# Mobile Source Air Toxics (MSAT) Technical Report

## 183A Toll Road, Phase III, Austin District and Central Texas Regional Mobility Authority

From Hero Way to 1.1 mile north of State Highway 29
CSJ: 0914-05-192
Williamson County, Texas

February 2019

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by the Texas Department of Transportation (TxDOT) pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated December 16, 2014, and executed by the Federal Highway Administration and TxDOT.

This page intentionally blank

## Contents

This page intentionally blank

# Acronyms

| | |
|---|---|
| CAAA | Clean Air Act Amendments |
| CFR | Code of Federal Regulations |
| CTRMA | Central Texas Regional Mobility Authority |
| EPA | Environmental Protection Agency |
| FHWA | Federal Highway Administration |
| HEI | Health Effects Institute |
| IRIS | Integrated Risk Information System |
| MOVES | Motor Vehicle Emissions Simulator |
| MSAT | Mobile Source Air Toxics |
| NEPA | National Environmental Policy Act |
| ROW | Right-of-way |
| TxDOT | Texas Department of Transportation |
| VMT | Vehicle-miles traveled |

This page intentionally blank

# 1 Introduction

The Central Texas Regional Mobility Authority (CTRMA) and Texas Department of Transportation propose the extension of the 183A Toll Road main lanes from Hero Way in Leander, Williamson County, Texas, to State Highway (SH) 29 in Liberty Hill, Williamson County, Texas. The currently proposed 183A Toll Phase III extends 6.6 miles from Hero Way to 1.1 miles north of SH 29. CTRMA anticipates financial support from the Federal Highway Administration (FHWA) for the proposed project.

This report involves review of possible mobile source air toxics (MSAT) impacts from the proposed project as required by the Clean Air Act Amendments (CAAA) of 1990, National Environmental Policy Act (NEPA), and FHWA NEPA Regulations (23 Code of Federal Regulations [CFR] 771).

# 2 Existing Facility

Within the project limits, the current six-lane 183A tolled main lanes terminate approximately 0.4 mile north of Hero Way, where they merge with the existing non-tolled, four-lane, divided 183A frontage roads. The 183A four-lane divided roadway continues north for 1.4 miles to its intersection with US 183 at Bryson Ridge Trail. From this intersection—which is the current northern terminus of existing 183A—heading north, the existing roadway within the project limits is US 183.

From the terminus of the 183A main lanes to SH 29, the existing facility (183A frontage roads and US 183) continues north as a four-lane divided roadway comprised of two 12-foot-wide general purpose lanes in each direction, with 10-foot-wide outside shoulders, four-foot-wide inside shoulders, at-grade intersections, and open-ditch drainage. Lanes are divided by a median typically over 250 feet wide, which was preserved to allow for the currently proposed potential extension of the 183A main lanes, and consists mostly of grassy vegetation, some trees, and drainage features. Left-turn and right-turn bays are present at major arterial intersections and turnarounds are already in place at the intersections with San Gabriel Parkway, US 183/Bryson Ridge Trail, and SH 29. The existing facility traverses the South Fork San Gabriel River via bridges, and multiple box culverts provide crossings over three tributaries to the river. North of SH 29 to the projects northern terminus, the existing facility transitions to an undivided facility with two 10-foot-wide travel lanes in each direction, a 15-foot-wide center left-turn lane, six-foot-wide shoulders, at-grade intersections, and open-ditch drainage.

The existing 183A Toll's functional classification is "major collector" for the frontage roads and "other freeway/expressway" for the main lanes. The existing US 183 functional classification within the project limits is "other principal arterial." The posted speed limit is 60 miles per hour (mph).

# 3 Proposed Project

Since the proposed project's forecasted design year annual average daily traffic is less than 140,000 vehicles per day, the project would not affect a major intermodal facility, and no known public concern has been raised regarding MSAT emissions associated with the project, a quantitative MSAT analysis is not required for this project. Consequently, this qualitative analysis has been prepared.

The proposed action (Build Alternative) would extend the six-lane, controlled-access, grade-separated 183A tolled main lanes from their current terminus approximately 0.4 mile north of Hero Way to approximately 0.4 mile north of SH 29. The 183A tolled main lanes would be located in the median between the existing northbound and southbound US 183 four-lane divided roadway. The existing US 183 four-lane divided roadway within the proposed project limits would serve as frontage roads north to SH 29, and transition back to the existing, undivided US 183 approximately 1.1 miles north of SH 29. This transition would allow the 183A tolled main lanes to merge with the proposed non-tolled, four-lane, divided frontage roads and, eventually, with the existing four-lane, non-divided US 183 at the project's northern terminus. Project design would include bridges over the South Fork San Gabriel River and multiple box culverts providing for tributary streamflow. A paved, 10-foot-wide pedestrian/bicycle shared use path would be provided within existing right-of-way (ROW) along the west side of the project from Hero Way to the Seward Junction Loop South (approximately 4.6 miles).

The proposed 183A main lanes would include three 12-foot-wide lanes in each direction, with 10-foot-wide paved shoulders and a 38-foot wide grassy median. The main travel lanes would be tolled as an extension of the existing 183A Toll currently in place south of Hero Way. As previously noted, the existing US 183 facility would serve as frontage roads and, along with the existing 183A frontage roads between Hero Way and US 183 (described in section 2.1, Existing Facility), would remain in use as a non-tolled facility. The transition from the 183A main lanes to existing US 183 north of SH 29 would comprise two 12-foot-wide lanes, divided, in each direction, with 10-foot-wide outside shoulders and 4-foot-wide inside shoulders. The 183A main lanes would be depressed under SH 29 and elevated over intersections with:

- Seward Junction (planned facility);
- Whitewing Drive/Larkspur Park Drive;
- South Gabriel Drive/Green Valley Drive (South Fork San Gabriel River bridge);
- US 183/Bryson Ridge Trail; and
- San Gabriel Parkway.

The existing main lanes are already elevated over Hero Way. The proposed divided US 183 section north of SH 29 would have an at-grade intersection at CR 213/258 with turnarounds in each direction. Main lane design speed is 70 mph and ramp design speed is 50 mph. The No Build Alternative would not meet project purpose and need.

## 4 Background

Controlling air toxic emissions became a national priority with the passage of the CAAA of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA 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) (http://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 or contributors and non-cancer hazard contributors from the 2011 National Air Toxics Assessment (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 EPA rules.

### *Motor Vehicle Emissions Simulator (MOVES)*

According to EPA, MOVES2014 is a major revision to MOVES2010 and improves upon it in many respects. MOVES2014 includes new data, new emissions standards, and new functional improvements and features. It incorporates substantial new data for emissions, fleet, and activity developed since the release of MOVES2010.

These new emissions data are for light- and heavy-duty vehicles, exhaust and evaporative emissions, and fuel effects. MOVES2014 also adds updated vehicle sales, population, age distribution, and vehicle miles travelled (VMT) data. MOVES2014 incorporates the effects of three new Federal emissions standard rules not included in MOVES2010.

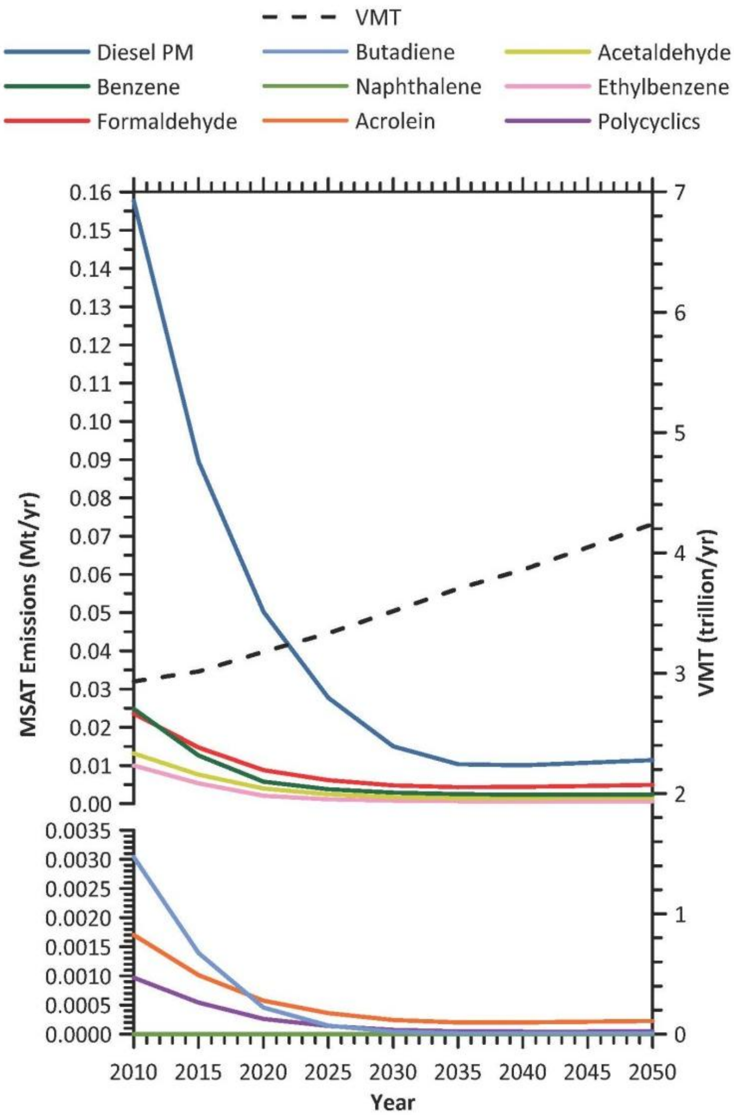
These new standards are all expected to impact MSAT emissions and include Tier 3 emissions and fuel standards starting in 2017 (79 FR 60344), heavy-duty greenhouse gas regulations that phase in during model years 2014-2018 (79 FR 60344), and the second phase of light duty greenhouse gas regulations that phase in during model years 2017-2025 (79 FR 60344).

Since the release of MOVES2014, EPA has released MOVES2014a. In the November 2015 MOVES2014a Questions and Answers Guide[1], EPA states that for on-road emissions, MOVES2014a adds new options requested by users for the input of local VMT, includes minor updates to the default fuel tables, and corrects an error in MOVES2014 brake wear emissions. The change in brake wear emissions results in small decreases in PM emissions, while emissions for other criteria pollutants remain essentially the same as MOVES2014. Using EPA's MOVES2014a model, as shown in **Figure 1**, FHWA estimates that even if VMT

[1] https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100NNR0.txt

increases by 45 percent from 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.

**Figure 1: FHWA PROJECTED NATIONAL MSAT EMISSION TRENDS 2010 – 2050 FOR VEHICLES OPERATING ON ROADWAYS USING EPA's MOVES2014a MODEL**




Source: EPA MOVES2014a model runs conducted by FHWA, September 2016.
Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, and meteorological and other factors.

Diesel PM is the dominant component of MSAT emissions, making up 50 to 70 percent of all priority MSAT pollutants by mass, depending on calendar year. Users of MOVES2014a will notice some differences in emissions compared with MOVES2010b. MOVES2014a is based on updated data on some emissions and pollutant processes compared to MOVES2010b, and also reflects the latest Federal emissions standards in place at the time of its release. In addition, MOVES2014a emissions forecasts are based on lower VMT projections than

MOVES2010b, consistent with recent trends suggesting reduced nationwide VMT growth compared to historical trends.

### *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. The FHWA, EPA, the Health Effects Institute (HEI), 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.

## 5 Project-Specific MSAT Information

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*.[2]

For each alternative in this document (Build and No Build), the amount of MSAT emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for the Build Alternative is slightly higher than that for the No Build Alternative, because the additional capacity and grade separation increases the efficiency of the roadway and attracts rerouted trips from elsewhere in the transportation network. This increase in VMT would lead to higher MSAT emissions for the Build Alternative along the highway corridor, along with a corresponding decrease in MSAT emissions along the parallel routes. The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds; according to EPA's MOVES2014a model, emissions of all of the priority MSAT decrease as speed increases. 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 over 90 percent between 2010 and 2050.[3] Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

---

[2] https://www.fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/mobile_source_air_toxics/msatemissions.cfm

[3] *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*, Federal Highway Administration, October 12, 2016 – http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm

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 the Build Alternative than the No Build Alternative. The localized increases in MSAT concentrations would likely be most pronounced along the expanded roadway sections between the 183A/US 183 merge and SH 29 (heaviest traffic), at on- and off-ramps (acceleration/braking), and at signalized intersections on the existing US 183 frontage roads (queuing/idling). However, the magnitude and the duration of these potential increases compared to the No Build Alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. In sum, when highway capacity is increased, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

# 6 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 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 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/iris/). 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 HEI. A number of HEI studies are summarized in Appendix D of

FHWA's *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents*.[4] 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[5] 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.

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.[6] 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 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."[7]

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

4 http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm

5 HEI Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects

6 Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects

7 EPA IRIS database, Diesel Engine Exhaust, Section II.C., https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0642.htm#quainhal

emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than one in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than one in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the US Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable.[8]

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.

# 7 Conclusion

In this document, a qualitative MSAT assessment has been provided of MSAT emissions and has acknowledged that the Build Alternative may result in 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.

[8] https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD59852578000050C9DA/$file/07-1053-1120274.pdf

# Appendix A
# Project Location Map

# Project Location Map
## 183A Phase III - From Hero Way to 1.1 mi north of SH 29

CSJ: 0914-05-192