APPENDIX H

AIR QUALITY TECHNICAL MEMORANDUM

Tier 2 Environmental Impact Statement

I-69 Section 6

Martinsville to Indianapolis

October 14, 2016

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EXECUTIVE SUMMARY

In compliance with the Clean Air Act (CAA) and its amendments, related Federal regulations and Federal Highway Administration (FHWA) Guidance, along with INDOT procedures, this report discusses the conformity status and the air quality impact of the project. The report presents a discussion on carbon monoxide (CO), ozone, fine particulate matter ($PM_{2.5}$), mobile source air toxics (MSAT), and greenhouse gases (GHG).

I-69 Section 6 is approximately 26 miles long, from the north terminus of I-69 Section 5 to I-465. The Tier 1 preferred alternative would begin just south of the intersection of SR 37 and SR 39 on the south side of Martinsville, and continue northward to Edgewood Avenue in Indianapolis, where it would leave SR 37 and head northwest for approximately 0.9 mile to a new I-465 interchange. Constructing I-69 Section 6 within the Tier 1 preferred alternative alignment would involve upgrading the existing four-lane, divided highway to freeway design standards. Access to I-69 would be fully controlled and limited to interchanges, requiring the elimination of intersections and driveways and the realignment of local service roads at selected locations.

The I-69 Section 6 project is located in Morgan, Johnson and Marion counties. All three counties are within the Metropolitan Indianapolis Intrastate Air Quality Control Region #80. Marion County has an approximately 0.5 square mile area CO maintenance area in central downtown Indianapolis. This maintenance area is approximately 5 miles north of the northern limits of the proposed project. All three counties are in attainment for all other criteria pollutants. FHWA no longer needs to demonstrate conformity for ozone and $PM_{2.5}$.

The localized level of MSAT emissions for the build alternatives could be higher relative to the no-build scenario, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT would be lower in other locations when traffic shifts away from them. On a regional basis, the United States Environmental Protection Agency's (USEPA's) vehicle and fuel regulations, coupled with fleet turnover, over time would cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

To date, no national standards have been established regarding GHGs, nor has USEPA established criteria or thresholds for ambient GHG emissions pursuant to its authority to establish motor vehicle emission standards for CO_2 under the CAA. The Council on Environmental Quality's *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* was published in the Federal Register on August 5, 2016. The guidance applies to NEPA documents initiated after the guidance was published in the Federal Register. As the final preparation of the air quality analysis for I-69 Section 6 was already underway at the time the guidance was published, an analysis of GHG emissions from project alternatives was not practicable for this study.

Based on the air quality assessment completed for proposed I-69 Section 6, this project will not contribute to any violation of the NAAQS.

1.0 INTRODUCTION

The Indiana Department of Transportation (INDOT) and the FHWA are proposing to upgrade the existing SR 37 four-lane highway from south of Martinsville to I-465 in Indianapolis.

As defined in the 2004 Tier 1 Record of Decision (ROD), I-69 Section 6 is approximately 26 miles long, from the end of I-69 Section 5 to I-465. The preferred alternative from Tier 1 would begin just south of the intersection of SR 37 and SR 39 on the south side of Martinsville, and continue northward to Edgewood Avenue in Indianapolis where it would leave SR 37 and head northwest for approximately 0.9 mile to a new I-465 interchange.

Constructing I-69 Section 6 within the Tier 1 preferred alternative alignment would involve upgrading the existing four-lane, divided highway to interstate highway design standards. Access to I-69 would be fully controlled and limited to interchanges, requiring the elimination of intersections and driveways and the realignment of local service roads at selected locations. Alternative alignments involved similar treatment of SR 37 at the southern end, with construction of a facility with the same interstate highway standards on new alignment further north.

The project location is shown on **Figure 1**.

2.0 PURPOSE

In compliance with the CAA and its amendments, related Federal regulations and FHWA Guidance, along with INDOT procedures, this report discusses the conformity status and the air quality impact of the project. The report presents a discussion on carbon monoxide (CO), ozone, fine particulate matter ($PM_{2.5}$), mobile source air toxics (MSATs), and greenhouse gases (GHG). This report is the technical document to support the proposed project's Environmental Impact Statement.

3.0 AIR QUALITY – BACKGROUND INFORMATION

3.1 Criteria Pollutants

The CAA and the 1990 CAA Amendments (CAAA) require the USEPA to establish National Ambient Air Quality Standards (NAAQS) for pollutants that are considered to be harmful to the public health and environment (**Table 1**). USEPA set forth standards for six criteria or principal pollutants CO, lead, nitrogen dioxide (NO_2), ozone, particulate matter (PM), and sulfur dioxide (SO_2). When concentrations of pollutants do not exceed the standards, an area is considered in attainment of the NAAQS. An area that exceeds NAAQS standards for one or more pollutants is designated by the USEPA as a nonattainment area.

Figure 1: Project Location Map

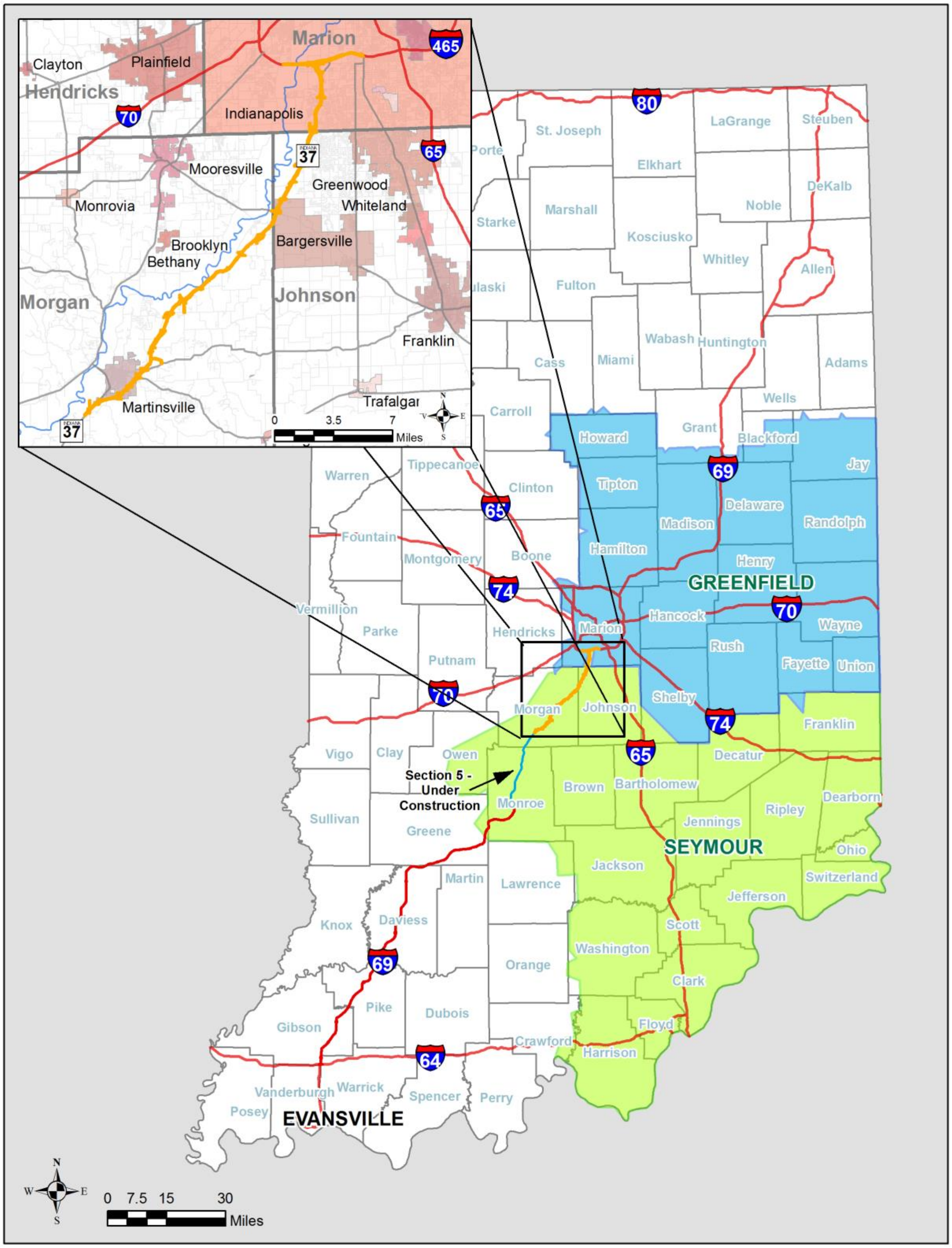

Table 1: National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary / Secondary	Averaging Time	Level	From
Carbon Monoxide (CO)	Primary	8 – Hour	9 ppm	Not to be exceeded more than once per year
		1 – Hour	35 ppm	
Lead (Pb)	Primary and secondary	Rolling 3-Month Average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)	Primary	1 – Hour	100 ppb	98th percentile, averaged over 3 years
	Primary and secondary	Annual Mean	53 ppb (2)	Annual Mean
Ozone (O_3)	Primary and secondary	8 – Hour	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particulate Matter ($PM_{2.5}$)	Primary	Annual	12.0 µg/m^3	Annual mean, averaged over 3 years
	Secondary	Annual	15 µg/m^3	annual mean, averaged over 3 years
	Primary and secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
Particulate Matter (PM_{10})	Primary and secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxides (SO_2)	Primary	1-hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.

(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purpose of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2)any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)), A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the require NAAQS.

Source: https://www.epa.gov/criteria-air-pollutants/naaqs-table, accessed October 10, 2016.

The primary pollutants from motor vehicles are unburned hydrocarbons, nitrogen oxides, CO, and particulates. Volatile organic compounds and nitrogen oxides can combine in a complex series of reactions, catalyzed by sunlight, to produce photochemical oxidants, such as ozone and nitrous oxide (N_2O). Since these reactions take place over a period of several hours, maximum concentrations of photochemical oxidants are often found far downwind of the precursor's source. These pollutants are regional problems. The modeling procedures for ozone and N_2O require long term meteorological data and detailed area wide emission rates for all potential sources. The Indiana Department of Environmental Management (IDEM) performs modeling of these pollutants for the State Implementation Plan (SIP).

CO is a colorless and odorless gas that is the byproduct of incomplete combustion, and is the major pollutant from gasoline fueled motor vehicles. CO emissions are greatest from vehicles operating at low speeds and prior to complete engine warm up (within approximately 8 minutes of starting).

Particulate matter includes both airborne solid particles and liquid droplets. These liquid particles come in a wide range of sizes. PM_{10} particulates are coarse particles (less than 10 microns in diameter), such as windblown dust from fields and unpaved roads. $PM_{2.5}$ particulates are fine particles (less than 2.5 microns) generally emitted from activities such as industrial and residential combustion and from vehicle exhaust.

In addition to the NAAQS criteria for air pollutants, USEPA also regulates air toxics. Most air toxics originate from human made sources, including on road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

In April 2007, under authority of the CAA Section 202(l), USEPA signed a final rule, Control of Hazardous Air Pollutants from Mobile Sources, which sets standards to control MSATs. Under this rule, USEPA set standards on fuel composition, vehicle exhaust emissions, and evaporative losses from portable containers. Beginning in 2011, refineries were required to limit the annual benzene content of gasoline to an annual average refinery average of 0.62 percent. The rule also set a new vehicle exhaust emission standard for non-methane hydrocarbon including MSAT compounds, which were phased in between 2010 and 2013 for lighter vehicles and 2012 and 2015 for heavier vehicles.

Greenhouse gases are trace gases that trap heat in the earth's atmosphere. Some greenhouse gases such as carbon dioxide (CO_2) occur naturally and are emitted to the atmosphere through natural processes and human activities. Other greenhouse gases (e.g., fluorinated gases) are created and emitted solely through human activities. The principal greenhouse gases that enter the atmosphere because of human activities are CO_2, methane (CH_4), N_2O, and fluorinated gases.

3.2 Attainment Designation

Areas that were formerly in nonattainment and now meet the NAAQS may petition for re-designation to attainment. The state must submit, and USEPA can approve, a plan for maintaining attainment for 10 years. These are called maintenance areas and the CAA calls for the state to update the maintenance plan for another 10 years for a total period of 20 years. Under the CAA, each state is required to establish a plan to achieve and/or maintain the NAAQS in nonattainment and maintenance areas. This plan is known as the State Implementation Plan (SIP) and sets the emission budget that meets the NAAQS. The process of determining whether a specific project, such as I-69 Section 6, conforms to the SIP is called transportation conformity.

FHWA, in consultation with IDEM, USEPA, and INDOT, is responsible for determining transportation conformity in nonattainment and maintenance areas for the transportation-related pollutants: ozone, NO_2, PM, and CO. Projects that do not conform cannot be adopted or approved for federal funding.

This conformity process is separate from the NEPA process but project level conformity determination is made as part of the NEPA process, and therefore it is documented within the NEPA documents. Both the CAA and NEPA require analysis of the potential air quality impacts of transportation projects on the human environment. Two notable differences exist between the project level air quality requirements under NEPA and those under transportation conformity. First, NEPA applies to federal projects regardless of location whereas transportation conformity applies to projects within specifically identified nonattainment, or maintenance, areas. Second, NEPA and its implementing regulations provide limited detail on the direction and criteria for conducting project level air quality analyses whereas the transportation conformity regulations provide substantial detail on criteria and procedures of meeting the CAA requirements.

The I-69 Section 6 project is located in Morgan, Johnson and Marion counties. All three counties are within the Metropolitan Indianapolis Intrastate Air Quality Control Region #80. Marion County has a 0.5 square mile CO maintenance area in central downtown Indianapolis.[1] This maintenance area is approximately 5 miles north of the northern limits of the proposed project. All three counties were redesignated to maintenance for the 1997 $PM_{2.5}$ standard on July 11, 2013 and are in attainment for 2012 $PM_{2.5}$ standard. With the implementation rule for the 2012 $PM_{2.5}$ standard effective on October 24, 2016, the USEPA revoked the "1997 primary annual $PM_{2.5}$ NAAQS in areas that have always been designated attainment for that NAAQS and in areas that have been redesignated to attainment for that NAAQS. As a result, after the effective date of the revocation, areas that have been redesignated to attainment for the 1997 annual $PM_{2.5}$ NAAQS (i.e., maintenance areas for the 1997 annual $PM_{2.5}$ NAAQS) will not be required to make transportation or general conformity determinations for the 1997 annual $PM_{2.5}$ NAAQS."[2]

This proposed project is included in the Indianapolis Metropolitan Planning Organization's (MPO) *Indianapolis Metropolitan Planning Area, Air Quality Conformity Determination Report, 2035 Long Range Plan Transportation Plan: Summer 2015 Amendment & 2016-2019 Indianapolis Regional Transportation Improvement Program*. The I-69 Section 6 project is currently in the 2035 approved fiscally constrained Long Range Transportation Plan (LRTP). The LRTP includes three projects that comprise the proposed I-69 Segment 6 project: MPO #s 7002 (from south north

[1] *Federal Register, Vol. 65, No. 12, January 19, 2000, EPA, 40 CFR Parts 52 and 81, Approval and Promulgation of Implementation Plans; and Designation of Areas for Air Quality Planning Purposes; Indiana, pages 2883 - 2889.*

[2] *Federal Register, Vol. 81, No. 164, August 24, 2016, EPA, 40 CFR Parts 50, 51, and 93, Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements, pages 117 and 118.*

of Martinsville to SR 144), 5004 (from SR 144 to the Johnson/Marion County line) and 6011 (from the Johnson/Marion County line to I-465).[3]

In August 2015 the FHWA and FTA concluded that the Indianapolis MPO's 2035 amended fiscally constrained LRTP "conforms to all applicable requirements."[4]

In approving the 2035 LRTP, FHWA determined that the plan meets transportation conformity requirements for the 1997 annual $PM_{2.5}$ standard.[5] FWHA approved the most recent conformity finding on the LRTP and the TIP on November 2, 2016.

Since the 1997 PM2.5 standard has been revoked, and all three counties are now in attainment for 2012 $PM_{2.5}$ standard, FHWA no longer needs to demonstrate conformity for PM2.5 when approving plans, TIPs, or projects in the Indianapolis Metropolitan Planning Area. The area also is in conformity for ozone and NO2, so conformity determinations also are not required for those pollutants. Within this metropolitan area, conformity requirements only apply in the maintenance area for CO in downtown Indianapolis.

4.0 AIR QUALITY ANALYSIS

4.1 Carbon Monoxide (CO)

The I-69 Section 6 project transverses portions of three Indiana counties, all portions of these counties are in attainment for the CO standard. The project does not include any two 8-lane arterials at signalized interchanges or an interstate interchange involving a 10-lane by 8-lane grade separated freeway crossover. Therefore, based on the Indiana CO Screening Criteria, this project does not meet the criteria requiring a CO project level analysis and will not produce a projected violation of the CO standards (35 ppm over a 1-hour or 9 ppm over an 8-hour period).[6]

4.2 Mobile Source Air Toxics

In October 2016 FHWA issued updated guidance for the analysis of mobile source air toxics (MSATs) in the National Environmental Policy Act (NEPA) process for highway projects (Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents) requiring the use of the most recent version of USEPA's Motor Vehicle Emissions Simulator (MOVES2014a) model for air quality analysis on documents prepared in accordance with NEPA. The following language is taken from the guidance document and associated appendices.[7]

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[3] *http://www.indympo.org/Plans/LRTP/Documents/2015/Summer2015Amendment_Final.pdf, page 24.*

[4] *http://www.indympo.org/Plans/LRTP/Documents/2015/Summer2015Amendment_Final.pdf, pages 3 and 4.*

[5] *http://www.indympo.org/Plans/LRTP/Documents/2015/Summer2015Amendment_Final.pdf, pages 3 and 4, accessed July 14, 2016.*

[6] *http://www.in.gov/indot/files/Procedural_Manual_for_Preparing_Environmental_Studies_2008.pdf, page 94, accessed August 31, 2016.*

[7] *http://www.fhwa.dot.gov/Environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm, accessed December 6, 2016.*

In addition to the criteria air pollutants for which there are the NAAQS, USEPA also regulates air toxics. Most air toxics originate from human-made sources, including on road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Controlling air toxic emissions became a national priority with the passage of the CAAA of 1990, whereby Congress mandated that the USEPA regulate 188 air toxics, also known as hazardous air pollutants. The USEPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (https://www.epa.gov/iris). In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors from the 2011 National Air Toxic Assessment (NATA) (https://www.epa.gov/national-air-toxics-assessment). These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future USEPA rules.

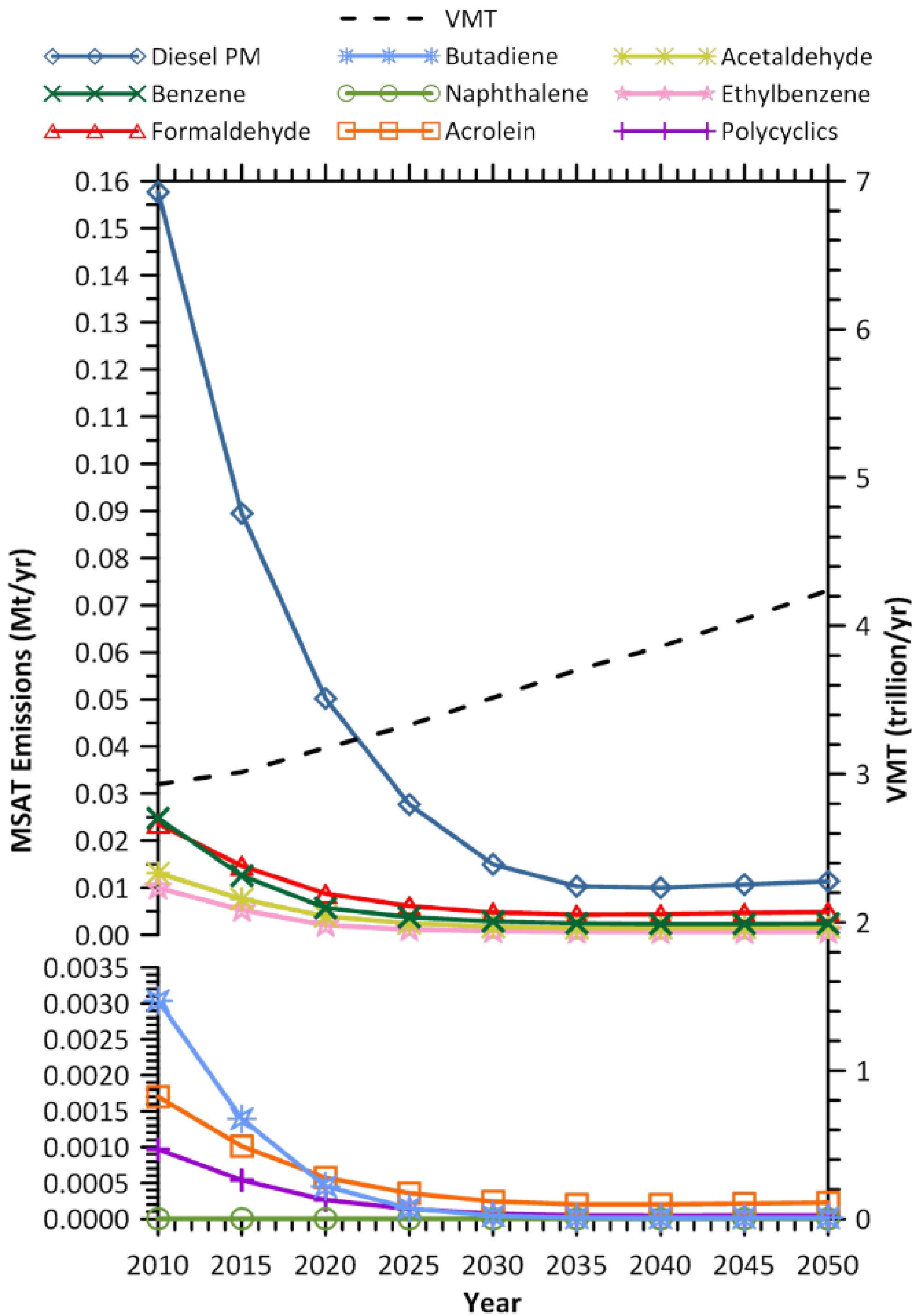
Based on an FHWA analysis using USEPA's MOVES2014a model, as shown in **Figure 2**, even if vehicle-miles travelled (VMT) increases by 45 percent 2010 to 2050 as forecast, a combined reduction of 91 percent in the total annual emissions for the priority MSAT is projected for the same time period.

4.2.1 MSAT Research

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

Nonetheless, air toxics concerns continue to arise on highway projects during the NEPA process. Even as the science emerges, FHWA is duly expected by the public and other agencies to address MSAT impacts in our environmental documents. The FHWA, USEPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this field.

Figure 2: FHWA Projected National MSAT Emission Trends 2010 – 2050



Note: Estimated for vehicles operating on roadways using EPA's MOVES2014a model. Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

Source: EPA MOVES2014a model runs conducted by FHWA, September 2016.

4.2.2 Consideration of MSAT in NEPA Documents

The FHWA developed a tiered approach with three categories for analyzing MSAT in NEPA documents, depending on specific project circumstances:

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

For projects warranting MSAT analysis, all nine priority MSAT should be analyzed.

(1) Projects with No Meaningful Potential MSAT Effects, or Exempt Projects.

The types of projects included in this category are:

- Projects qualifying as a categorical exclusion under 23 CFR 771.117(c) (subject to consideration whether unusual circumstances exist under 23 CFR 771.117(b));
- Projects exempt under the CAA conformity rule under 40 CFR 93.126; or
- Other projects with no meaningful impacts on traffic volumes or vehicle mix.

For projects that are categorically excluded under 23 CFR 771.117(c), or are exempt from conformity requirements under the CAA pursuant to 40 CFR 93.126, no analysis or discussion of MSAT is necessary. Documentation sufficient to demonstrate that the project qualifies as a categorical exclusion and/or exempt project will suffice. For other projects with no or negligible traffic impacts, regardless of the class of NEPA environmental document, no MSAT analysis is recommended. However, the project record should document in the EA or EIS the basis for the determination of no meaningful potential impacts with a brief description of the factors considered.

(2) Projects with Low Potential MSAT Effects

The types of projects included in this category are those that serve to improve operations of highway, transit, or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions. This category covers a broad range of projects.

The FHWA anticipates that most highway projects that need an MSAT assessment will fall into this category. Any projects not meeting the criteria in category (1) or category (3) below should be included in this category. Examples of these types of projects are minor widening projects; new interchanges, replacing a signalized intersection on a surface street; or projects where design year traffic is projected to be less than 140,000 to 150,000 annual average daily traffic (AADT).

For these projects, a qualitative assessment of emissions projections should be conducted. This qualitative assessment would compare, in narrative form, the expected effect of the project on traffic volumes, vehicle mix, or routing of traffic and the associated changes in MSAT for the project alternatives, including no-build, based on VMT, vehicle mix, and speed. It would also discuss national trend data projecting substantial overall reductions in emissions due to stricter engine and fuel regulations issued by USEPA. Since the emission effects of these projects typically are low, FHWA expects there would be no appreciable difference in overall MSAT emissions among the various alternatives.

(3) Projects with Higher Potential MSAT Effects

This category includes projects that have the potential for meaningful differences in MSAT emissions among project alternatives. FHWA expects a limited number of projects to meet this two-pronged test. To fall into this category, a project should:

- Create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location, involving a significant number of diesel vehicles for new projects or accommodating with a significant increase in the number of diesel vehicles for expansion projects; or
- Create new capacity or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the AADT is projected to be in the range of 140,000 to 150,000[8] or greater by the design year; And also
- Proposed to be located in proximity to populated areas.

Projects falling within this category should be more rigorously assessed for impacts.

If the analysis for a project in this category indicates meaningful differences in levels of MSAT emissions among alternatives, mitigation options should be identified and considered.

Annual average daily traffic (AADT) for the four build alternatives ranges from 52,400 south of Martinsville to 96,000 at the northern terminus of the study corridor to 127,000 along I-465. Based on FHWA’s three levels of analysis, the I-69 Section 6 project has a low potential for meaningful increases in MSAT emission and meets FHWA’s criteria for a qualitative assessment.

4.2.3 Qualitative Assessment Results

The amount of MSAT emissions emitted for the four build alternatives; Alternatives C1, C2, C3 and C4, along with the no-build scenario would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for the four build alternatives is slightly higher than that for the no-build scenario, (see Table 2), because the additional capacity increases the efficiency of the roadway and attracts rerouted trips from elsewhere in the transportation network. The resulting 9 percent increase in

[8] *Using EPA's MOVES2014a emissions model, FHWA determined that this range of AADT would result in emissions significantly lower than the Clean Air Act definition of a major hazardous air pollutant (HAP) source, i.e., 25 tons/yr. for all HAPs or 10 tons/yr. for any single HAP.*

VMT would lead to higher MSAT emissions for the four build alternatives along the highway corridor, along with a corresponding decrease in MSAT emissions along the parallel routes (SR-67, SR-135, US-31 and I-65).

The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds; according to USEPA's MOVES2014 model, emissions of all of the priority MSAT decrease as speed increases. Because the estimated VMT under each of the four build alternatives vary by less than 0.22 percent, it is expected there would be no appreciable difference in overall MSAT emissions between the four build alternatives.

Regardless of the alternative chosen, emissions will likely decrease for the future design year as a result of USEPA's national control programs that are projected to reduce annual MSAT emissions by over 90 percent between 2010 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the USEPA-projected reductions so great (even accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

Table 2: Design Year, 2045, Daily VMT

Design Year Daily VMT by Scenario				
No Build	Alt C1	Alt C2	Alt C3	Alt C4
6,679,311	7,260,550	7,250,967	7,263,494	7,247,884

The additional travel lanes contemplated as part of the project alternatives would have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, under each alternative there may be localized areas where ambient concentrations of MSAT could be higher under certain build alternatives than the no-build scenario.

The localized increases in MSAT concentrations would likely be most pronounced along the expanded roadway sections that would be built in Martinsville and north of SR 144 under any of the four build alternatives. However, the magnitude and the duration of these potential increases compared to the no-build scenario cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts.

In sum, when a highway is widened, the localized level of MSAT emissions for the build alternative could be higher relative to the no-build scenario, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT would be lower in other locations when traffic shifts away from them. However, on a regional basis, USEPA's vehicle and fuel regulations, coupled with fleet turnover, would over time cause substantial reductions that, in almost all cases, would cause region-wide MSAT levels to be significantly lower than today.

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

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

The USEPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the CAA and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The USEPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects".[9] Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious are the adverse human health effects of MSAT compounds at current environmental concentrations (HEI Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects) or in the future as vehicle emissions substantially decrease.

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

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

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[9] *Source: EPA, https://www.epa.gov/iris*

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (Special Report 16, http://www.fhwa.dot.gov/exit.cfm?link=https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The USEPA states that with respect to diesel engine exhaust, "[t]he absence of adequate data to develop a sufficiently confident dose-response relationship from the epidemiologic studies has prevented the estimation of inhalation carcinogenic risk (EPA IRIS database, Diesel Engine Exhaust, Section II.C. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0642.htm#quainhal)."

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the CAA to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than one in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than safe or acceptable https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD59852578000050C9DA/$file/07-1053-1120274.pdf).

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

5.0 GREENHOUSE GASES (GHG))

Human activity is changing the earth's climate by causing the buildup of heat-trapping greenhouse gas (GHG) emissions through the burning of fossil fuels and other human influences. Carbon dioxide (CO2) is the largest component of human produced emissions; other prominent emissions include methane (CH4), nitrous oxide (N2O) and hydrofluorocarbons (HFCs). These emissions are different from criteria air pollutants since their effects in the atmosphere are global rather than localized, and they remain in the atmosphere for decades to centuries, depending on the species. Greenhouse gas emissions are often reported together as CO2 equivalent (CO2e) emissions, weighting the global warming potential of the gases in terms of CO2.

GHG emissions have accumulated rapidly as the world has industrialized, with concentration of atmospheric CO2 increasing from roughly 300 parts per million in 1900 to over 400 parts per million today. Over this timeframe, global average temperatures have increased by roughly 1.5 degrees Fahrenheit (1 degree Celsius), and the most rapid increases have occurred over the past 50 years. Scientists have warned that significant and potentially dangerous shifts in climate and weather are possible without substantial reductions in greenhouse gas emissions. They commonly have cited 2 degrees Celsius (1 degree Celsius beyond warming that has already occurred) as the total amount of warming the earth can tolerate without serious and potentially irreversible climate effects. For warming to be limited to this level, atmospheric concentrations of CO2 would need to stabilize at a maximum of 450 ppm, requiring annual global emissions to be reduced 40-70 percent below 2010 levels by 2050. State and national governments in many developed countries have set GHG emissions reduction targets of 80 percent below current levels by 2050, recognizing that post-industrial economies are primarily responsible for GHGs already in the atmosphere. As part of a 2014 bilateral agreement with China, the U.S. pledged to reduce GHG emissions 26-28 percent below 2005 levels by 2025; this emissions reduction pathway is intended to support economy-wide reductions of 80 percent or more by 2050.

The transportation sector is the second largest source of total GHG emissions in the U.S., behind electricity generation. The transportation sector was responsible for approximately 26 percent of all anthropogenic (human caused) GHG emissions in the U.S. in 2014.[10] The majority of transportation GHG emissions are the result of fossil fuel combustion. CO_2 makes up the largest component of these GHG emissions.[11,12]

The three largest sources of highway-related GHG emissions are tailpipe emissions, upstream fuel cycle emissions (the emissions associated with producing and transporting the fuel used by highway vehicles), and roadway construction emissions. Projected design year in VMT in the project areas is greater for all build alternatives than for the no-build scenerio. As tailpipe and fuel cycle emissions generally increase with VMT, the project area would likely have an increase in GHG emissions under any of the build alternatives compared to the no-build scenario. Some of the increase in GHG emissions could be offset due to increases in speeds and reductions in congestion (which are associated with lower GHG emissions). Construction of the project would also generate GHG emissions. Preparation of the roadway corridor (e.g., earth-moving activities) involves a considerable amount of energy consumption and resulting GHG emissions; manufacture

[10] *Calculated from data in USEPA, Inventory of Greenhouse Gas Emissions and Sinks, 1990-2014. https://www.epa.gov/ghgemissions/us-greenhouse-gas-inventory-report-1990-2014*

[11] *Calculated from data in U.S. Energy Information Administration (EIA) International Energy Statistics, Total Carbon Dioxide Emissions from the Consumption of Energy, http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8.*

[12] *Calculated from data in EIA: http://www.eia.gov/forecasts/archive/ieo10/emissions.html and https://www.epa.gov/sites/production/files/2016-04/documents/us-ghg-inventory-2016-chapter-table-of-contents.pdf*

of the materials used in construction and fuel used by construction equipment also contribute GHG emissions.

To help address the global issue of climate change, the United States Department of Transportation (USDOT) is committed to reducing GHG emissions from vehicles traveling on the nation's highways. USDOT and USEPA are working together to reduce these emissions by substantially improving vehicle efficiency and shifting toward less carbon intensive fuels. The agencies have jointly established new, more stringent fuel economy and first ever GHG emissions standards for model year 2012-2025 cars and light trucks, with an ultimate fuel economy standard of 54.5 miles per gallon for cars and light trucks by model year 2025. Further, on September 15, 2011, the agencies jointly published the first ever fuel economy and GHG emissions standards for heavy-duty trucks and buses.[13] Increasing use of technological innovations that can improve fuel economy, such as gasoline- and diesel-electric hybrid vehicles, will improve air quality and reduce CO_2 emissions future years.

At the state level, project planning activities are key to reducing GHG from transportation projects and mitigation of GHGs. To this end, Indiana has identified measures to mitigate emissions from transportation and to prepare infrastructure in the state for current and future impacts of climate change, including the Indiana Safe Routes to School Partnership, Indiana State Rail Plan, the multi-state initiative (Missouri, Illinois, Indiana and Ohio DOTs) for I-70 dedicated truck lanes, the Indiana 2013-2035 Future Transportation Needs Report, and the High Speed Intercity Passenger Rail program.

Project-level mitigation measures will not have a substantial impact on global GHG emissions because of the exceedingly small amount of GHG emissions involved. Nonetheless, to reduce GHG emissions during construction, best practice measures will be adopted as mitigation commitments are made. These activities are part of a program-wide effort by FHWA to adopt practical means to avoid and minimize environmental impacts in accordance with 40 CFR 1505.2(c).

The contribution of GHGs from transportation in the U.S. as a whole is a large component of U.S. GHG emissions, but as the scale of analysis is reduced the GHG contributions become quite small. Based on projections from the Energy Information Administration, CO_2 emissions from motor vehicles in the entire state of Indiana contributed less than two tenths of one percent of global emissions in 2010. With global economies growing and the US Government working to reduce CO_2 emissions by substantially improving vehicle efficiency, Indiana's contributions to global emissions will be an even smaller fraction in 2045.

The Council on Environmental Quality (CEQ) issued on August 2, 2016, its "Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews"[14] describing how Federal

[13] *For more information on fuel economy proposals and standards, see the National Highway Traffic Safety Administration's Corporate Average Fuel Economy website: http://www.nhtsa.gov/fuel-economy/.*

[14] *https://www.whitehouse.gov/sites/whitehouse.gov/files/documents/nepa_final_ghg_guidance.pdf*

agencies should address climate change in NEPA documents. The guidance applies to NEPA documents initiated after the guidance was published in the Federal Register on August 5, 2016. As the final preparation of the air quality analysis for I-69 Section 6 was already underway at the time the guidance was published, an analysis of GHG emissions from project alternatives was not practicable for this study.

6.0 MITIGATION

Based on the air quality assessment completed for I-69 Section 6, the project will not contribute to any violation of the NAAQS. MSAT emissions will decrease, and neither carbon monoxide nor $PM_{2.5}$ levels will exceed the air quality standards. Therefore, no measures to mitigate air quality impacts have been identified.

7.0 CONCLUSION

The I-69 Section 6 project is located in Morgan, Johnson and Marion counties. All three counties are within the Metropolitan Indianapolis Intrastate Air Quality Control Region #80. With the exception of the one-hour 2010 (SO_2) NAAQS, all three counties are in attainment for all other criteria pollutants. Therefore, FHWA no longer needs to demonstrate conformity for ozone and $PM_{2.5}$.

The localized level of MSAT emissions for the build alternative could be higher relative to the no-build scenario, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT would be lower in other locations when traffic shifts away from them. On a regional basis, USEPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

To date, no national standards have been established regarding GHGs, nor has USEPA established criteria or thresholds for ambient GHG emissions pursuant to its authority to establish motor vehicle emission standards for CO_2 under the CAA.

Based on the air quality assessment completed for the proposed I-69 Section 6, this project will not contribute to any violation of the NAAQS.

8.0 REFERENCES

https://www.epa.gov/criteria-air-pollutants/naaqs-table, accessed August 27, 2016.

https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm, accessed August 31, 2016.

http://www.in.gov/indot/files/Procedural_Manual_for_Preparing_Environmental_Studies_2008.pdf, accessed August 31, 2016.

http://www.indympo.org/Plans/LRTP/Documents/2015/Summer2015Amendment_Final.pdf, accessed July 14, 2016.

Federal Register, Vol. 81, No. 164, August 24, 2016, EPA, 40 CFR Parts 50, 51, and 93, Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements.