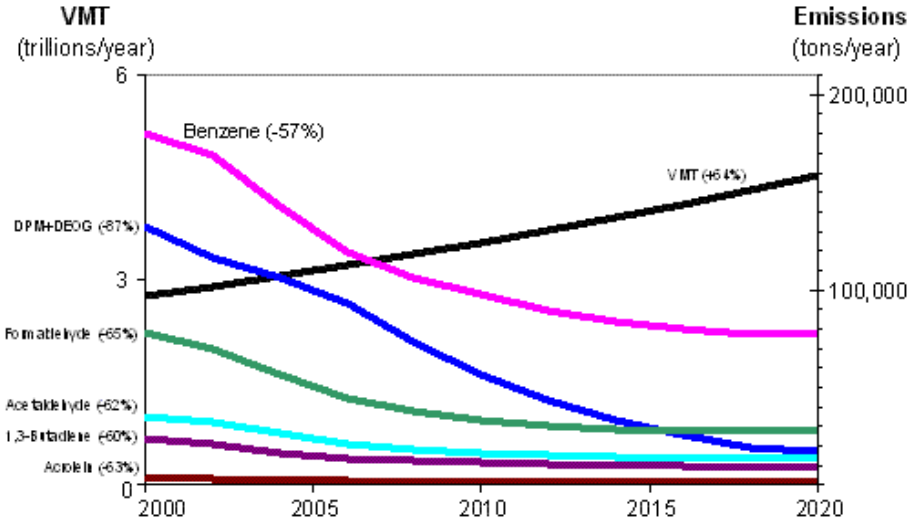
APPENDIX B.1.2

1. MOBILE SOURCE AIR TOXICS

In addition to the criteria pollutants for which there are National Ambient Air Quality Standards (NAAQS), EPA 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 source (e.g. dry cleaners) and stationary sources (e.g. factories or refineries).

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. The MSATs are compounds emitted from highway vehicles and non-road equipment. 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 also result from engine wear or from impurities in oil or gasoline.

The EPA is the lead Federal Agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources, 66 FR 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in VMT, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57% to 65%, and reduce on-highway diesel PM emissions by 87% as shown in the following graph:



Notes: For on-road mobile sources. Emissions factors were generated using MOBILE6.2. MTBE proportion of market for oxygenates is held

constant, at 50%. Gasoline RVP and oxygenate content are held constant. VMT: Highway Statistics 2000, Table VM-2 for 2000, analysis assumes annual growth rate of 2.5%. "DPM + DEOG" is based on MOBILE6.2-generated factors for elemental carbon, organic carbon and SO4 from diesel-powered vehicles, with the particle size cutoff set at 10.0 microns.

As a result, EPA concluded that no further motor vehicle emissions standards or fuel standards were necessary to further control MSATs. The agency is preparing another rule under authority of CAA Section 201(I) that will address these issues and could make adjustments to the full 21 and six primary MSATs.

1.1 Mobile Source Air Toxic (MSAT) Health Impacts

The NEPA documentation for the Louisville-Southern Indiana Ohio River Bridges Project (LSIORB) includes a basic qualitative analysis of the likely MSAT emission impacts of the FEIS Selected Alternative and the Modified Selected Alternative. However, available technical tools do not enable prediction of project-specific heath impacts of the emission changes associated with the alternatives for the Louisville Metropolitan Area (LMA). Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information.

Information that is Unavailable or Incomplete: According to FHWA's Interim Guidance Update on Mobile source Air Toxic Analysis in NEPA Documents, information is currently 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 U.S. Environmental Protection Agency (EPA) 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 Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA 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" (EPA, http://www.epa.gov/ncea/iris/index.html). 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 is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI, http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease (HEI, http://pubs.healtheffects.org/view.php?id=306).

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts, with each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable. The results produced by the EPA's MOBILE6.2 model, the California EPA's Emfac2007 model, and the EPA's DraftMOVES2009 model in forecasting MSAT emissions are highly inconsistent. Indications from the development of the MOVES model are that MOBILE6.2 significantly underestimates diesel particulate matter (PM) emissions and significantly overestimates benzene emissions.

Regarding air dispersion modeling, an extensive evaluation of EPA's guideline CAL3QHC model was conducted in an NCHRP study (http://www.epa.gov/scram001/dispersion_alt.htm#hyroad), which documents poor model performance at ten sites across the country, three where intensive monitoring was conducted plus an additional seven with less intensive monitoring. The study indicates a bias of the CAL3QHC model to overestimate concentrations near highly congested intersections and underestimate concentrations near uncongested intersections. The consequence of this is a tendency to overstate the air quality benefits of mitigating congestion at intersections. Such poor model performance is less difficult to manage for demonstrating compliance with National Ambient Air Quality Standards for relatively short time frames than it is for forecasting individual exposure over an entire lifetime, especially given that some information needed for estimating 70 year lifetime exposure is unavailable. It is particularly difficult to reliably forecast MSAT exposure near roadways, and to determine the portion of time that people are actually exposed at a specific location.

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 (http://pubs.healtheffects.org/view.php?id=282). 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 EPA (http://www.epa.gov/risk/basicinformation.htm#g) and the HEI (http://pubs.healtheffects.org/getfile.php?u=395) have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

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 Clean Air Act 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 a "safe" or "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 1 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.

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.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATS: Research into the health impacts of MSATs is ongoing. For different emissions types**,** there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposures to toxics have been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at http://www.epa.gov/iris. The following toxicity information for the six prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.

- The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.

- **Formaldehyde** is a probable human carcinogen based on limited evidence in humans and sufficient evidence in animals.

- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.

- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male or female rats and laryngeal tumors in male and female hamsters after inhalation exposure.

- **Diesel exhaust (DE)** is likely to be carcinogenic to humans by inhalation from environmental exposures. **Diesel exhaust** as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.

- **Diesel exhaust** also represents chronic respiratory effects, possibly the primary non-cancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address MSAT health impacts in proximity to roadways, The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the studies is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes, particularly respiratory problems. Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable a more comprehensive evaluation of the health impacts specific to this project.

Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of impacts based upon theoretical approaches or research methods generally accepted in the scientific community: Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. While available tools do allow a reasonable prediction of relative emissions changes between alternatives for larger projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. Therefore, the relevance of the

unavailable or incomplete information is that a determination of whether any of the alternatives would have "significant adverse impacts on the human environment" is not possible.

In this document, The DOTs have provided a qualitative assessment of MSAT emissions relative to the Build Alternatives and the No-Action Alternative. They have acknowledged that the 2030 No-Action Alternative and the Build Alternatives for the year 2030 may result increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

1.2 Qualitative Analysis

As discussed above, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project. However, even though reliable methods do not exist to accurately estimate health impacts of MSATs at the project level, it is possible to qualitatively assess the level of future MSAT emissions for the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSAT emissions from the build and No-Action 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.

For the LSIORB project the amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT), assuming that other variables such as fleet mix are the same for each alternative. As indicated in Table 1, the VMT for the 2030 No-Action Alternative is lower than any of the 2030 Build Alternatives; therefore, higher levels of regional MSATs are expected compared to the 2030 No-Action Alternative.

Table 1 - Average Daily Traffic and Vehicle Miles Traveled for The No-Action Alternative and the Build Alternatives

Project Area	Current Facility and No-Action Alternative		FEIS Selected Alternative	Modified Selected Alternative
	2010	2030	2030	2030
	AADT	AADT	AADT	AADT
Downtown	305,800	374,800	336,000	336,000
East End	0	0	52,000	52,000
Total AADT for	305,800	374,000	388,000	388,000
Total VMT for	28,799,000	35,297,000	35,826,000	35,740,000

The VMT for the FEIS Selected Alternative are expected to increase in VMTs by 1.5 percent in 2030. The VMT for Modified Selected Alternative are expected to increase in VMTs by 1.3 percent in 2030. It has been anticipated that 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 MSAT emissions by 57 to 87 percent from 2000 to 2020. 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 cases.

Because of the specific characteristics of the project alternatives (new roadway segments and redistribution of traffic patterns), 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 in the east end in the vicinity of Prospect, Kentucky, and Utica and Sellersburg, Indiana. If these increases do occur, they too will be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations.

Although increased VMT associated with the Build Alternatives in 2030 could produce higher MSAT emissions in the area of the project relative to the 2010 and 2030 VMT on existing facilities, total future MSAT emissions levels may be reduced due to EPA's MSAT reduction programs. In comparing various project alternatives, MSAT levels could be higher in some locations than others, but current tools and science are not adequate to quantify them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

The AADT volumes for the project are given in Table 1. While these project area volumes are higher than the FHWA criterion for a "Project with Higher Potential MSAT Effects", the AADT on the portion of the project that is located on the new urban highway (the East End area) is only 52,000 vpd and the remainder of the traffic volume is on the existing urban highway facilities, where significant new capacity is not being added. The LSIORB project meets the definition of a "Project with Higher Potential MSAT Effects" based on total project area AADT and location, however the increase in AADT from a build alternative (the new and significant capacity) in relation to the No-Action Alternative is only 14,000 (the project area wide AADT increase). These, and other factors discussed here contribute to the project's consideration as a project that will have minimal MSAT effect.

- Though the project creates a new interstate facility in the project area the AADT increases by only 3.7 percent and the AADT on the new interstate facility (the East End Area) is 52,000. The project area AADT only increases by 14,000 in comparison to the No-Action Alternative;

- The No-Action Alternative would concentrate all of the project area AADT into the existing downtown facilities and the number of Kennedy Interchange segments functioning at LOS E or F would be 22, up from 7 in 2010. The build alternatives would allow for cross-river mobility on the east end reducing the congestion in the Kennedy Interchange, improving conditions in regards to MSAT emissions;

- As noted in SDEIS Section 2.2.3, the demand for cross-river trips between the areas upstream of the Kennedy Bridge is projected to grow at a greater rate than the overall demand for cross-river trips in the LMA. This traffic will no longer have to travel to downtown Louisville or Jeffersonville for cross-river mobility and this will reduce the concentration of vehicles in the Downtown area which aids region wide MSAT emissions;

- Travel speeds for the Build Alternatives are expected to be higher than for the No-Action Alternative. The No-Action Alternative has 1,069,000 VHT while the Build Alternatives have 1,023,000 VHT for a 4.3% reduction. According to EPA's MOBILE6.2 emissions model, emissions of all of the priority MSATs except diesel particulate matter decrease as speed increases. The extent to which these speed-related emissions decrease will offset VMT-related emissions increases cannot be reliably projected due to the inherent deficiencies of technical models.

1.3 MSAT Mitigation Strategies

Lessening the effects of mobile source air toxics should be considered for projects with the potential for substantial construction-related MSAT emissions that are likely to occur over an extended building period. Such mitigation efforts should be evaluated based on the circumstances associated with individual projects and may not be appropriate in all cases. However, there are a number of mitigation strategies and solutions for countering the effects of MSAT emissions.

Mitigating for Construction MSAT Emissions: Construction activity may generate a temporary increase in MSAT emissions. Project-level assignments 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 MSATs. In addition, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) has emphasized a host of diesel retrofit technologies in the law's CMAQ provisions-technologies that are designed to lessen a number of MSATs.

Construction mitigation includes strategies that reduce engine activity or reduce emissions per unit of operating time. Operational agreements that reduce or redirect work or shift times to avoid community exposures can have positive benefits when sites are near vulnerable populations. For example, agreements that stress work activity outside normal hours of an adjacent school campus would be operations-oriented mitigation. Also on the construction emissions front, technological adjustments to equipment, such as off-road dump trucks and bulldozers, could be appropriate strategies. These technological fixes could include particulate

matter traps, oxidation catalysts, and other devices that provide an after-treatment of exhaust emissions. The use of clean fuels, such as ultra-low sulfur diesel, 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/retroverifiedlist.htm.