
S 189			0.34400000000	0.84000000000	0.496	9843	4882	1781976.72	Source: AADT TimeStamp: 2014-06-20_045602
S 189			0.84100000000	1.12700000000	0.286	9843	2815	1027510.77	Source: AADT TimeStamp: 2014-06-20_045602
S 189			1.12700000000	1.91400000000	0.788	14718	11598	4233191.16	Source: AADT TimeStamp: 2014-06-20_045602
S 189			1.91400000000	2.68500000000	0.771	14939	11518	4204058.685	Source: AADT TimeStamp: 2014-06-20_045602
S 189			2.68500000000	2.97500000000	0.290	20324	5894	2151295.4	Source: AADT TimeStamp: 2014-06-20_045602
S 189			2.97500000000	3.75700000000	0.782	18069	14130	5157434.67	Source: AADT TimeStamp: 2014-06-20_045602
S 189001E8			0.00000000000	0.01900000000	0.019	3752	71	26020.12	Source: AADT TimeStamp: 2014-06-20_045602
		S 189			**3.776**	**91587**	**50942**	**18593917.97**	
		S 289	0.00000000000	1.99900000000	**2.309**	**1074**	**2480**	**905151.09**	Source: AADT TimeStamp: 2014-06-20_045602
SB019	1		0.00400000000	0.66900000000	0.665	9668	6429	2346665.3	Source: AADT TimeStamp: 2014-06-20_045602
SB019	1		0.66900000000	1.60600000000	0.936	18223	17057	6225705.72	Source: AADT TimeStamp: 2014-06-20_045602
SB019	1		1.60600000000	2.76100000000	1.155	23071	26647	9726156.825	Source: AADT TimeStamp: 2014-06-20_045602
SB019	1		2.76100000000	2.86500000000	0.104	17636	1834	669462.56	Source: AADT TimeStamp: 2014-06-20_045602
SB019	1		2.86700000000	3.94200000000	1.075	17636	18959	6919925.5	Source: AADT TimeStamp: 2014-06-20_045602
SB019	1		3.94400000000	4.57900000000	0.635	18738	11899	4342999.95	Source: AADT TimeStamp: 2014-06-20_045602
SB019	1		4.57900000000	5.70300000000	1.124	13755	15461	5643126.3	Source: AADT TimeStamp: 2014-06-20_045602
SB019	01		0.28600000000	0.71500000000	0.429	9667	4147	1513707.195	Source: AADT TimeStamp: 2014-06-20_045602
		SB019			**6.123**	**128394**	**102432**	**37387749.35**	
		CAMINO CARALAMPI	2.76700000000	3.37700000000	**0.610**	**4265**	**2602**	**949602.25**	Source: AADT TimeStamp: 2014-06-20_045602
12 DUQUESNE	RD		0.00100000000	0.34000000000	0.339	237	80	29325.195	Source: AADT TimeStamp: 2014-06-20_045602
12 DUQUESNE	RD		0.34000000000	1.18750000000	0.848	268	227	82902.45	Source: AADT TimeStamp: 2014-06-20_045602
		DUQUESNE RD			**1.187**	**505**	**307**	**112227.645**	
		12 KINO SPRINGS DR	0.05800000000	1.47200000000	**1.415**	**633**	**896**	**326928.675**	Source: AADT TimeStamp: 2014-06-20_045602
12 OLD TUCSON	RD		0.00000000000	0.01800000000	0.018	2153	39	14145.21	Source: AADT TimeStamp: 2014-06-20_045602
12 OLD TUCSON	RD		0.01800000000	1.17400000000	1.155	2154	2488	908072.55	Source: AADT TimeStamp: 2014-06-20_045602
12 OLD TUCSON	RD		1.17400000000	2.60000000000	1.426	2320	3308	1207536.8	Source: AADT TimeStamp: 2014-06-20_045602
		OLD TUCSON RD			**2.599**	**6627**	**5835**	**2129754.56**	
12 PENDLETON	DR		0.70000000000	1.87800000000	1.178	1008	1187	433409.76	Source: AADT TimeStamp: 2014-06-20_045602
12 PENDLETON	DR		1.87800000000	3.38500000000	1.507	2455	3700	1350385.025	Source: AADT TimeStamp: 2014-06-20_045602
12 PENDLETON	DR		3.38500000000	5.35200000000	1.967	2228	4382	1599603.74	Source: AADT TimeStamp: 2014-06-20_045602
		PENDLETON DR			**4.652**	**5691**	**9270**	**3383398.525**	
		12 YAVAPAI DR	**0.06900000000**	**0.13500000000**	**0.066**	**8452**	**558**	**203608.68**	Source: AADT TimeStamp: 2014-06-20_045602
		12E ADAMS ST	**0.00000000000**	**0.19800000000**	**0.198**	**488**	**97**	**35267.76**	Source: AADT TimeStamp: 2014-06-20_045602
		12E DOE ST	**0.00100000000**	**0.07200000000**	**0.071**	**3113**	**221**	**80673.395**	Source: AADT TimeStamp: 2014-06-20_045602
12E EAST	ST		0.00000000000	0.17900000000	0.179	611	109	39919.685	Source: AADT TimeStamp: 2014-06-20_045602
12E EAST	ST		0.41200000000	0.44500000000	0.033	1552	51	18693.84	Source: AADT TimeStamp: 2014-06-20_045602
		E East St			**0.212**	**2163**	**161**	**58613.525**	
		12E INTERNATIONAL ST	**0.00000000000**	**0.06500000000**	**0.065**	**1817**	**118**	**43108.325**	Source: AADT TimeStamp: 2014-06-20_045602
12E LA CASTELLANA	DR		0.00000000000	0.27800000000	0.278	639	178	64839.33	Source: AADT TimeStamp: 2014-06-20_045602
12E LA CASTELLANA	DR		0.27800000000	0.44100000000	0.163	1563	255	92990.685	Source: AADT TimeStamp: 2014-06-20_045602
		LA CASTELLANA DR			**0.441**	**2202**	**432**	**157830.015**	
		12E MONROE ST	**0.00000000000**	**0.11000000000**	**0.110**	**1420**	**156**	**57013**	Source: AADT TimeStamp: 2014-06-20_045602
		12E MORLEY AVE	**0.00000000000**	**0.08600000000**	**0.086**	**3443**	**296**	**108075.77**	Source: AADT TimeStamp: 2014-06-20_045602
		12E PARK ST	**0.00000000000**	**0.02500000000**	**0.025**	**4049**	**101**	**36947.125**	Source: AADT TimeStamp: 2014-06-20_045602
		12E RANCHO GRANDE DR	**0.00100000000**	**0.25600000000**	**0.255**	**475**	**121**	**44210.625**	Source: AADT TimeStamp: 2014-06-20_045602
12E RUBY	RD		0.00000000000	0.97800000000	0.978	6429	6288	2294960.13	Source: AADT TimeStamp: 2014-06-20_045602
12E RUBY	RD		0.97800000000	1.20300000000	0.224	7343	1645	600363.68	Source: AADT TimeStamp: 2014-06-20_045602
12E RUBY	RD		1.20300000000	1.61100000000	0.408	4017	1639	598211.64	Source: AADT TimeStamp: 2014-06-20_045602
12E RUBY	RD		1.61100000000	1.92500000000	0.315	3997	1259	459555.075	Source: AADT TimeStamp: 2014-06-20_045602
		Ruby RD			**1.925**	**21786**	**10830**	**3953090.525**	
12N APACHE	BLVD		0.00000000000	0.59900000000	0.599	3661	2193	800422.735	Source: AADT TimeStamp: 2014-06-20_045602
12N APACHE	BLVD		0.59900000000	0.72200000000	0.124	5595	694	253229.7	Source: AADT TimeStamp: 2014-06-20_045602
12N APACHE	BLVD		0.72200000000	1.14100000000	0.419	4933	2067	754428.355	Source: AADT TimeStamp: 2014-06-20_045602
		Apache Blvd			**1.142**	**14189**	**4954**	**1808080.79**	
		12N AURORA DR	**0.00000000000**	**0.60700000000**	**0.607**	**213**	**129**	**47191.215**	Source: AADT TimeStamp: 2014-06-20_045602
		12N BANKERD AVE	**0.00000000000**	**0.23700000000**	**0.237**	**3305**	**783**	**285899.025**	Source: AADT TimeStamp: 2014-06-20_045602
12N BAYZE	AVE		0.00100000000	0.07700000000	0.077	741	57	20825.805	Source: AADT TimeStamp: 2014-06-20_045602
12N BAYZE	AVE		0.07700000000	0.14300000000	0.066	830	55	19994.7	Source: AADT TimeStamp: 2014-06-20_045602

BAYZE AVE			**0.143**	**1571**	**112**	**40820.505**		
12N BEJARANO ST	0.00000000000	0.02600000000	0.026	1098	29	10420.02	Source: AADT TimeStamp: 2014-06-20_045602	
12N BEJARANO ST	0.02600000000	0.05600000000	0.030	1235	37	13523.25	Source: AADT TimeStamp: 2014-06-20_045602	
12N BEJARANO ST	0.05600000000	0.14400000000	0.088	830	73	26659.6	Source: AADT TimeStamp: 2014-06-20_045602	
BEJARANO ST			**0.144**	**3163**	**139**	**50602.87**		
12N CAMINO VISTA DEL CIELO	**0.00000000000**	**0.33900000000**	**0.339**	**668**	**226**	**82654.98**	Source: AADT TimeStamp: 2014-06-20_045602	
12N FRANK REED RD	0.02300000000	0.05100000000	0.027	7768	210	76553.64	Source: AADT TimeStamp: 2014-06-20_045602	
12N FRANK REED RD	0.05100000000	0.22900000000	0.178	5237	932	340247.89	Source: AADT TimeStamp: 2014-06-20_045602	
Frank Reed RD			**0.205**	**13005**	**1142**	**416801.53**		
12N HIGHLAND DR	0.00000000000	0.10900000000	0.109	1556	170	61905.46	Source: AADT TimeStamp: 2014-06-20_045602	
12N HIGHLAND DR	0.10900000000	0.28100000000	0.172	961	165	60331.58	Source: AADT TimeStamp: 2014-06-20_045602	
N Highland DR			**0.281**	**2517**	**335**	**122237.04**		
12N INDUSTRIAL PARK AVE	0.00000000000	0.43600000000	0.436	1428	623	227251.92	Source: AADT TimeStamp: 2014-06-20_045602	
12N INDUSTRIAL PARK AVE	0.43600000000	0.80200000000	0.367	1874	688	251031.67	Source: AADT TimeStamp: 2014-06-20_045602	
12N INDUSTRIAL PARK DR	0.00000000000	0.28800000000	0.288	3243	934	340904.16	Source: AADT TimeStamp: 2014-06-20_045602	
12N INDUSTRIAL PARK DR	0.28800000000	0.49800000000	0.210	2983	626	228646.95	Source: AADT TimeStamp: 2014-06-20_045602	
12N INDUSTRIAL PARK DR	0.49800000000	0.68200000000	0.184	3981	733	267363.96	Source: AADT TimeStamp: 2014-06-20_045602	
12N INDUSTRIAL PARK DR	0.68200000000	0.73400000000	0.051	6179	315	115022.085	Source: AADT TimeStamp: 2014-06-20_045602	
Industrial Park Dr			**1.536**	**19688**	**3918**	**1430220.745**		
12N KELSEY AVE	0.00000000000	0.15000000000	0.150	1981	297	108459.75	Source: AADT TimeStamp: 2014-06-20_045602	
12N KELSEY AVE	0.15000000000	0.18800000000	0.038	528	20	7323.36	Source: AADT TimeStamp: 2014-06-20_045602	
KELSEY AVE			**0.188**	**2509**	**317**	**115783.11**		
12N MACNAB DR	0.00000000000	0.27800000000	0.278	558	155	56620.26	Source: AADT TimeStamp: 2014-06-20_045602	
12N MACNAB DR	0.27800000000	0.63900000000	0.360	514	185	67539.6	Source: AADT TimeStamp: 2014-06-20_045602	
12N MACNAB DR	0.63900000000	0.92300000000	0.284	2594	737	268894.04	Source: AADT TimeStamp: 2014-06-20_045602	
N MacNab DR			**0.922**	**3666**	**1077**	**393053.9**		
12N MORLEY AVE	0.07800000000	0.18200000000	0.104	2738	285	103934.48	Source: AADT TimeStamp: 2014-06-20_045602	
12N MORLEY AVE	0.18200000000	0.31400000000	0.132	3009	397	144973.62	Source: AADT TimeStamp: 2014-06-20_045602	
12N MORLEY AVE	0.31400000000	0.71800000000	0.405	3734	1512	551978.55	Source: AADT TimeStamp: 2014-06-20_045602	
12N MORLEY AVE	0.71800000000	0.84100000000	0.122	3926	479	174824.78	Source: AADT TimeStamp: 2014-06-20_045602	
12N MORLEY AVE	0.84100000000	0.93000000000	0.090	4705	423	154559.25	Source: AADT TimeStamp: 2014-06-20_045602	
12N MORLEY AVE	0.93000000000	1.04000000000	0.109	4822	526	191843.27	Source: AADT TimeStamp: 2014-06-20_045602	
12N MORLEY AVE	1.04000000000	1.39600000000	0.356	3041	1083	395147.54	Source: AADT TimeStamp: 2014-06-20_045602	
N Morley Ave			**1.318**	**25975**	**4705**	**1717261.49**		
12N NELSON AVE	**0.00000000000**	**0.14100000000**	**0.141**	**703**	**99**	**36179.895**	Source: AADT TimeStamp: 2014-06-20_045602	
12N OLD PATAGONIA RD	0.00000000000	0.30800000000	0.308	579	178	65091.18	Source: AADT TimeStamp: 2014-06-20_045602	
12N OLD PATAGONIA RD	0.30800000000	0.63800000000	0.330	668	220	80460.6	Source: AADT TimeStamp: 2014-06-20_045602	
N OLD PATAGONIA RD			**0.638**	**1247**	**399**	**145551.78**		
12N OLD TUCSON RD	**0.00200000000**	**0.35900000000**	**0.357**	**1926**	**688**	**250967.43**	Source: AADT TimeStamp: 2014-06-20_045602	
12N PERKINS AVE	0.00000000000	0.03500000000	0.035	1268	44	16198.7	Source: AADT TimeStamp: 2014-06-20_045602	
12N PERKINS AVE	0.03500000000	0.20600000000	0.171	1121	192	69967.215	Source: AADT TimeStamp: 2014-06-20_045602	
12N PERKINS AVE	0.20600000000	0.32100000000	0.115	1529	176	64179.775	Source: AADT TimeStamp: 2014-06-20_045602	
N PERKINS AVE			**0.321**	**3918**	**412**	**150345.69**		
12N RIDGELINE DR	**0.06000000000**	**0.12400000000**	**0.064**	**552**	**35**	**12894.72**	Source: AADT TimeStamp: 2014-06-20_045602	
12N ROYAL RD	**0.05100000000**	**0.94300000000**	**0.892**	**1306**	**1165**	**425207.48**	Source: AADT TimeStamp: 2014-06-20_045602	
12N SANTA CRUZ ST	**0.00000000000**	**0.12300000000**	**0.123**	**500**	**62**	**22447.5**	Source: AADT TimeStamp: 2014-06-20_045602 (Modified)	
12N SONOITA AVE	**0.15400000000**	**0.27500000000**	**0.121**	**1192**	**144**	**52644.68**	Source: AADT TimeStamp: 2014-06-20_045602	
12N TARGET RANGE RD	0.00000000000	0.30000000000	0.300	2930	879	320835	Source: AADT TimeStamp: 2014-06-20_045602	
12N TARGET RANGE RD	0.30000000000	0.44700000000	0.146	3477	508	185289.33	Source: AADT TimeStamp: 2014-06-20_045602	
Target Range RD			**0.446**	**6407**	**1387**	**506124.33**		
12N TERRACE AVE	**0.00000000000**	**0.12700000000**	**0.127**	**2594**	**329**	**120244.87**	Source: AADT TimeStamp: 2014-06-20_045602	
12N TYLER AVE	0.03400000000	0.10200000000	0.067	1196	80	29248.18	Source: AADT TimeStamp: 2014-06-20_045602	
12N TYLER AVE	0.10200000000	0.12700000000	0.025	1268	32	11570.5	Source: AADT TimeStamp: 2014-06-20_045602	
N Tyler Ave			**0.092**	**2464**	**112**	**40818.68**		
12N WESTERN AVE	0.00000000000	0.00600000000	0.006	7343	44	16081.17	Source: AADT TimeStamp: 2014-06-20_045602	
12N WESTERN AVE	0.11200000000	0.31200000000	0.201	5861	1178	429992.265	Source: AADT TimeStamp: 2014-06-20_045602	
12N WESTERN AVE	0.31200000000	0.66400000000	0.351	6433	2258	824163.795	Source: AADT TimeStamp: 2014-06-20_045602	
12N WESTERN AVE	0.66400000000	1.01200000000	0.348	5685	1978	722108.7	Source: AADT TimeStamp: 2014-06-20_045602	
N Western Ave			**0.906**	**25322**	**5458**	**1992345.93**		
12S RIVER RD	0.00000000000	0.43100000000	0.431	472	203	74252.68	Source: AADT TimeStamp: 2014-06-20_045602	
12S RIVER RD	0.43100000000	1.58900000000	1.158	536	621	226551.12	Source: AADT TimeStamp: 2014-06-20_045602	
12S RIVER RD	1.58900000000	2.20600000000	0.617	852	526	191874.66	Source: AADT TimeStamp: 2014-06-20_045602	
12S RIVER RD	2.20600000000	3.09700000000	0.891	975	869	317084.625	Source: AADT TimeStamp: 2014-06-20_045602	
12S RIVER RD	3.09700000000	6.11300000000	3.016	681	2054	749672.04	Source: AADT TimeStamp: 2014-06-20_045602	
12S RIVER RD	6.11300000000	6.58900000000	0.476	692	329	120228.08	Source: AADT TimeStamp: 2014-06-20_045602	
River RD			**6.589**	**4208**	**4602**	**1679663.205**		
12W ANTHONY DR	**0.00000000000**	**0.20400000000**	**0.204**	**1419**	**289**	**105658.74**	Source: AADT TimeStamp: 2014-06-20_045602	
12W ANZA DR	**0.00000000000**	**0.02400000000**	**0.024**	**1684**	**40**	**14751.84**	Source: AADT TimeStamp: 2014-06-20_045602	
12W CRAWFORD ST	**0.00000000000**	**0.37300000000**	**0.373**	**774**	**289**	**105376.23**	Source: AADT TimeStamp: 2014-06-20_045602	
12W ELM ST	**0.43200000000**	**0.57200000000**	**0.140**	**2509**	**351**	**128209.9**	Source: AADT TimeStamp: 2014-06-20_045602	
12W HUGHES ST	**0.20200000000**	**0.33900000000**	**0.137**	**1812**	**248**	**90609.06**	Source: AADT TimeStamp: 2014-06-20_045602	
12W INDUSTRIAL PARK DR	0.02000000000	0.10600000000	0.086	3287	283	103178.93	Source: AADT TimeStamp: 2014-06-20_045602	
12W INDUSTRIAL PARK DR	0.10600000000	0.15700000000	0.051	2809	143	52289.535	Source: AADT TimeStamp: 2014-06-20_045602	
W INDUSTRIAL PARK DR			**0.137**	**6096**	**426**	**155468.465**		
12W KINO ST	0.00000000000	0.33500000000	0.335	633	212	77400.075	Source: AADT TimeStamp: 2014-06-20_045602	
12W KINO ST	0.35900000000	0.77000000000	0.411	683	281	102460.245	Source: AADT TimeStamp: 2014-06-20_045602	
W KINO ST			**0.746**	**1316**	**493**	**179860.32**		
12W PARK ST	**0.00000000000**	**0.02500000000**	**0.025**	**2537**	**63**	**23150.125**	Source: AADT TimeStamp: 2014-06-20_045602	

12W PLUM		**ST**	**0.13800000000**	**0.34500000000**	**0.207**	**1336**	**277**	**100941.48**	Source: AADT TimeStamp: 2014-06-20_045602
12W TARGET RANGE	RD		0.00000000000	0.34400000000	0.344	3423	1178	429791.88	Source: AADT TimeStamp: 2014-06-20_045602
12W TARGET RANGE	RD		0.34400000000	0.41100000000	0.068	7343	499	182253.26	Source: AADT TimeStamp: 2014-06-20_045602
W TARGET RANGE		**RD**			**0.412**	**10766**	**1677**	**612045.14**	
12W WALNUT	ST		0.00000000000	0.18400000000	0.184	1428	263	95904.48	Source: AADT TimeStamp: 2014-06-20_045602
12W WALNUT	ST		0.44800000000	0.75100000000	0.303	1429	433	158040.255	Source: AADT TimeStamp: 2014-06-20_045602
W WALNUT		**ST**			**0.487**	**2857**	**696**	**253944.735**	
12W WESTERN		**AVE**	0.00000000000	0.61000000000	**0.610**	**5142**	**3137**	**1144866.3**	Source: AADT TimeStamp: 2014-06-20_045602

Appendix A: NNA-Specific VMT estimates; Base Year

2014 ADOT TDM		County	NAA (based on HPMS Shape File = 38.4516% of County)		2014 NEI Paved Road		County	NAA (based on HPMS Shape File = 38.4516% of County)	
HPMS Vehicle type ID	Average Daily VMT for County	Annual	Average Daily VMT for NAA	Annual	HPMS Vehicle type ID	Average Daily VMT for County	Total Annual County VMT by MOVES Road	Average Daily VMT for NAA	Annual
10	7,435	2,713,711	2,859	1,043,465	10	7,847	2,864,148	3,017	1,101,310
25	1,065,248	388,815,432	409,605	149,505,717	25	1,187,111	433,295,425	456,463	166,608,982
40	5,950	2,171,583	2,288	835,008	40	3,090	1,127,893	1,188	433,693
50	62,943	22,974,024	24,202	8,833,878	50	21,736	7,933,645	8,358	3,050,613
60	83,834	30,599,303	32,235	11,765,919	60	42,074	15,356,853	16,178	5,904,954
TOTAL (COUNTY)	1,225,408	447,274,054	471,189	171,983,987	TOTAL (COUNTY)	1,261,857	460,577,964	485,204	177,099,552

CNTLOCID	ROUTE	BMP	START	TCS MP	EMP	END	Length	AADT 2010	AADT 2030	BASE YEAR	AAGR DEV	Annual Growth Rate	Average Growth Rate	MOVES Road Type
100451	I 19	0.00	SB 19 (1) - Nogales	0.70	1.18	Exit 1 Western Ave	1.18	10,500	12,000	2007	3	0.63%	0.49%	2
100452	I 19	1.18	Exit 1 Western Ave	2.00	2.95	Exit 4 SR 189 / Mariposa Rd	1.77	14,500	16,000	2007	3	0.47%		
100453	I 19	2.95	Exit 4 SR 189 / Mariposa Rd	4.00	5.31	Exit 8 SB 19 (1)	2.36	22,500	25,500	2007	3	0.59%		
100454	I 19	5.31	Exit 8 SB 19 (1)	6.50	7.72	Exit 12 SR 289 / Pena Blanca Rd	2.41	34,000	36,000	2007	3	0.28%		
100883	SR 82	1.19	SB 19 - Nogales	1.60	1.66	Thelma St	0.47	7,700	9,200	2008	5	0.82%	0.68%	3
100884	SR 82	1.66	Thelma St	2.90	2.95	Old Patagonia Rd	1.29	5,000	6,000	2008	5	0.83%		
100886	SR 82	2.95	Old Patagonia Rd	4.90	5.87	South River Rd/Duquesne Rd.	2.92	2,900	3,200	2008	4	0.47%		
100887	SR 82	5.87	South River Rd/Duquesne Rd.	9.00	12.14	Patagonia Lake Rd	6.27	1,900	2,300	2008	4	0.87%		
101366	SR 189	0.00	International Border and POE - Nogales	0.60	1.10	Target Range / Arbo National Pit Rd	1.10	10,000	11,500	2008	5	0.65%		
101368	SR 189	1.10	Target Range / Arbo National Pit Rd	1.38	1.88	Industrial Park Dr (South)	0.78	10,000	11,500	2008	5	0.65%		
101370	SR 189	1.88	Industrial Park Dr (South)	2.00	2.64	Frank Reed Rd	0.76	15,500	18,000	2008	5	0.69%		
101372	SR 189	2.64	Frank Reed Rd	2.70	2.95	I-19 (Exit 4) / Mariposa Rd	0.31	24,000	27,000	2008	5	0.56%		
101374	SR 189	2.95	I-19 (Exit 4) / Mariposa Rd	3.40	3.75	SB 19 - Nogales	0.80	20,500	23,000	2008	5	0.54%		

2 = Rural Restricted

3 = Rural Unrestricted

4 = Urban Restricted

5 = Urban Unrestricted

Appendix A: County-level VMT Forcasts based on 2014 NEI

2014 NEI Paved Road	2017		2021		2030		2035	
HPMS Vehicle type ID	Average Daily VMT for County	Total Annual County VMT by MOVES Road Type	Average Daily VMT for County	Total Annual County VMT by MOVES Road Type	Average Daily VMT for County	Total Annual County VMT by MOVES Road Type	Average Daily VMT for County	Total Annual County VMT by MOVES Road Type
10	7,847	2,864,148	8,034	2,932,414	8,347	3,046,594	8,539	3,116,766
25	1,187,111	433,295,425	1,215,405	443,622,886	1,262,730	460,896,344	1,291,814	471,512,081
40	3,090	1,127,893	3,164	1,154,776	3,287	1,199,740	3,363	1,227,373
50	21,736	7,933,645	22,254	8,122,741	23,121	8,439,018	23,653	8,633,392
60	42,074	15,356,853	43,076	15,722,879	44,754	16,335,085	45,784	16,711,327
TOTAL (COUNTY)	1,261,857	460,577,964	1,291,933	471,555,696	1,342,238	489,916,780	1,373,153	501,200,940

2014 NEI Paved Road	2017		2021		2030		2035	
HPMS Vehicle type ID	Average Daily VMT for NAA	Annual NAA	Average Daily VMT for NAA	Annual NAA	Average Daily VMT for NAA	Annual NAA	Average Daily VMT for NAA	Annual NAA
10	3,017	1,101,310	3,089	1,127,560	3,089	1,171,464	3,283	1,198,446
25	456,463	166,608,982	467,343	170,580,055	467,343	177,221,974	496,723	181,303,894
40	1,188	433,693	1,217	444,030	1,217	461,319	1,293	471,945
50	8,358	3,050,613	8,557	3,123,323	8,557	3,244,937	9,095	3,319,677
60	16,178	5,904,954	16,564	6,045,697	16,564	6,281,100	17,605	6,425,771
TOTAL (NNA)	485,204	177,099,552	496,769	181,320,665	516,112	188,380,794	527,999	192,719,733

Appendix A: ADOT TDM-Based VMT Forecasts

2014 ADOT TDM	2017		2021		2030		2035	
HPMS Vehicle type ID	Average Daily VMT for County	Total Annual County VMT by MOVES Road Type	Average Daily VMT for County	Total Annual County VMT by MOVES Road Type	Average Daily VMT for County	Total Annual County VMT by MOVES Road Type	Average Daily VMT for County	Total Annual County VMT by MOVES Road Type
10	7,435	2,713,711	7,617	2,780,294	8,028	2,930,107	8,256	3,013,337
25	1,065,248	388,815,432	1,091,385	398,355,413	1,150,193	419,820,369	1,182,864	431,745,344
40	5,950	2,171,583	6,096	2,224,865	6,424	2,344,750	6,606	2,411,352
50	62,943	22,974,024	64,487	23,537,715	67,962	24,806,020	69,892	25,510,634
60	83,834	30,599,303	85,891	31,350,088	90,519	33,039,354	93,090	33,977,835
TOTAL (COUNTY)	1,225,408	447,274,054	1,255,475	458,248,375	1,323,125	482,940,600	1,360,708	496,658,502

2014 ADOT TDM	2017		2021		2030		2035	
HPMS Vehicle type ID	Average Daily VMT for NAA	Annual	Average Daily VMT for NAA	Annual NAA	Average Daily VMT for NAA	Annual NAA	Average Daily VMT for NAA	Annual NAA
10	2,859	1,043,465	2,929	1,069,067	3,087	1,126,673	3,174	1,158,676
25	409,605	149,505,717	419,655	153,173,991	442,267	161,427,608	454,830	166,012,951
40	2,288	835,008	2,344	855,496	2,470	901,594	2,540	927,203
50	24,202	8,833,878	24,796	9,050,626	26,132	9,538,309	26,875	9,809,244
60	32,235	11,765,919	33,026	12,054,607	34,806	12,704,157	35,795	13,065,018
TOTAL (NNA)	471,189	171,983,987	482,750	176,203,788	508,763	185,698,341	523,214	190,973,093

APPENDIX B

On-Road Emissions Estimates

April 2017

MOVES Input Data Summary

Data item	Input/Source
RunSpec	
Scale	County
Calculation type	Inventory
Time span	Annual runs: 12 months, weekday and weekend, 24 hours
Time aggregation	Hour
Geographic selection	Santa Cruz County
Vehicle selection	All 13 vehicle (source) types Gasoline, diesel, compressed natural gas, electricity, ethanol (E-85)
Road type	All road types (2, 3, 4, 5) and including off-network (1)
Pollutants and processes	$PM_{2.5}$, PM_{10}, and NO_x. PM includes exhaust, tire, and brake.
General output	Units: emission = pounds, distance = miles, time = hours, energy = million British thermal units
County Data Manager inputs	
Meteorology data	PM_{10}/$PM_{2.5}$ State Implementation Plan on-road analysis
Vehicle population	ADOT, January 2017
Vehicle age distribution	ADOT, January 2017
Annual vehicle miles traveled	Highway Performance Monitoring System via 2014 National Emissions Inventory and ADOT Travel Demand Model County-wide and Nogales Nonattainment Area estimates
Vehicle miles traveled fractions monthly/daily/hourly	Monthly = ADOT 2015 traffic count data Daily = national average Hourly = national average and ADOT Travel Demand Model
Average speed distribution	Existing = national average Build = adjusted based on State Route 189 traffic study
Road type distribution	Highway Performance Monitoring System via 2014 National Emissions Inventory ADOT Travel Demand Model
Ramp fraction	EPA/national average
Fuel data	Santa Cruz County fuel data provided by EPA with MOVES
Inspection/maintenance programs	None
Vehicle starts	EPA average values provided with MOVES
Retrofit data	None

Notes: ADOT = Arizona Department of Transportation, EPA = U.S. Environmental Protection Agency

2014NEI: 2017 County-Wide (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	487963	6280.09	5654.55				
Rural Restricted Access	303831	8543.62	7779.37	1402.29	1570.48	175.286	235.571
Rural Unrestricted Access	218154	5240.85	4764.88	3788.98	1919.52	473.622	287.926
Urban Restricted Access	260948	6848	6199.82	2656.81	1914.69	332.1	287.203
Urban Unrestricted Access	309924	7816.78	7095.78	15091.6	3739.95	1886.45	560.989
Grand Total	**1580820**	**34729.34**	**31494.4**	**22939.68**	**9144.64**	**2867.458**	**1371.689**

2014NEI: 2017 Nogales NA (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
1	410645	4927.4	4410.07				
2	116828	3285.16	2991.3	539.2	603.875	67.4002	90.581
3	83883.7	2015.19	1832.17	1456.92	738.086	182.115	110.712
4	100338	2633.16	2383.93	1021.59	736.228	127.698	110.434
5	119171	3005.67	2728.44	5802.97	1438.07	725.372	215.709
Grand Total	**830865.7**	**15866.58**	**14345.91**	**8820.68**	**3516.259**	**1102.5852**	**527.436**

ADOT TDM: 2017 County-Wide Emissions (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	447849	5566.89	4998.89				
Rural Restricted Access	203438	6245.33	5704.36	1459.21	914.161	182.402	137.123
Rural Unrestricted Access	418842	11384.2	10406.7	3757.39	2183.98	469.673	327.596
Urban Restricted Access	386416	11321.9	10317.8	3248.12	2033.95	406.015	305.091
Urban Unrestricted Access	550945	15092	13778	10634.5	3985.23	1329.31	597.782
Grand Total	**2007490**	**49610.32**	**45205.75**	**19099.22**	**9117.321**	**2387.4**	**1367.592**

ADOT TDM: 2017 Nogales NA Emissions (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	395877	4749.98	4243.61				
Rural Restricted Access	78006.4	2407.78	2199.06	598.439	355.584	74.8049	53.3371
Rural Unrestricted Access	161268	4400.72	4022.16	1443.88	835.568	180.485	125.334
Urban Restricted Access	148294	4371.86	3983.69	1297.87	786.621	162.233	117.992
Urban Unrestricted Access	211373	5819.75	5312.46	3946.28	1519.1	493.287	227.863
Grand Total	**994818.4**	**21750.09**	**19760.98**	**7286.469**	**3496.873**	**910.8099**	**524.5261**

2014NEI: 2021 County-Wide (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	390074	4777.42	4299.75				
Rural Restricted Access	188556	5334.66	4847.92	1433.95	1606.77	179.243	241.014
Rural Unrestricted Access	134404	3415.51	3096.77	3876.48	1964.35	484.561	294.65
Urban Restricted Access	162425	4470.54	4037.51	2718.08	1959.4	339.759	293.91
Urban Unrestricted Access	189658	5303.71	4798.5	15423.9	3826.57	1927.99	573.981
Grand Total	**1065117**	**23301.84**	**21080.45**	**23452.41**	**9357.09**	**2931.553**	**1403.555**

2014NEI: 2021 Nogales NA (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	316667	3812.38	3411.92				
Rural Restricted Access	72503	2051.26	1864.11	551.374	617.828	68.9219	92.674
Rural Unrestricted Access	51680.3	1313.32	1190.76	1490.57	755.324	186.321	113.298
Urban Restricted Access	62454.8	1718.99	1552.48	1045.14	753.422	130.643	113.013
Urban Unrestricted Access	72867.3	2035.48	1841.6	5919.79	1470.71	739.973	220.606
Grand Total	**576172.4**	**10931.43**	**9860.87**	**9006.874**	**3597.284**	**1125.8589**	**539.591**

ADOT TDM: 2021 County-Wide Emissions (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	352041	4268.66	3832.03				
Rural Restricted Access	126123	3792.9	3458.55	1492.34	935.621	186.543	140.342
Rural Unrestricted Access	258218	6952.53	6344.2	3843.56	2235.53	480.445	335.33
Urban Restricted Access	239562	6979.03	6346.83	3322.66	2082.02	415.331	312.3
Urban Unrestricted Access	339464	9409.54	8570.52	10882.2	4079.83	1360.28	611.971
Grand Total	**1315408**	**31402.66**	**28552.13**	**19540.76**	**9333.001**	**2442.599**	**1399.943**

ADOT TDM: 2021 Nogales NA Emissions (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	302692	3690.96	3297.7				
Rural Restricted Access	48352	1461.55	1332.64	612.094	363.935	76.5117	54.5898
Rural Unrestricted Access	99481.8	2685.98	2450.62	1477	855.291	184.625	128.293
Urban Restricted Access	91941	2692.68	2448.54	1327.72	805.213	165.965	120.781
Urban Unrestricted Access	130292	3622.73	3299.51	4037.68	1555.14	504.709	233.269
Grand Total	**672758.8**	**14153.9**	**12829.01**	**7454.494**	**3579.579**	**931.8107**	**536.9328**

2014NEI: 2030 County-Wide (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	261781	2912.26	2608.51				
Rural Restricted Access	73292.4	2173.04	1953.02	1486.98	1667.52	185.873	250.126
Rural Unrestricted Access	50574.8	1549.57	1389.66	4022.89	2039.4	502.862	305.907
Urban Restricted Access	63766.9	2199.96	1966.62	2820.6	2034.27	352.572	305.138
Urban Unrestricted Access	68615.3	2543.54	2276.94	16010.9	3973.46	2001.36	596.016
Grand Total	**518030.4**	**11378.37**	**10194.75**	**24341.37**	**9714.65**	**3042.667**	**1457.187**

2014NEI: 2030 Nogales NA (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	195806	2519.16	2246.87				
Rural Restricted Access	28182.1	835.57	750.97	571.769	641.186	71.4711	96.1774
Rural Unrestricted Access	19446.9	595.833	534.346	1546.86	784.18	193.358	117.626
Urban Restricted Access	24519.5	845.919	756.195	1084.56	782.207	135.57	117.331
Urban Unrestricted Access	26358.4	976.153	873.84	6145.08	1527.18	768.135	229.076
Grand Total	**294312.9**	**5772.635**	**5162.221**	**9348.269**	**3734.753**	**1168.5341**	**560.2104**

ADOT TDM: 2030 County-Wide Emissions (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	229356	2763.83	2470.26				
Rural Restricted Access	48644.8	1405.76	1268.9	1673.19	995.816	209.149	149.371
Rural Unrestricted Access	98590.4	2577.25	2328.13	4038.12	2340.74	504.764	351.108
Urban Restricted Access	92964.8	2850.36	2564.31	3630.38	2203.78	453.798	330.566
Urban Unrestricted Access	127411	3720.55	3353.61	11046.1	4256.93	1380.76	638.539
Grand Total	**596967**	**13317.75**	**11985.21**	**20387.79**	**9797.266**	**2548.471**	**1469.584**

ADOT TDM: 2030 Nogales NA Emissions (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	183731	2491.9	2220.09				
Rural Restricted Access	18704.7	540.539	487.91	643.367	382.906	80.421	57.4358
Rural Unrestricted Access	37909.4	990.992	895.203	1552.72	900.049	194.09	135.007
Urban Restricted Access	35746.3	1096.01	986.016	1395.94	847.389	174.492	127.108
Urban Unrestricted Access	48988.8	1430.43	1289.35	4247.03	1636.85	530.878	245.527
Grand Total	**325080.2**	**6549.871**	**5878.569**	**7839.057**	**3767.194**	**979.881**	**565.0778**

2014NEI: 2035 County-Wide (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	206092	2465.82	2209.48				
Rural Restricted Access	48740.5	1643.84	1475.68	1520.92	1705.8	190.116	255.869
Rural Unrestricted Access	30646.2	1223.3	1095.46	4115.02	2086.36	514.379	312.953
Urban Restricted Access	39671.6	1688.34	1508.04	2885.17	2081.11	360.646	312.166
Urban Unrestricted Access	38766.7	2024.35	1809.81	16378	4065.08	2047.25	609.759
Grand Total	**363917**	**9045.65**	**8098.47**	**24899.11**	**9938.35**	**3112.391**	**1490.747**

2014NEI: 2035 Nogales NA (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	140572	2117.23	1888.78				
Rural Restricted Access	18741.5	632.081	567.424	584.819	655.904	73.1025	98.3853
Rural Unrestricted Access	11784	470.379	421.22	1582.29	802.239	197.787	120.335
Urban Restricted Access	15254.3	649.194	579.865	1109.39	800.221	138.674	120.033
Urban Unrestricted Access	14888	777.015	694.668	6285.98	1562.39	785.748	234.358
Grand Total	**201239.8**	**4645.899**	**4151.957**	**9562.479**	**3820.754**	**1195.3115**	**573.1113**

ADOT TDM: 2035 County-Wide Emissions (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	174303	2332.42	2085.37				
Rural Restricted Access	33603.5	1062.2	957.504	1720.2	1023.93	215.025	153.589
Rural Unrestricted Access	66935	1969.5	1776.24	4151.68	2406.9	518.96	361.034
Urban Restricted Access	62725	2174.01	1953.53	3732.5	2266.11	466.562	339.913
Urban Unrestricted Access	83156.4	2880.1	2591.89	11357.4	4377.44	1419.67	656.614
Grand Total	**420722.9**	**10418.23**	**9364.534**	**20961.78**	**10074.38**	**2620.217**	**1511.15**

ADOT TDM: 2035 Nogales NA Emissions (lbs/year)

Sum of emissionQuant	Column Labels						
Row Labels	Oxides of Nitrogen (NOx)	Primary Exhaust PM10 - Total	Primary Exhaust PM2.5 - Total	Primary PM10 - Brakewear Particulate	Primary PM10 - Tirewear Particulate	Primary PM2.5 - Brakewear Particulate	Primary PM2.5 - Tirewear Particulate
Off-Network	128755	2090.02	1862.36				
Rural Restricted Access	12921.1	408.431	368.177	661.442	393.717	82.6803	59.0575
Rural Unrestricted Access	25737.7	757.304	682.995	1596.38	925.492	199.548	138.823
Urban Restricted Access	24118.7	835.941	751.162	1435.2	871.354	179.401	130.702
Urban Unrestricted Access	31972.9	1107.3	996.49	4366.72	1683.19	545.839	252.476
Grand Total	**223505.4**	**5198.996**	**4661.184**	**8059.742**	**3873.753**	**1007.4683**	**581.0585**

APPENDIX C

Agency Consultation

From: Wamsley, Jerry [mailto:Wamsley.Jerry@epa.gov]
Sent: Tuesday, January 31, 2017 11:58 AM
To: Beverly Chenausky
Cc: McKaughan, Colleen; OConnor, Karina; Berry, Laura; Ed Stillings; Ryan C. Templeton; Lo, Doris
Subject: RE: Interagency Consultation: Determining Project of Air Quality Concern in SEAGO Region STP-189-A(201)T / 189 SC 000 H8045 01L

Hello Beverly,

Thank you for the opportunity to review the proposed methodology for the Nogales Nonattainment Area Regional Conformity Analysis (RCA), dated December 18, 2016. Our comments and suggestions follow below.

If you have any questions or concerns, then please feel free to contact me.

Thanks,
Jerry

General Analysis Framework and Vehicle Miles Traveled (VMT) Forecasts

Again, thank you for organizing our January 25 meeting to discuss VMT forecast options for the RCA. We concur that using the 2014 National Emissions Inventory (NEI) as a base year for projecting analysis year PM10 and PM2.5 emissions is the best available resource compared to the Statewide TIP or Highway Performance Monitoring System (HPMS) estimates. We suggest that you take care in using the 2014 NEI and do your "due diligence" in reviewing the NEI documentation and metadata, the emissions estimate inputs, and any modeling default inputs to ensure that the resulting emissions estimates are accurate and suited to your analysis.

Interim Procedure Analysis for PM2.5

As we have discussed, we recommend that you use the no greater than baseline year method for doing your PM2.5 conformity analysis as opposed to the build/no build method. EPA has approved an appropriate 2008 PM2.5 Emissions Inventory for the Nogales nonattainment area at 80 FR 6907, February 9, 2015. In addition to PM2.5 emissions, on-road mobile NOx emissions should be included in your analysis, as required by section 93.119(f)(9) of the conformity regulation. We have worked with ADEQ to pull the appropriate source category emissions estimates information from the submitted and approved 2008 PM2.5 emissions inventory and they are provided below.

PM2.5 Emissions by Source Category/Santa Cruz County (SCC) Estimate/Nogales Nonattainment Area (NNA) Estimate (tons per year):

Unpaved Roads (fugitive) -	SCC, 234.4	NNA, 154.9;
Paved Roads (fugitive) -	SCC, 75	NNA, 49.6;
Road Construction -	SCC, 96.9	NNA, 64.0;
On Road Mobile -	SCC, 38.0	NNA, 25.1, (Brake, Tire wear, and Exhaust emissions).

NOx Emissions by Source Category/Santa Cruz County Estimate/Nogales Nonattainment Area Estimate (tons per year):

On Road Mobile - SCC, 1381.6 NNA, 912.9.

EPA did not make a finding in our emissions inventory action that on-road mobile fugitive (unpaved and paved road sources) PM2.5 emissions were significant and we understand that ADEQ wants ADOT to include these fugitive PM2.5 emissions in the regional conformity analysis. We have advised ADEQ to make a written request via their comments on the analysis methodology, if they have not done so. The important point is that ADEQ's request that fugitive emissions be considered and their assertion that fugitive emissions are significant is documented, per section 93.119(f)(8) of the conformity regulation. As a reminder, when estimating fugitive emissions from transportation projects, please use the latest version of the AP-42 emission factor equations, e.g., the June 2011 version for paved road fugitive PM10 emissions.

Timely Implementation of Transportation Control Measures

EPA has not approved any transportation control measures for the Nogales nonattainment area into the Arizona State Implementation Plan (SIP). Consequently, there is no need to address this requirement in the RCA. You may, however, take emission reduction credit for road paving projects included in the Nogales Transportation Improvement Program and Regional Transportation Plan. Local road paving projects/development requirements or street sweeping programs may be assumed in future analysis year emissions estimates, if the paving requirements/sweeping programs are codified locally and have a consistent and documented funding source. As always, please document your assumptions and calculations when estimating the effects of emission reduction efforts.

Witt, Jay

Subject: EPA Phone Call on SR 189
Location: Phone Number 866-583-7984 Access Code 1968494#

Start: Wed 1/25/2017 2:30 PM
End: Wed 1/25/2017 3:00 PM

Recurrence: (none)

Meeting Status: Accepted

Organizer: Beverly Chenausky

Discussions on the Planning Assumptions for the Regional Conformity Analysis.

(1) the utility of using the 2014 NEI estimates;
(2) existing sources of VMT estimates, such as the STIP; and
(3) have you considered a baseline year analysis for the PM2.5 interim procedures work?

Please refer to email w/ADEQ suggestions provided (2/26/2016)

The number is 866-583-7984. The access code is 1968494#.

Witt, Jay

From: Beverly Chenausky <BChenausky@azdot.gov>
Sent: Thursday, December 08, 2016 9:02 AM
To: Maslyk, Louis; Joonwon Joo; 'Wamsley.Jerry@epa.gov'; 'OConnor.Karina@epa.gov'; 'berry.laura@epa.gov'; 'meek.clifton@epa.gov'; Ed Stillings; 'Templeton.Ryan@azdeq.gov'; 'Christopher Vertrees'; 'patulski.meg@epa.gov'; 'McKaughan.Colleen@epa.gov'; 'Lucke-McDowell.Catherine@azdeq.gov'; 'tremaine.wilson@dot.gov'; 'jeff.houk@dot.gov'; Carlos Lopez; Ralph Ellis; Barton, Michael J.; Witt, Jay; Bennett, Jill; Amy.Moran@wilsonco.com; Sharon Gordon
Subject: Interagency Consultation: Determining Project of Air Quality Concern in SEAGO Region STP-189-A(201)T / 189 SC 000 H8045 01L
Attachments: RCA_Method_Assumptions_12-7-16.pdf; H8045_SR_189_Project_Level_PM-10 _Questionnaire_V5_2016-12-06.pdf

Categories: Important/Reminder

To Interested Parties:
ADOT is presenting the following project, **SR 189, International Border to Grand Avenue,** for interagency consultation per 40 CFR 93.105 as a potential project that is not a project of Air Quality Concern and thereby will not require a PM10 hot-spot analysis. If through interagency consultation it is determined that this project will not require a hot-spot analysis, other conformity provisions apply and will be addressed in the air quality analysis that will be submitted to FHWA. ADOT is requesting responses to the attached questionnaire within **10 business days**; a non-response will be interpreted as concurrence that the project is not a project of air quality concern and does not require a hot-spot analysis. If any consulted party believes this project should be treated as a project of air quality concern that requires a Quantitative PM hot-spot analysis, please document the appropriate section under 40 CFR 93.123 (b) that applies to the project and describe why the project should be treated as a project of air quality concern.

While this project may not require a quantitative hot-spot analysis, as a regionally significant project in an isolated rural PM10 and PM2.5 nonattainment area this project needs to be included in a regional conformity analysis prior to project approval, per
40 CFR 93.121(b). As required for interagency consultation per 40 CFR 93.105 (c) (ii), attached is ADOT's planning assumptions document that will be used for developing the regional conformity analysis for the Nogales nonattainment area(s). ADOT is requesting responses to the attached regional conformity analysis methodologies within **30 business days**; a non-response will be interpreted as concurrence on the planning assumptions that will be used for the regional conformity analysis.

As with before, additional technical information has been posted and shared on ADOT's ShareFile service as available, if you have any additional questions or need additional information that has not been posted prior on the ShareFile site please let me know, thanks.

Beverly T. Chenausky
Air & Noise Program Manager
MD EM02, Room 41
1611 W. Jackson St.
Phoenix, AZ 85007
602.712.6269
azdot.gov

Environmental Planning

From: Beverly Chenausky
Sent: Friday, September 16, 2016 1:29 PM
To: 'Maslyk, Louis'; Joonwon Joo; 'Wamsley.Jerry@epa.gov'; 'OConnor.Karina@epa.gov'; 'berry.laura@epa.gov'; 'mejia.marina@azdeq.gov'; 'meek.clifton@epa.gov'; Ed Stillings; 'Templeton.Ryan@azdeq.gov'; 'Christopher Vertrees'; 'patulski.meg@epa.gov'; 'McKaughan.Colleen@epa.gov'; 'Lucke-McDowell.Catherine@azdeq.gov'; 'tremaine.wilson@dot.gov'; 'jeff.houk@dot.gov'; Carlos Lopez; Marinela Konomi; 'Barton, Michael J.'; 'Witt, Jay'; 'Bennett, Jill'; 'Thomas Deitering'; 'Amy.Moran@wilsonco.com'
Subject: RE: H8045 SR 189 Air Quality Discussion

To All:
You should have all received a notification from ShareFile the documents have been added to the SR189 project folder, if not a link is included in the Agenda attached directing you to the project folder. There has been discussions with stakeholders on including the option of a roundabout and other project changes, a summary of the stakeholder meeting and suggested schedule have been added to the project folder. You will be notified when the information for project and regional conformity consultation is available, just wanted to provide an update on the project and let you know that there has been a shift in schedule, thanks.

Beverly Chenausky
602.712.6269

From: Beverly Chenausky
Sent: Monday, May 23, 2016 4:05 PM
To: 'Maslyk, Louis'; Joonwon Joo; 'Wamsley.Jerry@epa.gov'; 'OConnor.Karina@epa.gov'; 'berry.laura@epa.gov'; 'mejia.marina@azdeq.gov'; 'meek.clifton@epa.gov'; Ed Stillings; 'Templeton.Ryan@azdeq.gov'; Christopher Vertrees; 'patulski.meg@epa.gov'; 'McKaughan.Colleen@epa.gov'; 'Lucke-McDowell.Catherine@azdeq.gov'; 'tremaine.wilson@dot.gov'; 'jeff.houk@dot.gov'; Carlos Lopez; Marinela Konomi; Barton, Michael J.; Witt, Jay; Bennett, Jill; Thomas Deitering; 'Amy.Moran@wilsonco.com'
Subject: RE: H8045 SR 189 Air Quality Discussion

Please find attached agenda with supporting materials listed on ADOT's Sharefile site you should receive information notifying you that you have access to the SR189 folder and content, let me know if you have any additional questions.
<< File: Nogales Agenda May 25th.pdf >>

Beverly T. Chenausky
Air & Noise Program Manager
MD EM04, Room 41
1611 W. Jackson St.
Phoenix, AZ 85007
602.712.6269
azdot.gov
<< OLE Object: Picture (Device Independent Bitmap) >>
Environmental Planning

-----Original Appointment-----
From: Maslyk, Louis [mailto:Louis.Maslyk@hdrinc.com]
Sent: Monday, May 23, 2016 10:37 AM
To: Beverly Chenausky; Joonwon Joo; 'Wamsley.Jerry@epa.gov'; 'OConnor.Karina@epa.gov'; 'berry.laura@epa.gov'; 'mejia.marina@azdeq.gov'; 'meek.clifton@epa.gov'; Ed Stillings; 'Templeton.Ryan@azdeq.gov'; Christopher Vertrees; 'patulski.meg@epa.gov'; 'McKaughan.Colleen@epa.gov'; 'Lucke-McDowell.Catherine@azdeq.gov'; 'tremaine.wilson@dot.gov'; 'jeff.houk@dot.gov'; Carlos Lopez; Marinela Konomi; Barton, Michael J.; Witt, Jay; Bennett, Jill; Thomas Deitering
Subject: H8045 SR 189 Air Quality Discussion
When: Wednesday, May 25, 2016 11:00 AM-12:00 PM (UTC-07:00) Arizona.
Where: Conference Call: 866-583-7984/Call-in Code: 1968494#

Hello Everyone,

We have scheduled a call to further discuss the topic of air quality for the SR 189 improvements project in Nogales, Arizona based on the interagency coordination that has recently been conducted.

Suggested agenda topics for the call include:

1 – General overview of project
2 – Project Level Conformity - Discussions on the updated POAQC (hope to send out prior to meeting for review)
3 - Regional Conformity Analysis approach
4 – Discussions on further action

Prior to the meeting, informational materials will be posted on the ADOT website under Interagency Consultation Meetings for May 25, 2016 at http://azdot.gov/business/environmental-planning/air-quality/transportation-conformity. We will let everyone know when they are posted.

Please contact Beverly Chenausky, ADOT Air Quality Lead, at 602-712-6269 or bchenausky@azdot.gov or me if anyone has any questions about the upcoming meeting next Wednesday May 25th from 11 am to 12 pm at the conference call number posted above.
Thanks

Lou Maslyk, AICP
Senior NEPA Project Manager
HDR
3200 E. Camelback Road, Suite 350
Phoenix, AZ 85018
D 602.474.3913 C 480.323.0298
louis.maslyk@hdrinc.com
hdrinc.com/follow-us

Background

The Clean Air Act (CAA) requires transportation projects and plans conform to any plans established to achieve and/or maintain federal air quality standards. Transportation projects cannot receive federal funding until "conformity" has been demonstrated in areas designated by the Environmental Protection Agency (EPA) as maintenance or nonattainment of air quality standards. There are two levels of conformity required; project-level and regional. Project-level conformity demonstrates that the project will not create a location (or "hot spot") that exceeds the national ambient air quality standards (NAAQS) for a given criteria pollutant. Regional conformity demonstrates that the total emissions from a nonattainment/maintenance area's future transportation system, as described by a transportation improvement program (TIP) or long-range transportation plan, are consistent with the goals for achieving the air quality standards found in an area's state implementation plan (SIP).

The Nogales area is designated as nonattainment for two criteria pollutants, PM_{10} and $PM_{2.5}$. ADEQ worked with EPA to establish SIPs for the Nogales nonattainment area (NNA) specific to PM_{10} and $PM_{2.5}$. The most recent PM_{10} SIP was completed in August of 2012 and the most recent $PM_{2.5}$ SIP was adopted on September 6, 2013. Both SIPs were based on emissions estimates developed using the EPA's National Emissions Inventory (NEI) for 2008. EPA releases a new NEI every three years. The most current NEI is for the year 2014.

The Arizona Department of Transportation (ADOT), in association with the Federal Highway Administration (FHWA), proposes to improve State Route (SR) 189 from the Mariposa Port of Entry (POE) at the U.S.-Mexico border to the Mariposa Traffic Interchange (TI) at SR 189 and Interstate 19 (I-19) and east to Grand Avenue (milepost 0.6 to milepost 3.75) in the city of Nogales, Santa Cruz County, Arizona. Therefore air quality conformity must be demonstrated and approved at both the project-level and regional level. A project-level analysis will be completed if the project is determined to be a Project of Air Quality Concern pursuant to 40 CFR 93.123. However a regional air quality conformity analysis (RCA) has not. Given the NNA is a rural area without a metropolitan planning organization (MPO), the RCA for the NNA must be based on ADOT's statewide transportation improvement program (STIP) and statewide transportation plan (Plan).

Introduction

RCAs address each pollutant for which an area has been designated nonattainment or maintenance and includes agency consultation, regional emissions analyses, and a budget test, build/no-build test, or both as applicable. A budget test compares regional emission estimates to a "budget" or "budgets" established by the SIP or maintenance plan. A build/no-build test is conducted when emissions budgets have not been established. They compare emissions estimates of a "build" condition (represented by the STIP and/or Plan) to emissions estimates of a scenario where no projects are built.

A PM_{10} emissions budget exists for the NNA. It was established by forecasting PM_{10} emissions estimates developed for EPA's 2008 National Emissions Inventory (2008 NEI). However a budget for $PM_{2.5}$ was not established due to a "clean data" determination on January 7, 2013 by the EPA. Thus, a budget test will be conducted for PM_{10} and a build/no-build test will be conducted for $PM_{2.5}$.

A budget test will compare regional emissions estimates for the NNA as they pertain to ADOT's current STIP and Plan to the area's PM_{10} Budget. The Budget is 1,274.3 tons per year (tpy) and is made up of four source categories:

- Unpaved Road Dust (864.9 tpy)
- Paved Road Dust (121.4 tpy)
- Road Construction (267.0 tpy)

- On-road Mobile (21.0 tpy including exhaust, break, and tire wear)

A build/no-build test will compare $PM_{2.5}$ and on-road NO_x emissions estimates given a "build" condition represented by ADOT's STIP and Plan to emissions estimates associated with the current system (i.e. no new capacity improvements in the NNA).

For both tests, specific years must be analyzed. These include:

- 2017 (base year, first year of the STIP)
- 2021 (last year of the STIP)
- 2030 (required interim year)
- 2035 (LRTP horizon year)

An emissions analysis is needed to support these tests and must include estimates of annual road dust emissions (both paved and unpaved), road construction dust, and vehicle (or on-road mobile) emissions. All regionally significant planned and programmed transportation projects in the area will be included in estimates for the build condition. No-build emissions estimates will assume no additional roadway capacity is constructed in the future. This document presents the methodology and assumptions proposed to complete a regional emissions analysis for use in the RCA for the NNA.

Unpaved Road Dust

Both the PM_{10} and $PM_{2.5}$ SIPs for the NNA used the 2008 NEI for Santa Cruz County to estimate unpaved road dust emissions. The NEI is a periodic national emissions inventory conducted by the EPA. Specifically for unpaved road dust estimates, the 2008 NEI used EPA emissions factors, estimates of the miles of unpaved roadways, and activity data obtained for the county from ADOT, ADEQ, and federal agencies such as the FHWA. Since the NNA is only a portion of the county, emissions were apportioned to the NAA using population.

For this emissions analysis, ADOT proposes using the most recent unpaved road dust emissions estimates EPA developed for Santa Cruz County as part of the 2014 NEI. ADOT will forecast emissions estimates to each analysis year using either population growth as it relates to vehicle ownership or growth in vehicle miles of travel (VMT). County-level emissions will then be apportioned to the NNA using the most recent population forecast for Rio Rico, the City of Nogales, and Santa Cruz County. ADEQ has previously determined that 88.7% of the Rio Rico Southeast and 19.1% of the Southwest portions of the US Census Designated Places (CDPs) are within the NNA. Therefore, the NNA population is assumed to be the City of Nogales and corresponding portions of the Rio Rico community. The remainder of the NNA is assumed to be rural and minimally populated.

Paved Road Dust

As with unpaved road dust, paved road dust emissions were estimated for the PM_{10} and $PM_{2.5}$ SIPs using 2008 NEI data for Santa Cruz County. NEI emissions estimates for paved road dust were based on paved roadway miles in the county and VMT data obtained from FHWA, ADOT, and other local roadway agencies. County-level emissions estimates were then apportioned to the NNA by population using the same methodology described to apportion unpaved road dust.

ADOT proposes using the 2014 NEI to estimates paved road dust emissions. Emissions apportioned to the NNA will be forecast to each analysis year using either population growth as it relates to vehicle ownership or VMT growth. VMT growth rates for either the County or the NNA will be obtained from ADOT specific sources including the statewide travel demand model and/or VMT growth rates used to estimate the traffic impacts of the SR 189 improvement project in Nogales, Arizona. Population forecasts

for Santa Cruz County will be obtained from the Arizona Department of Administration – Employment and Population Statistics.

Road Construction Dust

Dust from road construction in the NNA will be estimated in two parts. First, to account for road construction related to development, ADOT will use the same methodology used for the 2014 NEI. Emissions will be estimated for Santa Cruz County, apportioned to the NNA using a ratio of land area in the county to land area in the NNA, and forecast to each analysis year using population growth rate forecasts obtained from the Arizona Department of Administration – Employment and Population Statistics. The land area for Santa Cruz County is 1,237.6 square miles. The land area for the NNA is 76.1 square miles. The ratio of NNA land area to the county land area is calculated by dividing 76.1 by 1,237.6, which equals .061489 or 6.15 percent.

The PM_{10} and $PM_{2.5}$ SIPs relied on the 2008 NEI road construction dust emissions estimates for Santa Cruz County to develop estimates for the NNA. The NEI used ADOT's overall roadway program value (in dollars) for six roadway types (urban interstates, rural interstates, urban arterials, rural arterials, urban collectors, and rural collectors) to estimate emissions for the entire state. General conversion factors were used to convert dollars to lane-miles being constructed and then to acres of land under construction specific to roadway development. Acres disturbed for the state were then apportioned to each county using housing starts information.

For this emissions analysis, construction dust for each regionally significant/ADOT project identified in the STIP or Plan for a given analysis year will be calculated by relating project length (or lane miles) to the number of acres disturbed. EPA emissions factors will then be applied based on acres disturbed. Since ADOT will not have NNA specific housing start information to forecast emissions, ADOT will use population forecasts as a surrogate to forecast emissions for each analysis year.

On-Road Mobile

MOVES2010a, EPA's on-road mobile emissions model, was used to estimate on-road mobile emissions for the PM_{10} SIP to establish the motor vehicle emissions budget. Emissions were estimated for Santa Cruz County for the 2008 NEI and then scaled to the NNA using population data. 2008 NEI data on VMT and average roadway speed distribution for Santa Cruz County were used as MOVES inputs.

To maintain consistency with the PM_{10} emissions budget established for the PM_{10} SIP, ADOT proposes using the most recent version of EPA's MOVES model (MOVES2014a) with data collected for the 2014 NEI. The following is a list of MOVES required data elements and the NEI data sources proposed for this emissions analysis:

> Meteorology Data – 2008 NEI. It is assumed the 2008 NEI inputs are the same as 2014 NEI. If not, the 2008 NEI data will be used because it was used to establish emissions budgets for PM_{10}. Forecasts will assume meteorology will not change over time.
>
> Pollutants - PM_{10} (tailpipe, tire and break wear), $PM_{2.5}$ (tailpipe, tire and break wear), NO_x (tailpipe)
>
> Vehicle Population – 2014 NEI. Vehicle population data used for the 2011 NEI was forecast to 2014 based on the population of light duty vehicles in the county and Highway Performance Monitoring System (HPMS) VMT data for heavy duty vehicle types. Vehicle population will be grown based on population forecasts as appropriate.

Vehicle Age Distribution – 2014 NEI. County-level vehicle registration data were used for the 2008 NEI and to establish the budget in the PM_{10} SIP. Therefore, the county-specific age distributions used for the 2014 NEI will be used for this emissions analysis. It is assumed vehicle age distributions in the county match those in the NNA and will remain the same for all forecast years.

Vehicle Type VMT – ADOT will compare two types of VMT estimates for the NNA and use the best one to produce on-road emissions.

One method will evaluate VMT estimates for 2017 from ADOT's state-wide travel demand model. It is assumed ADOT's model network sufficiently represents the miles of paved roadway in the NNA and that ADOT's MOVES converter tool will provide VMT estimates apportioned to each MOVES vehicle type. VMT will be forecasted using the same growth factors used in the traffic analysis for the proposed improvement to SR 189 from the Mariposa POE to Grand Avenue.

The contrasting method will develop VMT estimates per the same method used to establish the budget in 2012; EPA's NEI methodology. Statewide VMT data from FHWA's HPMS will be apportioned to each county using a ratio of county population to state population. County-wide VMT estimates will then apportioned to specific road types (rural/urban) and vehicle types. Because HPMS vehicle types are different then the types used by MOVES, VMT by vehicle type will be apportioned using 2011 activity data. VMT will be forecasted using the same growth factors used in the traffic analysis for the proposed improvement to SR 189 from the Mariposa POE to Grand Avenue.

Average Speed Distribution - 2008 NEI. It is assumed the 2008 NEI inputs are the same as 2014 NEI. If not, the 2014 NEI data will be used. Speed is entered in MOVES as a distribution rather than a single value. For regional conformity analyses, where activity is averaged over a wide variety of driving patterns, a local speed distribution by road type and source type is necessary. MOVES uses specific drive cycles to calculate operating mode distributions. The operating mode distributions in turn determine the calculated emission rates. Specific local speed distributions are usually created using travel demand models or on-vehicle GPS speed data. Because neither exists for the NNA, ADOT proposes using the average speed distributions used for the 2008 and/or 2014 NEI. Forecasts will assume average speed distribution will not change significantly in Santa Cruz County or the NNA over time unless a new regionally significant project is identified in the STIP or LRTP.

Road Type Distribution – 2008 NEI. It is assumed the road type distributions used for the 2008 NEI are the same as those used for the 2014 NEI. If not, the 2014 NEI data will be used. Forecasts will assume the road type distribution do not change significantly in the future unless a new regionally significant project is identified in the STIP or LRTP.

Ramp Fraction – EPA default. EPA's default ramp fraction on both rural and urban interstates is 8% of VHT. Forecasts will assume the ramp fraction will not change significantly in the future.

Fuel – The most current EPA defaults for Santa Cruz County will be used in the emission's analysis. It is assumed EPA's default data for Santa Cruz County were used for the 2008 NEI and 2014 NEI. Additionally, it is assumed fuel properties will not significantly change in the future.

I/M Programs – None. No inspection/maintenance programs exist in Santa Cruz County or the NNA. This is assumed to continue into the future.

Vehicle Starts – EPA default.

Retrofit Data – None. These data are not required unless a vehicle retrofit program exists that needs to be modeled. No program exists in the NNA. This is assumed to continue into the future.

Hoteling - EPA default. Hoteling is non-driving activity associated with long-haul combination trucks. There are four operating modes associated with hoteling; Extended Idle, Diesel Auxiliary Power (APU), Battery Power, and Engine-Off. Detailed, local data regarding hoteling hours and operating mode fractions does not exist for the NNA. Therefore EPA default data will be used to estimate emissions given current and future conditions.

SIP Control Measures

The PM_{10} SIP for the NNA listed six formal control measures. Four were implemented by ADEQ. They include:

- Requiring reasonably available control technology (RACT) for stack and fugitive PM_{10} from permitted stationary sources
- Requiring RACT for haul roads and staging areas from permitted stationary sources
- Requiring dust control measures for material storage piles
- Limiting use of recreation vehicles on open land

ADEQ implemented these control measures through changes to the Arizona Administrative Code and will not require quantification as part of this regional emissions analysis as they do not impact on-road mobile source activity or emissions.

Two PM_{10} control measures were implemented by the City of Nogales and Santa Cruz County. They involve paving or stabilizing unpaved roadways and stabilizing access points between paved and unpaved traffic surfaces. The $PM_{2.5}$ SIP did not require any control measures as a result of the clean data finding. Therefore there are no $PM_{2.5}$-specific control measures that must be addressed by the emissions analysis.

Accounting for Conversion and Stabilizing of Unpaved Roads to Paved Roads

The regional emissions analysis will account for paving/chip sealing of unpaved roads between 2014 and 2017 by estimating the dust emissions from specific roadway segments. Information on paving activities in the NNA will be obtained from local agencies and Annual Average Daily Traffic (AADT) estimated.

Google Earth will be used to determine the number of homes on each identified roadway. The PM_{10} SIP estimated annual vehicle trips per household by adjusting national estimates to account for the median household income of the area:

Vehicle trips by household income = Person trips by household income * (National Average Vehicle trips by household ÷ National Average Person trips by household)

VMT will then be estimated for each individual roadway assuming on average a vehicle must travel one quarter of the road length exiting and one quarter of the road length returning. Thus:

VMT = 0.5 * roadway length ÷ (number of homes on the roadway * average annual trips per household)

Equations from EPA AP-42 5th Ed. Volume 1 Chapter 13.2.2 will be used to estimate dust emissions given both the paved and unpaved condition. A low surface material silt content value of 2.90% and a high surface material silt content value of 7.50% were utilized in the PM_{10} SIP per EPA recommendation.

No reliable surface soil moisture measurements are known for the area. Therefore, the average 2 inch depth soil moisture from Walnut Gulch, AZ NRCS Site # 2026 (4.30%) was adjusted for use in the PM_{10} SIP to account for the average annual difference in rainfall between the two locations (21.5% more rainfall in Nogales than Walnut Gulch). Other assumptions from the PM_{10} SIP include:

- Unpaved road speed = 25 mph
- Number of days in a year with at least 0.01 in of precipitation = 45 days
- Paved road surface silt loading = 0.105 g/m^2
- Average vehicle weight = 3 tons

The difference between emissions estimates for paved and unpaved conditions will be subtracted from the NEI-based unpaved road dust emissions estimate for 2017. In forecasted years, an estimate of average number of miles paved in the NNA will be applied to unpaved road dust emissions estimates to account for anticipated future paving projects.

APPENDIX D

Attached Files

16 MOVES RunSpec Files (*.mrs)

16 CDM Input Databases (2014nei_c04023y20XX and tdm_c04023y20XX)

16 MOVES Output Databases (2014nei_c04023y20XX and tdm_c04023y20XX)

16 MOVES Output Export (2014NEI_Moves… .csv and TDM_Moves… .csv)