AIR QUALITY TECHNICAL MEMORANDUM

For

Milton Madison Bridge Project

Milton, Kentucky-Madison, Indiana

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Introduction and Project History

The Milton-Madison Bridge Project is a joint effort between the Kentucky Transportation Cabinet (KYTC), the Indiana Department of Transportation (INDOT), and the Federal Highway Administration (FHWA) to repair or replace the aging US 421 Bridge over the Ohio River between Milton, Kentucky and Madison, Indiana as shown in Figure 1. The existing US 421 Bridge over the Ohio River is a steel truss structure with a total length of 3,181 feet 6 3/8 inches. It has two 10-foot travel lanes and no shoulders. The existing US 421 Bridge over the Ohio River was built in 1929 between Trimble County, Kentucky and Jefferson County, Indiana. It is one of only two bridges across the Ohio River between Louisville, Kentucky and Cincinnati, Ohio.

In the mid-1990s, KYTC undertook a planning study and environmental overview to replace the US 421 Bridge over the Ohio River. This study identified a number of potential river crossing alternatives and assembled information on the environmental constraints existing at that time. However, no final alternative was selected for implementation. Therefore, the existing structure was rehabilitated in 1997 to extend the life by 10 to 20 years. Since that time, the information contained in the study has become outdated. Numerous changes in the project area have occurred that may affect the alternatives development and evaluation processes. Significantly, a large portion of downtown Madison has been designated as a National Historic Landmark District since the previous study.

The proposed action is to improve or replace the existing structurally deficient Milton Madison Bridge by a new bridge across the Ohio River.

The purpose of this technical memorandum is to evaluate the air quality impacts for the proposed action and determine the impacts if any to the ambient air quality in the study area.

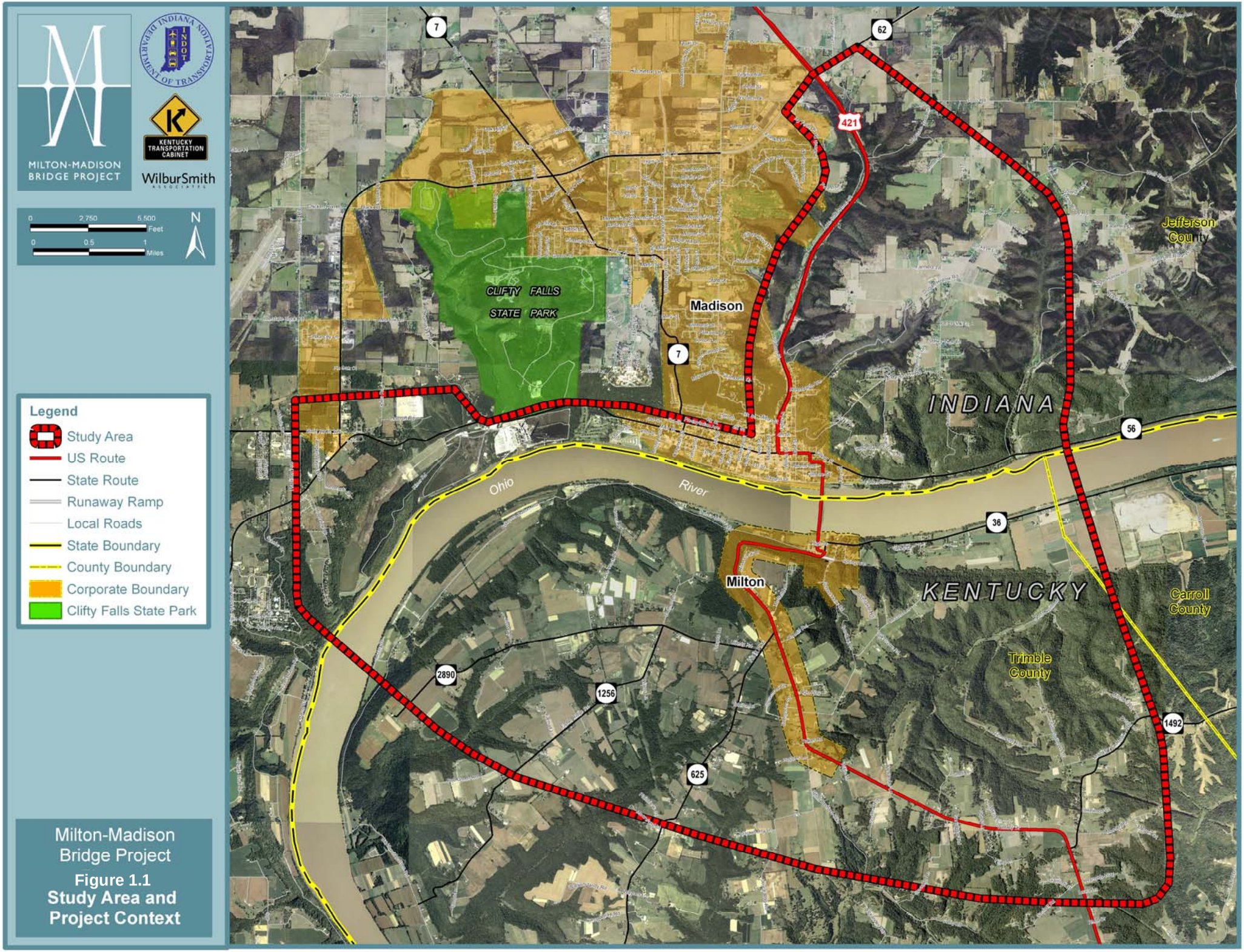
Purpose and Need for the Project

The purpose of the US 421 structurally deficient Milton-Madison Bridge replacement/rehabilitation project is to improve or replace the functionally obsolete/structurally deficient bridge and to improve safety, cross-river mobility, and community connectivity between Milton, Kentucky and Madison, Indiana.

Project Alternatives

The Kentucky Transportation Cabinet (KYTC) and the Indiana Department of Transportation (INDOT) have recommended four alternatives to be studied:

1) Superstructure replacement
2) Tiber Creek alternative
3) Canip Creek alternative
4) Do nothing - as required by federal law, this alternative remains to provide a baseline for comparison of other alternatives



Milton-Madison Bridge Project

Figure 1.1
Study Area and Project Context

Study Area Air Quality

The project is located across the Ohio River between the towns; Milton in Trimble County, Kentucky and Milton in Jefferson County, Indiana. The project study area is located in the Kentucky Transportation Cabinet (KYTC) North Central Kentucky Intrastate Air Quality Control Region and the Indiana Department of Transportation (INDOT) Madison Sub-District, within the much larger Seymour District. This project is part of the 2005-2007 KYTC Statewide Transportation Implementation Program as STIP amendment Number 2004-165 and the 2008-2011 INDOT Statewide Transportation Implementation Program as STIP Designation Number 0501151-4761.

Trimble County in Kentucky is in attainment for the six criteria pollutants established by the US Environmental Protection Agency (EPA). On December 17, 2004, based on 2001-2003 monitoring data, US EPA designated Madison Township in Jefferson County as nonattainment for the annual standard for fine particulate matter 2.5 (PM2.5) with a demonstration that the area will meet the annual standard for fine particles by April 5, 2010. This designations became effective on April 5, 2005. It should be noted that the largest stationary source for the point source $PM_{2.5}$ emission within Jefferson County Indiana is an electricity generating facility located in Madison Township and not from transportation sources or diesel vehicles. These $PM_{2.5}$ levels are likely caused by sulfur dioxide (SO_2) plumes created from the burning of coal at the Clifty Creek Power Plant. This power plant is located just outside the western edge of the Madison corporate limits on the Ohio River. High levels of this pollutant may be short lived as the Indiana-Kentucky Electric Corp. (IKEC) recently announced a $460 million project to install "scrubbers" to help remove 98% or more of the $PM_{2.5}$ (sulfur dioxide) that results from the burning of coal. Construction is currently underway, with an anticipated finish date of January 1st, 2010. Once the new scrubbers are fully operational, the plant should be able to comply with the Indiana SIP and become a maintenance area under EPA guidance.

In addition, on October 8, 2009 EPA issued a final Federal Register notice designating areas throughout the U.S. as "nonattainment" and "unclassifiable/attainment" for the 24-hour national air quality standards for fine particulate matter and Madison Township is not listed as a non-attainment area for the 24-hour national air quality standards for $PM_{2.5.}$

National Ambient Air Quality Standards (NAAQS)

The US EPA has identified seven air pollutants as being of concern nationwide: carbon monoxide, hydrocarbons, nitrogen oxides, photochemical oxidants, lead, particulate matter, and sulfur oxides. As required by the Clean Air Act (CAA), National Ambient Air Quality Standards (NAAQS) have been established for six of the seven major air pollutants excluding hydrocarbons. (National standards for hydrocarbons have been withdrawn because this pollutant is primarily of concern only in its role as ozone precursor). The criteria pollutants and the NAAQS standards are listed in Table 1.

The NAAQS have primary and secondary standards for each pollutant. The primary standards are intended to protect the public health, and represent levels at which there

are no known significant effects on human health. The secondary standards are intended to protect the nation's welfare, and address air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. For all pollutants except sulfur, the primary and secondary standards are the same. Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air ($\mu g/m^3$).

TABLE 1 - National Ambient Air Quality Standards (NAAQS)
Source: EPA 2009

	Primary Standards		Secondary Standards	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [1]	None	
	35 ppm (40 mg/m^3)	1-hour [1]		
Lead	0.15 $\mu g/m^3$ [2]	Rolling 3-Month Average	Same as Primary	
	1.5 $\mu g/m^3$	Quarterly Average	Same as Primary	
Nitrogen Dioxide	0.053 ppm (100 $\mu g/m^3$)	Annual (Arithmetic Mean)	Same as Primary	
Particulate Matter (PM_{10})	150 $\mu g/m^3$	24-hour [3]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 $\mu g/m^3$	Annual [4] (Arithmetic Mean)	Same as Primary	
	35 $\mu g/m^3$	24-hour [5]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [6]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [7]	Same as Primary	
	0.12 ppm	1-hour [8]	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm (1300 $\mu g/m^3$)	3-hour [1]
	0.14 ppm	24-hour [1]		

[1] Not to be exceeded more than once per year.

[2] Final rule signed October 15, 2008.

[3] Not to be exceeded more than once per year on average over 3 years.

[4] To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.

[5] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).

[6] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

[7] (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

[8] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.

(b) As of June 15, 2005 EPA has revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone nonattainment Early Action Compact (EAC) Areas. For one of the 14 EAC areas (Denver, CO), the 1-hour standard was revoked on November 20, 2008. For the other 13 EAC areas, the 1-hour standard was revoked on April 15, 2009.

Project Traffic

The traffic forecasts for the proposed facility prepared by Wilbur Smith Associates are used to estimate the traffic volume in the study area.

Annual Average Daily Traffic (ADT)
The Annual Average Daily Traffic (AADT) on the Milton Madison Bridge was estimated from the traffic forecast for the 2008 Existing and 2032 Build scenario. Four percent of the AADT is expected to comprise of heavy vehicles (buses, medium, and heavy trucks) in the 2008 Existing and the 2032 Build scenario. The estimated AADT and percent heavy vehicles on the bridge is shown in Table 2.

TABLE 2
Annual Average Daily Traffic & % Heavy Vehicles

	2008 Existing	2032 Build
ADT (vehicles per day)	10,300	12,900
% Trucks (2%Medium+2%Heavy)	4%	4%

For the study alternatives, all intersections operate under STOP control. The unsignalized intersections operate with acceptable levels of service during the AM and PM peak hour with minimal delays in the 2008 Existing and 2032 Build scenarios. Due to the low volume of vehicular traffic at these intersections, pollution from idling and queuing of vehicles are non existent in the study area.

Vehicle Pollutants

The impact resulting from a new transportation project or the improvement of an existing facility ranges from intensifying existing air pollution problems to improving the ambient air quality. Changing traffic patterns are a primary concern when determining this impact. Motor vehicles emit Carbon Monoxide (CO), Nitrogen Oxide (NOx), Hydrocarbons (HC), Particulate Matter (PM), Sulfur Dioxide (SO_2) and Lead (Pb) (listed in order of decreasing emission rate). Automobiles are generally considered to be the major source of CO in a transportation project area.

Automobiles are not regarded as significant sources of particulate matter and sulfur dioxide. Nationwide, highway sources account for less than seven percent of particulate matter emissions and less than two percent of sulfur dioxide emissions. Particulate matters and sulfur dioxide are predominantly the result of non highway sources (e.g. industrial, commercial, and agricultural). However, ultra fine diesel exhaust particles may be responsible for additional health risks very near diesel emissions sources.

In addition to the air pollutants for which there are National Ambient Air Quality Standards (NAAQS), US Environmental Protection Agency (EPA) also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources (cars, trucks, and construction equipment), non-road mobile sources (airplanes), area sources (dry cleaners) and stationary sources (factories, refineries, power plants).

Air toxics can exist in the form of particulate matter or as gases. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics can result from engine wear or from impurities in oil or gasoline.

The project area is in attainment for all criteria pollutants in Trimble County, Kentucky and five out of six criteria pollutants in Jefferson County in Indiana. Madison Township in Jefferson County is in non-attainment for PM2.5. The impact of the project to each of these criteria pollutants are described below:

Carbon Monoxide

Carbon monoxide is the primary pollutant emitted by automobiles. Automobiles are considered to be the primary source of CO pollution for a transportation project. Typically CO emissions are concentrated near signalized intersections or unsignalized intersections where significant idling is observed. Due to the low volume of vehicular traffic at these intersections, pollution from idling and queuing of vehicles is non existent in the study area. Since the study area is in attainment for CO, a microscale air quality analysis indicates is not required. There are no existing violations of CO in the project area. Furthermore, the proposed project will not cause any air quality violations or increase the severity or frequency of existing CO violations within the 2025 study year. Therefore, the proposed action does not have a negative adverse impact on Carbon Monoxide air quality in the region.

Hydrocarbons and Nitrogen Oxides

Automobiles are generally regarded as considerable sources of Nitrogen Oxides (NO_X) and Hydrocarbons (HC). Nitrogen oxides and hydrocarbons are carried into the atmosphere where they react with sunlight to form nitrogen dioxide (NO_2) and ozone (O_3). The photochemical reactions that form O_3 and NO_2 require several hours to occur. For this reason, the peak levels of O_3 generally occur six to 13 miles (10 to 20 km) downwind of the source of HC emissions. Urban areas as a whole are regarded as sources of HCs rather than individual streets and highways. There are no large urban areas within at least 10 miles (16 km) of the study area. The study area counties are in attainment for O_3 and NO_2. The proposed project is not anticipated to worsen existing levels of O_3 and NO_2.

Although attainment status was achieved by all counties in the study area, USEPA released new and tougher standards for the 8-hour ozone on March 15, 2008; the new standard is now 0.75 ppm. Final boundary determinations are expected to be made by March, 2010.

Lead

Automobiles without catalytic converters emit Pb as a result of burning gasoline containing tetraethyl lead. However, the Clean Air Act (CAA) of 1990 made the sale, supply, or transport of leaded gasoline or lead additives unlawful after December 31, 1995. Air quality standards for Pb are being met in the study area.

Particulate Matter ($PM_{2.5}$) and Sulfur Dioxide (SO_2)

Automobiles are not generally regarded as significant sources of SO_2. Nationwide, highway sources account for less than seven percent of particulate matter emissions and less than two percent of SO_2 emissions. Particulate matter and SO_2 emissions are predominantly the result of non-highway sources (i.e. industrial, commercial, and agricultural). Air quality standards for particulate matter are met in Trimble County, but Madison Township, Jefferson County is in non-attainment for $PM_{2.5}$.

The *Transportation Conformity Guidance for Qualitative Hot-spot Analysis in PM 2.5 and PM 10 Nonattainment and Maintenance Areas,* circulated on March 29, 2006, outlines how to conduct qualitative PM 2.5 hot-spot analyses for "projects of air quality concern", as defined in the final rule by 40 CFR 93.123(b)(1). Projects of air quality concern are highway and transit projects that involve significant levels of diesel traffic, or any project that is identified as a localized air quality concern by the PM 2.5 State Implementation Plan (SIP). The guidance also notes that a qualitative PM 2.5 hot-spot analysis is not required for projects that are not an air quality concern, but states that the project-level conformity determination should document Clean Air Act and 40 CFR 93.116 requirements were met without a hot-spot analysis, since the project has been found to not be of air quality concern under 40 CFR 93.123(b)(1). The guidance also provides examples of projects that would and would not be considered projects of air quality concern.

The following determination criteria are used to evaluate if the Milton Madison Bridge replacement is a project of air quality concern.

- *Is the project on a new highway or expressway that serves a significant volume of diesel truck traffic, such as a facility with greater than 125,000 annual average daily traffic (AADT) and 8% or more of such AADT is diesel truck traffic?*

  No. In 2008, the AADT on the bridge was 10,300 with 4% Trucks and in 2032, the AADT is 12,900 with 4% Trucks. Based on the traffic volumes and truck percentages, the project AADT is significantly below the 125,000 AADT and does not serve a significant volume of diesel truck traffic.

- *Does the project construct new exit ramps or other highway facility improvements that connect a highway or expressway to a major freight, bus, or intermodal terminal?*

  No. The alternatives studied do not construct new ramps or connect to a highway, expressway or major transit facility.

- *Does the project expand an existing highway or other facility that affects a congested intersection (Operates at LOS D, E, or F) that has a significant increase in the number of diesel trucks?*

  No.

  For the study alternatives, all intersections operate under STOP control. The unsignalized intersections operate with acceptable levels of service during the AM and PM peak hour with minimal delays in the 2008 Existing and 2032 Build scenarios. Due to the low volume of vehicular traffic at these intersections, pollution from idling and queuing of vehicles are non existent in the study area.

- Does the highway project involve a significant increase in the number of diesel transit buses and / or diesel trucks?

  No. In 2032, only 4% trucks are anticipated to use the facility if the project is constructed.

Comparing the Milton Madison project with examples of projects considered "projects of air quality concern" (that would be covered by 40 CFR 93.123(b)(1) and would require a qualitative PM 2.5 hot-spot analysis) it shows that this project is not a "project of air quality concern". The construction of the bridge will not result in a significant increase in the number of diesel vehicles in the area.

The Milton Madison project does compare favorably to an example of a project that would not be covered under 40 CFR 93.123(b)(1). The guidance states that "any new or expanded highway project that primarily services gasoline vehicle traffic (i.e., does not involve a significant number or increase in number of diesel vehicles), including such projects involving congested intersections operating at Level-of-Service D, E, or F" is an example of a project that is not an air quality concern under 40 CFR 93.123(b)(1)(i) and (ii).

Since the Milton Madison project was not found to be a project of air quality concern under 40 CFR 91.123(b)(1), a qualitative PM 2.5 hot-spot analysis is not required. The following statement will be added to the environmental document for the proposed project:

A qualitative PM 2.5 hot-spot analysis is not required for this project since it is not an air quality concern. The Clean Air Act and 40 CFR 93.116 requirements were met without a hot-spot analysis, since this project has been found not to be of air quality concern under 40 CFR 93.123(b)(1).

Mobile Air Toxics (MSAT)

The Clean Air Act has listed 188 air toxics which form the Mobile Source Air Toxics (MSAT). The EPA has identified a group of 21 as mobile source air toxics. The *Control of Emissions of Hazardous Air Pollutant from Mobile Sources (EPA 66 FR 17235)* extracted six priority MSATs from the 21 air toxics that have a significant effect on human health. The six main MSATs are; *benzene, formaldehyde, acetaldehyde, diesel*

particulate matter/diesel exhaust organic gases, acrolein, and 1, 3-butadiene. Exposure to air toxics in sufficient concentrations and sufficient durations may increase the risk of cancer and respiratory health concern, although exposure relationships have not yet been determined by EPA. Currently, EPA has not proposed to establish ambient standards for any of these pollutants, so there are no nonattainment areas for air toxics.

According to Federal Highway Administration (FHWA), "Interim Guidance on Air Toxic Analysis in NEPA Documents", released on February 3, 2006, and updated on September 30, 2009, guidance on when and how to analyze Mobile Source Air Toxics (MSATs) is discussed. This guidance is interim since MSAT science is still evolving.

A qualitative analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives, found at: www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm

The proposed action of reconstruction the existing Milton Madison bridge is expected to have low potential MSAT emissions. Unless during the period of construction, this project will not result in any meaningful changes in traffic volumes, vehicle mix, location of the existing facility, or any other factor that would cause an increase in emissions impacts relative to the no-build alternative. As such, this project will generate minimal MSAT emissions.

For each alternative in the EA, the amount of MSAT emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. Because the VMT estimated for the No Build Alternative and Build Alternative are similar, higher levels of MSAT are not expected from any of the Build Alternatives compared to the No Build. In addition, because the estimated VMT under each of the Build Alternatives are nearly the same, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by 72 percent from 1999 to 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 EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in virtually all locations.

Under each alternative there may be localized areas where VMT would increase, and other areas where VMT would decrease. Therefore, it is possible that localized increases and decreases in MSAT emissions may occur. The localized increases in MSAT emissions would likely be most pronounced along the new roadway sections that would be built for the Canip Creek Alternative and Tiber Creek Alternative than the No-Build and the replacement alternative. However, even if these increases do occur, they too will be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations. In sum, under all Build Alternatives in the design year it is expected there would be reduced MSAT emissions in the immediate area of the project, relative to

the No Build Alternative, due to the reduced VMT associated with more direct routing, and due to EPA's MSAT reduction programs.

Mitigating for Construction MSAT Emissions

During the construction of this project, the construction activity may generate a temporary increase in MSAT emissions. Project-level assessments that render a decision to pursue construction emission mitigation will benefit from a number of technologies and operational practices that should help lower short-term MSAT. Construction MSAT mitigation includes strategies that reduce engine activity or reduce emissions per unit of operating time, such as reducing the numbers of trips and extended idling. Operational agreements that reduce or redirect work or shift times to avoid community exposures can have positive benefits when sites are near populated areas. Verified emissions control technology retrofits or fleet modernization of engines for construction equipment could be appropriate mitigation strategies. Technology retrofits could include particulate matter traps, oxidation catalysts, and other devices that provide an after-treatment of exhaust emissions. Implementing maintenance programs per manufacturers' specifications to ensure engines perform at EPA certification levels, as applicable, and to ensure retrofit technologies perform at verified standards, as applicable, could also be deemed appropriate. The use of clean fuels, such as ultra-low sulfur diesel, biodiesel, or natural gas also can be a very cost-beneficial strategy.

The EPA has listed a number of approved diesel retrofit technologies; many of these can be deployed as emissions mitigation measures for equipment used in construction. This listing can be found at: www.epa.gov/otaq/retrofit/index.htm.

Construction Air Quality

Temporary air quality impacts that may occur from construction activities include the dust emissions generated by the construction of the new bridge and the demolition of the existing structure. Emissions related to sandblasting, construction equipment, and the emissions from construction-generated traffic or diversions of traffic may arise during construction of the proposed project. During construction activities, materials resulting from clearing and grubbing, demolition, or other operations should be properly disposed of by the client, in accordance with applicable local laws and ordinances and regulations from Kentucky Division of Air Quality and Indiana Department of Environmental Management. Also during construction, measures should be taken to reduce the dust generated by construction for the protection and comfort of motorists and residents in the area.

Summary

Based upon the above criteria, the potential bridge alternatives are not anticipated to have a negative cumulative impact on air quality within the study area. The Milton-Madison Bridge Project is not classified as a "project of air quality concern" for PM2.5. A qualitative PM 2.5 hot-spot analysis is not required for this project since it is not an air quality concern. The Clean Air Act and 40 CFR 93.116 requirements were met without a hot-spot analysis, since this project has been found not to be of air quality concern under 40 CFR 93.123(b)(1).

This study shows that the proposed project will not have any significant air quality impacts and no violations for CO, PM2.5 and MSATs are expected. Temporary air quality impacts that may occur from construction activities include the dust emissions generated by the construction of the new facility and the demolition of the existing structure. Emissions related to sandblasting, construction equipment, and the emissions from construction-generated traffic or diversions of traffic may arise during construction of the proposed project. During construction activities, materials resulting from clearing and grubbing, demolition, or other operations should be properly disposed of by the contractor, in accordance with applicable local laws and ordinances and regulations from Kentucky Division of Air Quality and Indiana Department of Environmental Management. Also during construction, measures should be taken to reduce the dust generated by construction for the protection and comfort of motorists or residents in the area.