TRANSFORM I-66: INSIDE THE BELTWAY
Eastbound Widening
Environmental Assessment
AIR QUALITY
TECHNICAL REPORT
NOVEMBER 2016
Air Quality Technical Report

November 2016

Prepared in support of the Environmental Assessment for

Transform Interstate 66: Inside the Capital Beltway, Eastbound Widening

State Project Number: 0066-96A-417, P101, R201, C501; UPC: 108424
Federal Project Number: NHPP-066-1(356)
From: Exit 67 (Route 267) Dulles Connector Road
To: Exit 71 (Route 237) Fairfax Drive
Fairfax and Arlington Counties, Virginia
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EXECUTIVE SUMMARY

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA), is evaluating improvements along approximately four miles of eastbound Interstate 66 (I-66) inside of the Interstate 495 (I-495) Capital Beltway between the Dulles Connector Road (Route 267) in Fairfax County to Fairfax Drive (Route 237) in the Ballston area of Arlington County, Virginia. Pursuant to the National Environmental Policy Act of 1969, as amended, (NEPA) and in accordance with FHWA regulations, an Environmental Assessment (EA) is being prepared to analyze and document the potential social, economic, and environmental effects associated with the transportation improvements being evaluated.

This project is located within areas (Fairfax and Arlington Counties) that are part of a region currently designated non-attainment or maintenance for one or more of the national ambient air quality standards (NAAQS) established by the Environmental Protection Agency (EPA), as follows:

- DC-Maryland-Virginia marginal nonattainment area for the 2008 eight-hour ozone standard, and
- DC-Maryland-Virginia maintenance area for the 1997 primary annual fine particulate matter (PM$_{2.5}$) NAAQS.

As such, federal transportation conformity rule (40 CFR Parts 51 and 93) requirements apply, including specifically requirements for inter-agency consultation for conformity (IACC) on the models, methods and assumptions to be applied in project-level air quality analyses (40 CFR 93.105(c)(1)) and the corresponding section of the Virginia Regulation for Transportation Conformity (9 VAC 5-151 Section 70). The IACC requirements were met in two ways:

1. In December 2015, IACC was conducted on all of the models, methods and assumptions specified or referenced in the VDOT Project-Level Air Quality Resource Document, which were applied in this analysis either directly or without substantive change. The Resource Document was created by VDOT to facilitate and streamline the preparation of project-level air quality analyses while maintaining high standards for quality. Appendix L of the VDOT Resource Document includes specific technical criteria for screening projects as ones potentially of air quality concern for PM$_{2.5}$, which were developed based on examples provided in EPA guidance. No adverse comments were received.

2. In addition, in the interests of full transparency and notwithstanding the IACC already completed on the Resource Document, IACC was conducted for this project via webinar on September 8, 2016. No adverse comments were received, including specifically the proposed determination that the project was not one of potential air quality concern for PM$_{2.5}$.

1 On August 24, 2016, EPA issued a final rule (81 FR 58010), effective October 24, 2016, on “Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements” that stated, in part: “Additionally, in this document the EPA is revoking the 1997 primary annual standard for areas designated as attainment for that standard because the EPA revised the primary annual standard in 2012 . Therefore, effective October 24, 2016 the region will no longer be classified as attainment-maintenance for the 1997 primary annual PM$_{2.5}$ standard, and the associated EPA regulatory requirements for conformity for PM$_{2.5}$ will be eliminated for northern Virginia.

**PM\textsubscript{2.5} ANALYSIS:**

Notwithstanding the imminent revocation of the applicable NAAQS and the removal of the associated transportation conformity requirements, a PM\textsubscript{2.5} assessment was conducted for this project. For this purpose, the screening criteria presented in Appendix L of the VDOT Resource Document, which were established based on EPA guidance and subjected to IACC as noted above, were applied to determine if this project represents one of local air quality concern. Traffic forecasts developed for this project showed that increases in average daily diesel truck traffic associated with the Build scenario would not exceed 2,000 trucks per day\(^3\), the criterion established in the VDOT Resource Document for highway capacity expansion. Additional factors that support the conclusion that this project is not one of local air quality concern for PM\textsubscript{2.5} include:

- I-66 is limited to 4-tire vehicles inside the beltway.
- The area has already achieved the 1997, 2006 and 2012 PM\textsubscript{2.5} NAAQS.
- Background concentrations are well below the 1997 NAAQS (8.8 – 9.4 ppb).
- The 1997 PM\textsubscript{2.5} NAAQS will be revoked effective October 24\(^{th}\), 2016. This would change the status of the area from maintenance to attainment of the NAAQS, eliminating PM\textsubscript{2.5} conformity requirements.

Based on the weight of evidence, the proposed improvements are not ones of air quality concern for PM\textsubscript{2.5} and therefore a detailed quantitative assessment of potential impacts is not required.

**CO ANALYSIS:**

A quantitative CO hot spot worst-case screening analysis was performed for the project for purposes of NEPA, using inputs and procedures specified in the VDOT Resource Document and consistent with applicable EPA and FHWA requirements and guidance. The analysis was conducted as follows:

- Modeling was completed for existing (2016), the project opening (2025) and design (2040) years.
- The modeling was conducted with EPA models for emissions (MOVES2014a) and dispersion (CAL3QHC and CALINE3), with the dispersion modeling facilitated in part with the FHWA CAL3i interface model (which invokes the EPA models).
- Analysis was conducted for the three worst-case intersections (VA-123 & Lewinsville Rd, Idylwood Road & VA-7, and Pimmit Dr & VA-7) and the worst-case interchange between I-66 & the Dulles Toll Road.
- Modeling in all cases was conducted using worst-case assumptions for traffic and facility configurations. For example, at the interchange, worst-case traffic volumes were applied, traffic and emissions were concentrated into a single grade separation rather than modeled over broadly dispersed ramps, and receptors were located at twenty feet from the edge of the travelled roadways rather than outside the right of way limits that are outside the footprint of the interchange and therefore much further away from the modeled roadway.
- The results for all of the analyses (intersection and interchange) show that CO concentrations for the Build scenario are expected to remain well below the CO NAAQS for all locations modeled throughout the corridor for each year modeled.

\(^3\) This represents 20% of the ten thousand diesel trucks per day criterion established in the VDOT Resource Document (based on the examples provided in EPA guidance) for new highway construction.
Based on the modeling results, implementation of the project is not expected to cause or contribute to a violation of the CO NAAQS.

MOBILE SOURCE AIR TOXICS (MSATS):

Based on FHWA guidance and the forecast total traffic volumes for I-66, this project is categorized as one with high potential effects for MSATs, which include the following: acrolein, benzene, 1,3 butadiene, diesel particulate matter, formaldehyde, naphthalene, and polycyclic organic matter. A detailed quantitative assessment (modeling) following FHWA guidance was therefore conducted for the project to assess the potential impacts for MSATs. The assessment shows that there would be no long-term adverse impacts associated with the Build scenario and that future MSAT emissions across the entire study corridor would be substantially below today’s levels, even after accounting for projected VMT growth.

More specifically, the modeling results indicate that MSAT emissions are expected to increase slightly from the No-Build to the Build scenario in 2025 and 2040, although these increases are not considered substantial. However, when compared to existing conditions, emissions of all MSAT pollutants under the 2025 and 2040 Build scenarios are projected to be substantially lower than exist today. EPA's increasingly more stringent vehicle emission and fuel regulations, combined with fleet turnover, are expected to substantially lower fleet-average emission rates for MSATs in the future relative to today.

Overall, best available information indicates that, nationwide, regional levels of MSATs are expected to decrease in the future due to fleet turnover and the continued implementation of more stringent emission and fuel quality regulations. Nevertheless, it is possible that some localized areas will show an increase in emissions and ambient levels of these pollutants due to locally increased traffic levels associated with the project.

INDIRECT EFFECTS AND CUMULATIVE IMPACTS:

Indirect effects are those effects that would be caused by the project but occur later in time or are removed in distance from the project. Cumulative effects are those effects that result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative effects include indirect effects.

The potential for indirect effects or cumulative impacts to air quality that may be attributable to this project are not expected to be substantial for several reasons. First, regarding indirect effects, much of the area in which the project is located is already highly developed, which limits the potential for incremental indirect effects.

Second, regarding the potential for cumulative impacts, the annual conformity analysis conducted by the Transportation Planning Board (MPO for the Washington, D.C. metropolitan nonattainment/maintenance area) represents a cumulative impact assessment for purposes of regional air quality. Federal conformity requirements, including specifically 40 CFR 93.114 and 40 CFR 93.115, apply as the area in which the project is located is designated as nonattainment for ozone and maintenance for fine particulate matter. Accordingly, there must be a currently conforming transportation plan and program at the time of project approval, and the project must come from a conforming plan and program (or otherwise meet criteria specified in 40 CFR 93.109(b)).

- The existing air quality designations for the region are based, in part, on the accumulated mobile source emissions from past and present actions, and these pollutants serve as a baseline for the current conformity analysis.
The conformity analysis quantifies the amount of mobile source emissions for which the area is designated nonattainment/maintenance that will result from the implementation of all reasonably foreseeable (i.e., those proposed for construction funding over the life of the region’s transportation plan) regionally significant transportation projects in the region.

It is anticipated that the conformity analysis currently being conducted will demonstrate that the incremental impact of the proposed project on mobile source emissions, when added to the emissions from other past, present, and reasonably foreseeable future actions, is in conformance with the SIP and will not cause or contribute to a new violation, increase the frequency or severity of any violation, or delay timely attainment of the NAAQS established by EPA.

The indirect and cumulative effects of the project are not expected to be substantial.
1. INTRODUCTION

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA), is evaluating improvements along approximately four miles of eastbound Interstate 66 (I-66) between the Dulles Connector Road (Route 267) in Fairfax County to Fairfax Drive (Route 237) in the Ballston area of Arlington County, Virginia.

The purpose of the improvements under consideration is to increase capacity in order to improve traffic operations, reduce congestion, and address safety needs. Pursuant to the National Environmental Policy Act of 1969, as amended, (NEPA) and in accordance with FHWA regulations, VDOT is preparing an Environmental Assessment (EA) to analyze the potential social, economic, and environmental effects associated with the improvements being considered. As part of the EA being prepared, VDOT is evaluating in detail the environmental consequences of the No Build Alternative and one Build Alternative. In support of that effort, this report has been prepared to describe the impact to air quality potentially resulting from the alternatives being considered in the EA.

1.1 HISTORY OF I-66

I-66 was primarily developed to serve east-west travel from I-81 near Strasburg, Virginia, on the west, to Washington, D.C., in the east. Initial planning for the 76-mile corridor began in 1956, and the first segments west of I-495 were opened between 1958 and 1964. Inside of I-495, I-66 was originally conceptualized as an eight-lane interstate facility, for which preliminary planning and study began in 1962 to identify a location for I-66 through Fairfax and Arlington Counties. In 1962, ROW acquisition and construction were initiated on portions of the I-66 corridor inside of I-495. However, in April 1972, work was suspended until an Environmental Impact Statement (EIS) was completed, pursuant to NEPA and Section 4(f) of the Department of Transportation Act of 1966, to consider the social and environmental impacts of the project. Following extensive environmental review and consideration of numerous alternative solutions, I-66 was ultimately approved in 1977 as a multi-modal transportation concept that included a four-lane interstate facility with a dedicated median right of way for the construction of the Metrorail transit system for part of its length. I-66 opened inside of I-495 in 1982 as one of the first interstates in the United States limited to high occupancy vehicle (HOV)-only traffic during peak weekday travel periods. At its outset, on all lanes between I-495 and Washington, D.C., I-66 functioned as a HOV-restricted facility for carpools with four or more occupants during weekday peak periods. Rush hour occupancy requirements were reduced to three or more in 1983 and again reduced to two or more in 1995. Drivers of hybrid vehicles were once permitted to use the HOV-restricted lanes even without meeting minimum rider requirements; however, in response to rising congestion in the I-66 corridor during HOV-restricted hours, regulations changed to require that only vehicles with clean special fuels license plates issued prior to July 2011 could legally use the HOV lanes on I-66 without meeting the occupancy requirements during the restricted periods.

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**1.2 PROJECT HISTORY**

In an effort to better understand the increasingly congested travel conditions in the I-66 corridor, several studies have been undertaken. In 2009, the Virginia Department of Rail and Public Transportation (DRPT) conducted the *I-66 Transit/Transportation Demand Management (TDM) Study*, which focused on the overall I-66 corridor from Route 15 to downtown Washington, D.C. and recommended a variety of services and infrastructure improvements to increase mobility in the corridor. Upon completion of this 2009 study, the corridor was divided into two sections for more detailed analysis of the recommendations. The western section between Route 15 and I-495 and the eastern sections between I-495 and Washington, D.C. were identified as logical endpoints for future studies of transportation and mobility improvements, based on identified travel demand patterns, concentrations of transit and carpool markets, and corridor constraints for transit, highway, and bicycle and pedestrian improvement options.

In 2012, VDOT and DRPT completed the *I-66 Multimodal Study Inside the Beltway*, followed by a 2013 Supplemental Report, which examined several alternatives for the corridor and developed a recommended package of improvements. The combination of these studies and their specific findings and recommendations formed the basis of the planned multimodal changes for the Transform 66: Inside the Beltway improvements program. Comprehensively, these changes include the following components:

- Converting I-66 inside of I-495 to dynamically-priced toll lanes during peak travel periods (construction initiated Summer 2016, anticipated project opening 2017);
- Applying toll revenue to the development of improved multimodal transit options including enhanced bus service, enhanced carpool, and other TDM strategies throughout the corridor; and
- Widening of I-66 eastbound from the Dulles Connector Road to Fairfax Drive in Ballston.

Each of these individual components of the overall Transform I-66: Inside the Beltway improvements program was included in the Metropolitan Washington Council of Government’s (MWCOG) approved *Financially Constrained Long-Range Transportation Plan (CLRP) for the National Capital Region*. Although identified as a package of programmed improvements, each component consists of an individual project(s) with independent utility to be implemented in a specific sequential progression to address a variety of distinct needs along I-66 inside of I-495 in the near-, mid-, and long-term future, as funding is identified. Included among the identified needs are overarching goals such as enhance connectivity, improve transit service, increase travel options, and reduce roadway congestion. The distinct project components of the Transform I-66: Inside the Beltway improvements program are intended to specifically address these identified needs, independently from one another.

The needs for the widening component of the Transform I-66: Inside the Beltway program improvements initiative were initially identified in the *I-66 Multimodal Study Inside the Beltway* report but have been further considered through the detailed evaluations described in the following sections. Based on these detailed evaluations, the immediate needs are more pronounced along eastbound I-66 in the study area, which have informed the development of improvements for consideration. As a result, the eastbound portion of I-66 within the study area is the focus of this study. Following the implementation of other components of the Transform I-66: Inside the Beltway program, improvements along westbound I-66 will be evaluated as part of the progression of Transform I-66: Inside the Beltway improvements.
1.3 ALTERNATIVES CARRIED FORWARD FOR DETAILED STUDY

1.3.1 NO BUILD ALTERNATIVE

In accordance with the implementing regulations for NEPA (40 CFR § 1502.14(d)), the No Build Alternative has been retained for detailed study and serves as a benchmark for comparison with the Build Alternative. The No Build Alternative would retain the existing configuration of I-66 through the study area except for those modifications to the roadway network that have been programmed and approved for implementation by 2040, as identified in the most recent Financially Constrained Long-Range Transportation Plan (CLRP) for the National Capital Region. Prepared by the National Capital Region Transportation Planning Board (TPB), which is the designated Metropolitan Planning Organization (MPO) for the Washington, D.C. region under the Metropolitan Washington Council of Governments (MWCOG), the current CLRP includes projected transit and traffic, demographic, and air quality conditions through the 2040 horizon year. The most recent 2040 CLRP was adopted in October 2015 but includes amendments through 2016.

The regional planned and programmed transportation projects in close vicinity to the study area that could influence the improvements being evaluated include the following:

- Tolling along I-66 between the I-495 Capital Beltway in Fairfax County to Lee Highway (Route 29) near the Rosslyn area of Arlington County. During morning and evening commutes, this segment of I-66 is currently restricted to carpools (with 2 or more people), vehicles with authorized clean special fuel license plates, Dulles Airport travelers, and law enforcement. The HOV restrictions are enforced between 6:30-9:00 AM (all eastbound travel lanes) and 4:00-6:30 PM (all westbound travel lanes). With the I-66 Inside the Beltway tolling program, carpools and vanpools (with 2 or more people, until a regional change to HOV-3+ goes into effect in 2020), transit, on-duty law enforcement, and first responders will continue to use the lanes for free. Solo drivers will be given the opportunity to use the interstate during the restricted period by paying a toll. The tolling program will extend the restricted period to 5:30-9:30 AM (all eastbound travel lanes) and 3:00-7:00 PM (all westbound travel lanes) and is anticipated to be implemented by 2017.

- I-66 Spot Improvements – Spot 3, which include construction of an auxiliary lane extension connecting the on-ramp from Exit 72 Lee Highway/Spout Run (Route 29) to the off-ramp to North Glebe Road (Route 120) on westbound I-66. The project is expected to be completed in 2020.

- Construction of two express lanes in either direction along I-66 between James Madison Highway (Route 15) in Haymarket to the I-495 Capital Beltway, while maintaining three general purpose lanes in each direction and providing a number of travel choices including express transit buses and park and ride facilities along the corridor.

- Leesburg Pike (Route 7) widening from six to eight lanes between Chain Bridge Road (Route 123) and I-495 and from four to six lanes between I-495 and I-66.

- On I-66, the vehicle occupancy requirement for all HOV/high occupancy toll (HOT) restrictions will change from two or more (2+) to three or more (3+) in 2020. The exemption for clean fuel and hybrid vehicles to use HOV lanes will also expire by 2020.
Other transit-oriented transportation improvements included in the CLRP include new priority bus routes on I-66, Route 29, and Route 50; Metrorail station improvements at Ballston and East Falls Church; and service enhancements for numerous bus routes inside the I-495 Capital Beltway.

1.3.2 BUILD ALTERNATIVE

The Build Alternative would include the construction of one additional lane in the eastbound direction beginning at approximately mile post 67.7, just east of the convergence of I-66 eastbound and the Dulles Connector Road. The widening would continue for a total of approximately 3.3 miles to mile post 71.0, where the Fairfax Drive/Glebe Road exit ramp diverges from eastbound I-66. To avoid and minimize the potential impacts of the improvements under consideration, a variety of typical sections have been developed to incorporate the widening largely within the existing VDOT right of way.

The widening would primarily occur to the inside of the roadway throughout the extent of the study area with the exception of one location: just west of Patrick Henry Drive to exit 71 at Fairfax Drive and Glebe Road (approximately mile posts 70.1 to 71.0). In this location, the widening would transition from the median to the outside of the roadway along the existing shoulder. At mile post 71.0, the eastern project terminus, the additional lane would tie in to the existing mainline lane configuration. The Build Alternative will include sound barriers at locations meeting the federal criteria and supported by adjacent benefited property owners. The improvements also would include modifications to existing intersecting roadways and bridges as well as to existing drainage systems including inlets, roadside ditches, culverts, storm sewer systems, and stormwater management facilities.
2. REGULATORY CONTEXT/METHODOLOGY

This section provides an overview of regulations and guidance applicable to the project-level air quality analysis to support the environmental review of the project.

2.1 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (NEPA)

Under NEPA, federal agencies must consider the effects of their decisions on the environment before making any decisions that commit resources to the implementation of those decisions. Changes in air quality, and the effects of such changes on human health and welfare, are among the effects to be considered. A project-level air quality analysis is performed to assess the potential air quality impacts of the project, document the findings of the analysis, and make the findings available for review by the public and decision-makers.

2.2 CLEAN AIR ACT

As implemented by the Clean Air Act, the US Environmental Protection Agency (EPA) is required to set the National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and welfare. As shown in Table 2-1, there are currently two types of standards: Primary Standards that are intended to protect public health (including protecting the health of "sensitive" populations such as asthmatics, children and the elderly), and Secondary Standards that are intended to protect the public welfare (e.g., to protect against damage to crops, vegetation, buildings, and animals). Federal actions must not cause or contribute to any new violation of any standard, increase the frequency or severity of any existing violation, or delay timely attainment of any standard or required interim milestone.

EPA designates geographic regions that do not meet the NAAQS for one or more criteria pollutants as “non-attainment areas.” Areas previously designated as non-attainment, but subsequently re-designated to attainment because they no longer violate the NAAQS, are reclassified as “maintenance areas” subject to maintenance plans to be developed and included in a state’s SIP. This project is located in Arlington and Fairfax Counties, areas designated as marginal non-attainment for the 2008 8-hour ozone standard and attainment/maintenance for the 1997 annual PM$_{2.5}$ standard. Because of these designations, the project is subject to transportation conformity requirements under the CAA pertaining to ozone and (until October 24, 2016) PM$_{2.5}$.

The federal transportation conformity rule (40 CFR Parts 51 and 93) requires air quality conformity determinations for transportation plans, programs, and projects in “non-attainment or maintenance areas for transportation-related criteria pollutants for which the area is designated non-attainment or has a maintenance plan” (40 CFR 93.102(b)). Transportation-related criteria pollutants, as specified in the conformity rule, include ozone (O$_3$), CO, nitrogen dioxide (NO$_2$), PM$_{10}$ and PM$_{2.5}$. Regional conformity analysis requirements apply for plans and programs; hot-spot analysis requirements of 40 CFR 93.116 and 93.123 apply for projects.

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On August 24, 2016, EPA issued a final rule (81 FR 58010), effective October 24, 2016, on “Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements” that stated, in part: “Additionally, in this document the EPA is revoking the 1997 primary annual standard for areas designated as attainment for that standard because the EPA revised the primary annual standard in 2012 “. Therefore, effective October 24, 2016 the region will no longer be classified as attainment-maintenance for the 1997 primary annual PM$_{2.5}$ standard, and the associated EPA regulatory requirements for conformity for PM$_{2.5}$ will be eliminated for northern Virginia.
On March 10, 2006, EPA released a rulemaking titled PM$_{2.5}$ and PM$_{10}$ Hot-Spot Analyses in Project-Level Transportation Conformity Determinations for the PM$_{2.5}$ and PM$_{10}$ National Ambient Air Quality Standards (40 CFR Part 93). This rulemaking established the criteria for determining which projects will be required to analyze particulate emissions. In addition, the rule established the criteria for demonstrating conformity for PM$_{2.5}$ standards, and updated the existing criteria for determining conformity for PM$_{10}$ areas. EPA also provided the document Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM$_{2.5}$ and PM$_{10}$ Nonattainment and Maintenance Areas, the current version published November 2015. Additionally, the Metropolitan Washington Council of Governments is currently updating their air quality conformity analysis for the 2016 Constrained Long Range Transportation Plan (CLRP), which will include the project.

### Table 2-1: National Ambient Air Quality Standards

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Primary/Secondary</th>
<th>Averaging Time</th>
<th>Level</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Monoxide (CO)</td>
<td>Primary</td>
<td>8 hours</td>
<td>9 ppm</td>
<td>Not to be exceeded more than once per year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 hour</td>
<td>35 ppm</td>
<td></td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>Primary and secondary</td>
<td>Rolling 3 month average</td>
<td>0.15 µg/m$^3$</td>
<td>Not to be exceeded</td>
</tr>
<tr>
<td>Nitrogen Dioxide (NO$_{2}$)</td>
<td>Primary</td>
<td>1 hour</td>
<td>100 ppb</td>
<td>98th percentile of 1-hour daily maximum concentrations, averaged over 3 years</td>
</tr>
<tr>
<td></td>
<td>Primary and secondary</td>
<td>1 year</td>
<td>53 ppb$^{(2)}$</td>
<td>Annual Mean</td>
</tr>
<tr>
<td>Ozone (O$_{3}$)</td>
<td>Primary and secondary</td>
<td>8 hours</td>
<td>0.070 ppm$^{(3)}$</td>
<td>Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 year</td>
</tr>
<tr>
<td>PM$_{2.5}$</td>
<td>Primary</td>
<td>1 year</td>
<td>12.0 µg/m$^3$</td>
<td>Annual mean, averaged over 3 years</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>1 year</td>
<td>15.0 µg/m$^3$</td>
<td>Annual mean, averages over 3 years</td>
</tr>
<tr>
<td></td>
<td>Primary and secondary</td>
<td>24 hours</td>
<td>35 µg/m$^3$</td>
<td>99th percentile, averaged over 3 years</td>
</tr>
<tr>
<td></td>
<td>Primary and secondary</td>
<td>24 hours</td>
<td>150 µg/m$^3$</td>
<td>Not to be exceeded more than once per year</td>
</tr>
<tr>
<td>Sulfur Dioxide (SO$_{2}$)</td>
<td>Primary</td>
<td>1 hour</td>
<td>75 ppb$^{(4)}$</td>
<td>99th percentile of 1-hour daily maximum concentrations averaged over 3 years</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>3 hour</td>
<td>0.5 ppm</td>
<td>Not to be exceeded more than once per year</td>
</tr>
</tbody>
</table>

(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/m$^3$ 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 purposes of clearer comparison to the 1-hour standard level.

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

(4) PM and CO hot-spot guidance documents are available on the EPA website: [https://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses](https://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses)
2.3 MOBILE SOURCE AIR TOXICS

On December 6, 2012, FHWA issued updated guidance titled Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA. The purpose of the memorandum was to update the September 2009 interim guidance that advised FHWA Division offices on when and how to analyze MSAT under the NEPA review process for highway projects. Based on FHWA's analysis using MOVES2010b, diesel particulate matter (diesel PM) has become the primary MSAT of concern. Additionally, the updated guidance reflects recent regulatory changes, projects national MSAT emission trends out to 2050 using EPA’s MOVES2010b model, and summarizes recent research efforts; however, it did not change any project analysis thresholds, recommendations, or guidelines.

The MSAT guidance includes specific criteria for determining which projects are to be considered exempt from MSAT analysis requirements and which may require a qualitative or quantitative analysis. In accordance with the guidance, the FHWA developed a tiered approach with three categories for analyzing MSAT in NEPA documents, depending on specific project circumstances. Those categories are listed below:

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

Projects considered exempt under section 40 CFR 93.126 of the federal conformity rule are also specifically designated as exempt from MSAT analysis requirements.

2.4 MOVES2014/2014A

On October 7, 2014, the EPA published a Federal Register Notice of Availability that approved the Motor Vehicle Emissions Simulator (MOVES2014) as the latest EPA tool for estimating emissions of volatile organic compounds (VOCs), nitrogen oxide (NO\textsubscript{X}), CO, PM\textsubscript{10}, PM\textsubscript{2.5} and other pollutants from motor vehicles. With this release, EPA started a 2-year grace period to phase in the requirement of using MOVES2014 for transportation conformity analyses. In July 2014, EPA issued guidance on the use of MOVES2014 for State Implementation Plan Development, Transportation Conformity, and Other Purposes. This guidance specifies that the same grace period be applied to project-level emissions analyses. At the end of the grace period, i.e., beginning October 7, 2016, project sponsors are required to use MOVES2014 to conduct emissions analysis for both transportation conformity and NEPA purposes. In March 2015, EPA published a new EPA guidance document titled Using MOVES2014 in Project-Level Carbon Monoxide Analyses\textsuperscript{7} for completing project-level carbon monoxide analyses using MOVES2014.

In November 2015, EPA released MOVES2014a to allow MOVES users to benefit from several improvements to the model. MOVES2014a does not significantly change the criteria pollutant

\textsuperscript{7} See: https://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses#coguidance
emissions results of MOVES2014 and therefore is not considered a new model for SIP and transportation conformity purposes. MOVES2014a incorporates significant improvements in calculating non-road equipment emissions, and incorporates additional reporting capabilities for these sources of emissions. For on-road emissions, MOVES2014a adds new options requested by users for the input of local vehicle miles traveled (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. MOVES2014a also corrects an error in the way hydrocarbon emissions are apportioned into the inputs needed by air quality models such as CMAQ and CAMx.8

2.5 VDOT PROJECT-LEVEL AIR QUALITY RESOURCE DOCUMENT

As the project is located in an area subject to the federal transportation conformity rule (40 CFR Parts 51 and 93), inter-agency consultation was required by the federal rule (40 CFR 93.105(c)(1)) and the corresponding section of the Virginia Regulation for Transportation Conformity (9 VAC 5-151 Section 70). This consultation was conducted on the models, methods and assumptions specified in the VDOT Project-Level Air Quality Resource Document (see: http://www.virginiadot.org/programs/pr-environmental.asp), which were applied in this analysis either directly or without substantive change9. The Resource Document was created by VDOT to facilitate and streamline the preparation of project-level air quality analyses while maintaining high standards for quality. Inter-agency consultation for conformity purposes was conducted on the VDOT Resource Document on December 14th, 2015. Federal, state and local agencies, including the following, were invited to participate as required by the federal and Virginia conformity regulations:

- FHWA Virginia Division and Resource Center;
- Virginia Department of Environmental Quality;
- Virginia Department of Transportation;
- Virginia Department of Rail and Public Transit;
- Metropolitan Washington Council of Governments;
- EPA Region 3;
- Local agencies

All comments received on the VDOT Resource Document in the consultation process were considered, as appropriate, before the models, methods and assumptions (including data and data sources), and the definition of substantive change as provided in the VDOT Resource Document, were finalized. No adverse comments were received. A summary of the consultation process, including a list of all individuals and agencies invited to participate, can be found in Appendix A of the VDOT Resource Document.

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9 Note the following definition of “substantive change” was included in the Resource Document and made the subject of inter-agency consultation: “For project-level air quality analyses conducted to meet conformity requirements and/or for purposes of NEPA, a substantive change is defined here as one that would reasonably be expected to affect the modeling results and/or the analysis to the degree that it would change a finding, determination or conclusion that all applicable requirements for the air quality analysis for the project would be met and the project cleared. For analyses involving project-specific dispersion modeling for any pollutants for conformity purposes, this includes whether the project would pass the applicable conformity tests.”
Due to the high-level of interest from public and stakeholders regarding the Transform 66 project, an interagency consultation meeting/webinar for the project was conducted on September 8th, 2016. An overview was provided of the project improvements, traffic data and modeling, and Resource Document screening criteria. The meeting provided an opportunity for stakeholder review and comment.

All comments received in this additional inter-agency consultation were considered as appropriate before the models, methods and assumptions (including data and data sources) for the project analysis were finalized. A summary of the additional or project-specific consultation and results is provided in Appendix A of this analysis.
3. CARBON MONOXIDE ANALYSIS

Carbon monoxide (CO) is a stable gas that disperses in predictable ways in the environment surrounding a project. Computer modeling can be used to assess both existing and expected future concentrations of CO at selected receptor sites in the vicinity of a project.

In order to better screen projects for CO, a programmatic agreement for project-level air quality (CO) analyses (Programmatic Agreement) was executed between the FHWA Virginia Division Office and VDOT in April 2016. It uses worst-case modeling (defined below) to identify the conditions for which a proposed project or action would require either a quantitative or qualitative CO hot-spot analysis to meet requirements under NEPA\(^\text{10}\). Based on the agreement and applicable federal requirements, the Transform 66 project exceeds the criteria set forth in the programmatic agreement and a quantitative CO hot-spot analysis for purposes of both NEPA and conformity is indicated. The primary reason this level of analysis was required was that the project exceeds the technical criteria (i.e., exceedance of number of left turn or free flow lanes) specified in the FHWA-VDOT Programmatic Agreement, which applies for both NEPA and conformity purposes per the protocols established in the VDOT Resource Document which completed inter-agency consultation for conformity in December 2015.

CO hot-spot analyses can be completed as either screening analyses or refined analyses. Screening analyses are performed using worst-case modeling assumptions for traffic, meteorological conditions and other inputs to generate estimates of the maximum concentrations that may be expected within the project corridor. If under these worst-case assumptions the applicable NAAQS are still met for the project, then it may be reasonably concluded that the actual proposed action will not result in an exceedance of the applicable NAAQS. All worst-case modeling assumptions for this project were taken as specified in or consistent with the VDOT Resource Document, consistent with EPA and FHWA requirements and guidance, and include (but are not limited to):

- Worst-case traffic volumes that are substantially higher than expected or forecast volumes, which were set approximately to the theoretical capacity of a level roadway without physical constraints that would affect capacity, which substantially increases the modeled emissions and therefore the modeled maximum concentrations in the vicinity of the project.
- Worst-case receptor locations (points for which ambient concentrations are estimated) selected as locations at which CO concentrations were likely to be highest.
  - For intersections, receptors were located on the edge of the roadway right of way.
  - For the interchange, receptors were also located along the edge of the roadway mixing zone, i.e., well inside the roadway right of way.
- Worst-case roadway configuration for the interchange
  - A grade separation (with no vertical separation) was applied to represent the interchange, effectively concentrating all of the traffic and emissions in the smallest possible area and resulting in modeled estimates for worst-case concentrations that would be well in excess of those actually expected for the project. This is in keeping with the general worst-case analysis approach taken for modeling CO for this project.

The modeling inputs and procedures were developed in accordance with FHWA and (although this project is not subject to conformity for CO) EPA guidance, including the Guideline for Modeling

\(^{10}\) EPA conformity requirements for CO effective March 16, 2016 with the conclusion of the maintenance status for Arlington County for CO.
3.1 OVERVIEW OF SCREENING ANALYSIS

A worst-case screening analysis was applied using the EPA MOVES2014a emission model and CAL3QHC dispersion model. For the latter, which does not have a graphical user interface, the FHWA CAL3i\textsuperscript{11} interface was applied to facilitate the analyses. CAL3i provides a convenient and user-friendly means of generating input files and executing CAL3QHC, effectively streamlining the dispersion modeling process. CAL3i is an update to CAL3interface\textsuperscript{12,13} which was originally released by the FHWA in December 2006. Following standard procedure for the screening analysis, CAL3i was run first to estimate project contributions to ambient CO concentrations, without including background concentrations; background CO levels were then added to the modeling results to estimate worst-case CO concentrations at each receptor location.

3.2 TRAFFIC SUMMARY INFORMATION

The traffic analysis for this project was completed under a separate effort and the results applied for the purposes of this air quality analysis. Traffic forecasts were developed for existing, 2016 baseline conditions, as well as both No-Build and Build scenarios for the Interim/Opening Year (2025) and the Design Year (2040). The resulting traffic volume forecasts were then used in selecting the intersections to be analyzed.

A detailed effort was undertaken as part of the traffic analysis to identify all intersections that were likely to be substantially impacted by the project. A total of 76 intersections were identified by the traffic team and are shown in Figure 3-1. These selected intersections served as the starting point for selecting the top three worst-case intersections. The traffic analysis team completed an operations analysis of each intersection using traffic forecasts developed on an intersection-by-intersection basis and the Synchro simulation package. The delay, level of service and traffic volume for every intersection identified was completed, and the results were placed in an Excel table in order to rank the intersections. Although not strictly required as the project is not located in an area subject to conformity requirements for CO, the ranking process used for this study is as specified in EPA guidance\textsuperscript{14,15}:

1. Rank the top 20 intersections by traffic volumes;
2. Calculate the Level-of-Service (LOS) for the top 20 intersections based on traffic volumes;
3. Rank these intersections by LOS;
4. Model the top 3 intersections based on the worst LOS; and
5. Model the top 3 intersections based on the highest traffic volumes.

\textsuperscript{11}CAL3i can be obtained by contacting the FHWA Resource Center: \url{http://www.fhwa.dot.gov/resourcecenter/teams/airquality/}


\textsuperscript{13}M.Claggett (FHWA), “Update of FHWA’s CAL3Interface – A Graphical User Interface for the CALINE3 and CAL3QHC Highway Air Quality Models”, ca 2008

\textsuperscript{14}EPA guidance was applied although not strictly required for this project, as it is not in a nonattainment or maintenance area for carbon monoxide and therefore not subject to EPA transportation conformity rule requirements or guidance for carbon monoxide.


Transform Interstate 66

November 2016

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Since many of the worst-case intersections had the same LOS, delay was also incorporated into the ranking.\textsuperscript{16} It is assumed that if the selected worst-case intersections do not show an exceedance of the NAAQS, none of the ranked intersections will. This is based on the assumption that these intersections will have the highest CO impacts and those intersections with lower traffic volumes and less congestion will have lower ambient air impacts. Thus, if no exceedances of the CO NAAQS occur for the opening and design years when the results of the intersection modeling are added to the urban area-wide component of the CO concentration at each of the worst-case intersections evaluated, then it can reasonably be assumed that the project will not cause or contribute to a violation of the CO NAAQS at any location throughout the project corridor.

The top ten of the 76 intersections as ranked (using the 2040 build scenario results) are shown in Table 3-1 with the top three worst-case intersections identified as:

- VA-123 & Lewinsville Rd
- Idylwood Road & VA-7
- Pimmit Dr & VA-7

In addition, the interchange of I-66 & the Dulles Toll Road shows the highest volumes in the corridor and was considered to be the worst-case interchange and therefore selected for analysis.

\textsuperscript{16} Ibid.
<table>
<thead>
<tr>
<th>Intersection</th>
<th>2016 Existing</th>
<th>2025 NB</th>
<th>2025 Build</th>
<th>2040 NB</th>
<th>2040 Build</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vol.</td>
<td>LOS</td>
<td>Delay*</td>
<td>Vol.</td>
<td>LOS</td>
</tr>
<tr>
<td>VA-123 &amp; Lewinsville Rd</td>
<td>6983</td>
<td>E</td>
<td>67.7</td>
<td>7006</td>
<td>E</td>
</tr>
<tr>
<td>Idylwood Road &amp; VA-7</td>
<td>5380</td>
<td>E</td>
<td>63.1</td>
<td>6243</td>
<td>E</td>
</tr>
<tr>
<td>Pimmit Dr &amp; VA-7</td>
<td>4683</td>
<td>E</td>
<td>60.6</td>
<td>5552</td>
<td>F</td>
</tr>
<tr>
<td>Shreve Rd/Haycock Rd &amp; VA-7</td>
<td>4620</td>
<td>E</td>
<td>62.6</td>
<td>5127</td>
<td>E</td>
</tr>
<tr>
<td>US-50 &amp; Graham Road</td>
<td>5227</td>
<td>E</td>
<td>76.3</td>
<td>5287</td>
<td>E</td>
</tr>
<tr>
<td>Washington Blvd &amp; Patrick Henry Dr</td>
<td>2141</td>
<td>D</td>
<td>50.1</td>
<td>2246</td>
<td>E</td>
</tr>
<tr>
<td>US-50 &amp; N. Fillmore Street</td>
<td>6418</td>
<td>D</td>
<td>50.2</td>
<td>6688</td>
<td>E</td>
</tr>
<tr>
<td>VA-123 &amp; Anderson Rd/SR 267 EB Off-Ramp</td>
<td>5403</td>
<td>D</td>
<td>51</td>
<td>5713</td>
<td>D</td>
</tr>
<tr>
<td>VA-7 &amp; Ramada Rd/Lisle Ave</td>
<td>4602</td>
<td>D</td>
<td>45.7</td>
<td>5235</td>
<td>D</td>
</tr>
<tr>
<td>Nutley St &amp; US 29</td>
<td>4878</td>
<td>E</td>
<td>55.9</td>
<td>4846</td>
<td>E</td>
</tr>
</tbody>
</table>

*Delay is in seconds per vehicle
Highlighted cells are the three (3) worst-case intersections selected for analysis
Worst-case traffic volumes selected for the screening analysis were consistent with the values in the VDOT Resource Document. Typically, the assumed federal worst-case traffic volumes tend to be substantially higher than the modeled volumes. Table 3-2 summarizes the traffic estimates developed by the project team on I-66, showing the actual volumes to be substantively lower in each scenario. The map presented in Figure 3-2 shows the physical locations of the locations identified for the CO screening analyses.

Table 3-2: Comparison of Forecasted Peak Hour Traffic Volumes and Worst-Case Volumes Assumed for CO Screening Analysis

<table>
<thead>
<tr>
<th>Location</th>
<th>Peak Hour Forecasted Traffic Volumes</th>
<th>Values Used in CO Screening</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2016</td>
<td>2025</td>
<td>2040</td>
</tr>
<tr>
<td>VA-123 &amp; Lewinsville Rd</td>
<td>6,983</td>
<td>7,000</td>
<td>7,755</td>
</tr>
<tr>
<td>Idylwood Road &amp; VA-7</td>
<td>5,380</td>
<td>6,389</td>
<td>6,520</td>
</tr>
<tr>
<td>Pimmit Dr &amp; VA-7</td>
<td>4,683</td>
<td>5,666</td>
<td>5,909</td>
</tr>
<tr>
<td>I-66 &amp; Dulles Toll Road</td>
<td>7,485</td>
<td>10,360</td>
<td>9,195</td>
</tr>
</tbody>
</table>
3.3 CO RECEPTOR LOCATIONS

Based on EPA guidance, air quality receptor sites are selected based on assessments of where human activity is likely to coincide with the highest CO concentrations. The selected receptor locations are used to quantify both existing and future maximum CO concentrations throughout the project area and satisfy all EPA and FHWA requirements. If the peak CO concentrations at the locations selected in the analysis are below the NAAQS for CO, it is assumed that all other locations in the corridor will also remain below the NAAQS.

For the worst-case analysis for CO, receptors were automatically placed at the edge of the default right of way (10 feet for arterial streets and 20 feet for freeways), regardless of whether the public even has access to these locations, in order to generate the highest possible (worst-case) estimates for concentrations. That is, the receptors were placed 10 feet (3 meters) from the traveled roadway for intersections and 20 feet (6.1 meters) from the traveled roadway for freeways. For a freeway-to-freeway interchange, this means that receptors are placed well within the actual right of way, resulting in substantially higher

17 M. Claggett (FHWA), “Update of FHWA’s CAL3Interface – A Graphical User Interface for the CALINE3 and CAL3QHC Highway Air Quality Models”, ca 2008
modeled estimates for peak concentrations than would be obtained in a refined analysis (i.e., not following worst-case methodology). A refined analysis of the interchange would be more spread out over a wider geography, with traffic more dispersed over ramps and various lane configurations, distributing and diffusing emissions over a wider area. The worst-case assumption of modeling the interchange as a grade separation effectively assumes all traffic and emissions sources are tightly confined to lanes directly crossing each other, with receptors only 20 feet from the travelled roadway edge instead of outside the actual right of way (i.e., in areas with public access). While these receptor locations are close to the on-road emission sources, they are unlikely to be locations accessible to the public and therefore represent a worst-case assumption substantially in excess of what would be specified in EPA or FHWA guidance. Because these assumptions are so conservative, and by design intended to yield the highest possible estimates for concentrations, if the worst-case screening analysis still does not show an exceedance of the CO NAAQS despite these assumptions then no exceedance of the standard would reasonably be expected for the project.

### 3.4 MODELING INPUTS

Key assumptions used in the CO modeling are the recommended values found in the VDOT Project-Level Air Quality Resource Document. This information, along with data and assumptions specific to this project, are detailed below:

- **Emission Modeling:**
  - MOVES2014a was applied.
  - Inputs into MOVES2014a were consistent with the latest version of VDOT Project-Level Air Quality Resource Document and/or associated supplemental materials distributed with the Document.
  - Modeling was performed for roadway links using the urban area type.
  - The link inputs to MOVES2014a that affect the calculation of CO emission rates included the road type, speed, and road grade.
    - For this analysis, links on I-66 and The Dulles Toll Road were classified as MOVES road type “urban restricted” while links on all other roads were classified as “urban unrestricted”.
    - For the intersections, link grades were developed based on elevation data from GIS files and the National Elevation Dataset provided by USGS.
    - For the interchange only, grades were assumed to be +/- 3% on all lanes, the maximum grade present at the interchange. This represents the worst case for emissions modeling.
    - The link source type hour fraction data were developed using the Link Source Type Hour calculation tool provided with the VDOT Resource Document. More specifically, the method to estimate a local distribution based on VDOT DVMT Report 1236 and available MOVES Source Type Population Data was applied (see Appendix B).

- **Posted speeds were assumed for all freeway links (65 mph) and the intersection analyses, consistent with the methodology specified in the VDOT Resource Document.**

- **Dispersion Modeling:**
  - CAL3QHC was applied using the FHWA CAL3i interface.
  - CO background concentration values were those specified in the VDOT Resource Document, which were based on recent VDEQ monitoring data. Documentation for local
background concentrations and associated persistence factors is included in the VDOT Resource Document.

- All other defaults were based on the VDOT Resource Document.
- Worst-case traffic volumes of 2,400 vehicles per hour per lane (vphpl) or 1,230 vphpl were applied for the interchange and intersection, respectively, far exceeding the theoretical capacity on any one approach.
- Receptors were located on the edge of the roadway right-of-way, following federal guidance for worst-case analyses.
- All other worst case assumptions were consistent with recommendations included in the VDOT Project-Level Air Quality Resource Document including:
  - 3 foot median width for freeways
  - No median width for intersections
  - 20 foot right of way for freeways
  - 10 foot right of way for intersections
  - 2,400 vphpl for each travel lane for freeways
  - 1,230 vphpl for each travel lane for intersections
  - Average red cycle length of 68 seconds
  - Saturation flow rate of 1,900 vphpl

An example MOVES input data file applied in the CO analysis is provided in Appendix C, and worst-case emission factors are shown in Table 3-3.

**Table 3-3: Emission Rates (grams per mile)**

<table>
<thead>
<tr>
<th>Location</th>
<th>2016</th>
<th>2025</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freeflow</td>
<td>Idle</td>
<td>Freeflow</td>
</tr>
<tr>
<td>VA-123 &amp; Lewinsville Rd</td>
<td>7.1</td>
<td>16.7</td>
<td>6</td>
</tr>
<tr>
<td>Idylwood Road &amp; VA-7</td>
<td>6</td>
<td>16.7</td>
<td>5</td>
</tr>
<tr>
<td>Pimmit Dr &amp; VA-7</td>
<td>4.6</td>
<td>16.7</td>
<td>3.9</td>
</tr>
<tr>
<td>I-66 &amp; Dulles Toll Road</td>
<td>5.4</td>
<td>--</td>
<td>4.8</td>
</tr>
</tbody>
</table>

CAL3QHC via the CAL3i interface was applied for modeling CO concentrations at the selected receptor locations. Emission factors derived from MOVES2014a, calculated as discussed above, were included as inputs to the CAL3i model. Worst-case traffic operations and atmospheric conditions were incorporated to predict worst-case CO concentrations. The surface roughness coefficient used in the analysis was based on land use in the project area. In addition, a persistence factor of 0.78 (taken from the VDOT Resource Document) was applied to the 1-hour CO concentrations to project the 8-hour CO concentrations following the methodology stipulated in EPA guidance. An example CAL3QHC input and output file are provided in Appendix D, and a complete set of modeling files can be made available upon request. Figures 3-3 and 3-4 show the roadway configuration and receptor locations as modeled for the intersections and interchange.
Figure 3-3: Roadway Configuration and Receptor Locations for Intersection

Figure 3-4: Roadway Configuration and Receptor Locations for Interchange
3.5 NO BUILD SCENARIO

Modeling of No-Build scenario for the project-level air quality analysis for CO is not required for this analysis in keeping with the FHWA-VDOT 2009 Agreement for No-Build Analyses. Per that Agreement, modeling of a No-Build scenario is not required for projects that qualify for an Environmental Assessment (EA).

A base year analysis was completed using 2016 emission rates, the number of lanes indicative of the No-Build scenario, and the same assumptions as indicated for the Build scenario below.

3.6 RESULTS OF CO SCREENING ANALYSIS – BUILD SCENARIO

For the base year (2016), the worst-case CO concentrations at the I-66/Dulles Toll Road interchange of 7.1 ppm (1-hour) and 5.7 (8-hour) are observed at receptor 2. For the project-opening year (2025), the worst-case CO concentrations of 6.5 ppm (1-hour) and 5.2 ppm (8-hour) are observed at receptor 2. For the design year (2040), the worst-case CO concentrations of 3.2 ppm (1-hour) and 2.7 ppm (8-hour) are observed at receptor 2. All of these maximum potential CO concentrations are below the CO NAAQS. Thus, these results demonstrate that, under worst-case conditions, the Build scenario will not cause or contribute to a violation of the CO NAAQS at the worst-case interchanges adjacent to the project corridor. The modeling configurations used in the CO analysis can be seen in Appendix E and all input and output data for the analysis can be made available upon request. As shown in Table 3-4 the highest CO concentrations are predicted at the interchange at receptor 2. The maximum observed CO concentrations (in ppm) are shown for the existing and Build condition for each year. The summary table also shows the CO NAAQS for the corresponding averaging period.

<table>
<thead>
<tr>
<th>Location</th>
<th>Averaging Period</th>
<th>2016</th>
<th>2025</th>
<th>2040</th>
<th>NAAQS</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA-123 &amp; Lewinsville Rd</td>
<td>1-hour CO</td>
<td>5.6</td>
<td>4.8</td>
<td>2.4</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>8-hour CO</td>
<td>4.5</td>
<td>3.9</td>
<td>2.0</td>
<td>9</td>
</tr>
<tr>
<td>Idylwood Road &amp; VA-7</td>
<td>1-hour CO</td>
<td>4.6</td>
<td>4</td>
<td>2.2</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>8-hour CO</td>
<td>3.7</td>
<td>3.2</td>
<td>1.9</td>
<td>9</td>
</tr>
<tr>
<td>Pimmit Dr &amp; VA-7</td>
<td>1-hour CO</td>
<td>4.1</td>
<td>3.6</td>
<td>2.1</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>8-hour CO</td>
<td>3.4</td>
<td>2.9</td>
<td>1.8</td>
<td>9</td>
</tr>
<tr>
<td>I-66 &amp; Dulles Toll Road</td>
<td>1-hour CO</td>
<td>7.1</td>
<td>6.5</td>
<td>3.2</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>8-hour CO</td>
<td>5.7</td>
<td>5.2</td>
<td>2.7</td>
<td>9</td>
</tr>
</tbody>
</table>

Notes: 1-hour and 8-hour concentrations are shown in parts per million (ppm). 1-hour concentrations were predicted using a background concentration of 1.6 ppm. 8-hour concentrations were calculated by applying a persistence factor of 0.78 to the 1-Hour concentration, and assume a background concentration of 1.4 ppm.

For the base year (2016), the maximum potential (worst-case) CO concentrations at an intersection are observed at the VA 123 & Lewinsville Road intersection with a 1-hour CO concentration of 5.6 ppm and an 8-hour CO concentration of 4.5 ppm. This peak occurs at receptor 13. For the project opening year (2025), the worst-case CO concentration at the signalized intersections is observed at the VA 123 & Lewinsville Road intersection with a 1-hour CO concentration of 4.8 ppm and an 8-hour CO concentration of 4.5 ppm. The design year (2040) results indicate a further reduction in CO concentrations.
concentration of 3.9 ppm. This peak occurs at receptor 13. For the design year (2040), the estimated worst-case CO concentrations are below the base and opening year worst-case concentrations.

The analysis of the interchange of I-66 and Dulles Toll Road represents a worst-case screening analysis. While the interchange is spread over a wide area, the screening analysis reduces it to a compact roadway crossing with vehicle emissions similarly constrained and concentrated. Traffic volumes are assumed to be at the roadway capacity, and receptors are located adjacent to the roadway at locations that are actually inaccessible to the public. Despite these worst-case assumptions and others as noted previously, the maximum CO concentrations modeled for this project are well below the CO NAAQS.

3.7 CO CONCLUSIONS

Based on a worst-case analysis following EPA and FHWA requirements and guidance, and using modeling inputs from or consistent with the VDOT Resource Document, which completed inter-agency consultation for conformity purposes in December 2015, the maximum CO concentrations modeled for this project are well below the CO NAAQS. These results demonstrate that, under worst-case conditions, the Build scenario would not cause or contribute to a violation of the CO NAAQS.
4. PARTICULATE MATTER

The Transform 66 project is located in Arlington and Fairfax Counties; areas that at the time of preparation of this analysis are designated as maintenance for the 1997 annual PM$_{2.5}$ NAAQS. Until October 24, 2016, when the revocation of that standard by EPA becomes effective, the project is subject to EPA conformity requirements for PM$_{2.5}$. The VDOT Project-Level Air Quality Resource Document, for which inter-agency consultation for conformity purposes was completed in December 2015, provides guidance and criteria to assist in determining whether a project warrants consideration as a possible project of local air quality concern for PM$_{2.5}$. For more background on inter-agency consultation for conformity conducted for this project, see sections 2.5 and 4.2.

4.1 PM REGULATIONS AND OVERVIEW

Quantitative PM$_{2.5}$ considerations are a requirement under the Transportation Conformity Requirements of the Clean Air Act (CAA). CAA section 176(c)(1) is the statutory requirement that must be met by all projects in nonattainment and maintenance areas that are subject to transportation conformity. Section 176(c)(1)(B) states that federally-supported transportation projects must not “cause or contribute to any new violation of any standard [NAAQS] in any area; increase the frequency or severity of any existing violation of any standard in any area; or delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.” Section 93.123(b)(1) of the conformity rule defines the projects that require a PM$_{2.5}$ or PM$_{10}$ hot-spot analysis as:

(i) New highway projects that have a significant number of diesel vehicles, and expanded highway projects that have a significant increase in the number of diesel vehicles;

(ii) Projects affecting intersections that are at Level-of-Service D, E, or F with a significant number of diesel vehicles, or those that will change to Level-of Service D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project;

(iii) New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location;

(iv) Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location; and

(v) Projects in or affecting locations, areas, or categories of sites which are identified in the PM$_{2.5}$ or PM$_{10}$ applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

Some examples of projects of local air quality concern that would be covered by 40 CFR 93.123(b)(1)(i) (ii) and EPA’s Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM$_{2.5}$ and PM$_{10}$ Nonattainment and Maintenance Areas (EPA-420-B-15-084, November 2015) are:

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18 On August 24, 2016, EPA issued a final rule (81 FR 58010), effective October 24, 2016, on “Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements” that stated, in part: “Additionally, in this document the EPA is revoking the 1997 primary annual standard for areas designated as attainment for that standard because the EPA revised the primary annual standard in 2012 “. Therefore, effective October 24, 2016 the region will no longer be classified as attainment-maintenance for the 1997 primary annual PM$_{2.5}$ standard, and the associated EPA regulatory requirements for conformity for PM$_{2.5}$ will be eliminated for northern Virginia.
A project on a new highway or expressway that serves a significant volume of diesel truck traffic, such as facilities with greater than 125,000 annual average daily traffic (AADT) and 8% or more of such AADT is diesel truck traffic;

- New exit ramps and other highway facility improvements to connect a highway or expressway to a major freight, bus, or intermodal terminal;
- Expansion of an existing highway or other facility that affects a congested intersection (operated at Level-of-Service D, E, or F) that has a significant increase in the number of diesel trucks; and,
- Similar highway projects that involve a significant increase in the number of diesel transit busses and/or diesel trucks.

Some examples of projects of local air quality concern that would be covered by 40 CFR 93.123(b)(1)(iii) and (iv) are:

- A major new bus or intermodal terminal that is considered to be a “regionally significant project” under 40 CFR 93.1012; and,
- An existing bus or intermodal terminal that has a large vehicle fleet where the number of diesel buses increases by 50% or more, as measured by bus arrivals.

It should be noted that the region currently attains the 2006 and 2012 PM$_{2.5}$ NAAQS based on monitoring data.\textsuperscript{19}

Appendix L of the previously referenced VDOT Resource Document specifies criteria for determining whether a project might be considered one of potential air quality concern for fine PM, based on the examples provided by EPA. The VDOT Resource Document including the Appendix L criteria were subjected to inter-agency consultation for conformity purposes in December 2015, as summarized previously, and no adverse comments were received.

### 4.2 INTERAGENCY CONSULTATION AND DISCUSSION OF FINDINGS

As noted previously, the Transform 66 project has garnered both media and public attention. All models, methods and assumptions applied for this assessment were taken from or are consistent with those specified in the VDOT Resource Document for which the requisite inter-agency consultation was completed in December 2015 (see section 2.5). In addition, a webinar was held on September 8, 2016 specifically for this project. Agencies invited to participate included:

- FHWA Virginia Division and Resource Center;
- Virginia Department of Environmental Quality;
- Virginia Department of Transportation;
- Virginia Department of Rail and Public Transit;
- Metropolitan Washington Council of Governments;
- EPA Region 3;
- FTA local and regional offices;
- Fairfax County; and
- Arlington County;

\textsuperscript{19} Attainment status for any region of the country for all NAAQS can be found on the USEPA Greenbook: \url{https://www.epa.gov/green-book}
Traffic forecasts, particularly along I-66 itself, did not indicate a significant growth in truck or diesel bus traffic as a result of the project. Diagrams summarizing the daily traffic on I-66 can be found in Figures 4-1 through 4-3. The absence of significant growth in Average Annual Diesel Truck Traffic (AADTT) in the project area was expected given that the project widening on a roadway to prohibits trucks. There are no new land uses anticipated that would include congregations of idling trucks or diesel vehicles as a result of the proposed action. There is no specific transit component to the project involving diesel buses either traveling through the corridor, for example a dedicated bus lane, or new congregations of idling buses, such as at a major bus-to-bus transfer facility or a new bus yard.

Appendix L of the VDOT Resource Document specifies criteria to determinate whether a proposed project or action is one of potential air quality concern for fine particulate matter (PM$_{2.5}$) that warrants a more detailed investigation. For proposed improvements to existing highways, the applicable criterion is whether the proposed improvement is likely to lead to an increase in AADTT greater than 2,000 vehicles/day. For this project, the forecast changes in traffic volume, even if buses are included in the truck totals, do not attain this 2,000 vehicle/day criterion. This observation holds true in both the opening year of the project (2025) and the design year (2040), years for which traffic forecasts were made available. It can therefore be asserted that this is not a project of local air quality concern for PM$_{2.5}$. This is based both on the previously agreed to thresholds by the IACC, and on a more detailed review of the project specifics. The determination that the proposed improvements do not constitute ones of potential air quality concern for fine particulate matter is supported by the following findings:

- Currently I-66 inside the beltway has a prohibition on trucks and this prohibition will continue.
- Traffic analysis/traffic modeling performed for this project shows no significant (>2,000 VPD) increase in truck traffic on any of the freeway or arterial roadways in the study corridor that are indirectly impacted by the project, and as such the project does not meet the technical criteria specified in the VDOT Resource Document to be specified to be one of air quality concern for fine particulate matter.\(^{20}\)

Additional factors described in the VDOT Air Quality Resource Document also help to support this determination:

- The area has already achieved the 1997, 2006 and 2012 PM2.5 NAAQS
- Background concentrations are well below the 1997 NAAQS (8.8 – 9.4 ppb).\(^{21}\)
- EPA has revoked 1997 primary annual PM2.5 NAAQS, effective October 24, 2016, for which the region has been designated as attainment-maintenance. With that revocation, the region will no longer be subject to conformity requirements for PM2.5.

4.3 PM CONCLUSIONS

Overall, the weight of evidence shows that the Transform 66 project is not a project of local air quality concern for PM$_{2.5}$. No comments to the contrary were received in inter-agency consultation for conformity purposes for this project.

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\(^{20}\) Transform 66: Traffic and Transportation Technical Report
\(^{21}\) Monitored data provided by VDEQ
Figure 4-1: Traffic Forecasts for I-66 Inside the Beltway
Figure 4-2: Traffic Forecasts for I-66 Inside the Beltway
Figure 4-3: Traffic Forecasts for I-66 Inside the Beltway
5. MOBILE SOURCE AIR TOXICS

In December of 2012, the FHWA issued an interim guidance update regarding the evaluation of MSAT in NEPA analyses and included projections utilizing the EPA MOVES emission model and updated research on air toxic emissions from mobile sources. The guidance includes three categories and criteria for analyzing MSATs in NEPA documents:

1. No meaningful MSAT effects,
2. Low potential MSAT effects, and
3. High potential MSAT effects.

A qualitative analysis is required for projects which meet the low potential MSAT effects criteria while a quantitative analysis is required for projects meeting the high potential MSAT effects criteria.

Projects with Low Potential MSAT Effects are described as:

- Those that serve to improve operations of highway, transit, freight without adding substantial new capacity or without creating a facility that is likely to significantly increase emissions. This category covers a broad range of project types including minor widening projects and new interchanges, such as those that replace a signalized intersection on a surface street or where design year traffic is not projected to meet the 140,000 to 150,000 AADT criteria.

Projects with High Potential MSAT Effects must:

- 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;
- Create new 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 or greater by the design year; and
- Proposed to be located in proximity to populated areas.

In accordance with the MSAT guidance, the study area is best characterized as a project with “higher potential MSAT effects” since projected design year traffic is expected to exceed the 140,000 to 150,000 AADT thresholds. Specifically, the 2040 Build scenario is expected to have AADT volumes on I-66 that reach 171,500 AADT between the Dulles Toll Road and US-29/Washington Boulevard and this traffic is also in proximity to populated areas. The quantitative assessment of MSATs is discussed Section 5.4.

5.1 MSAT BACKGROUND

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, when Congress mandated that the EPA regulate 188 air toxics, also known as hazardous air pollutants (HAPs). The EPA assessed this expansive list in their 2007 rule on the Control of Hazardous Air Pollutants from Mobile Sources and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA). The seven compounds identified were:
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. The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines.

5.2 MOTOR VEHICLE EMISSIONS SIMULATOR (MOVES)

According to EPA, MOVES improves upon the previous MOBILE model in several key aspects. MOVES is based on a vast amount of in-use vehicle data collected and analyzed since the latest release of MOBILE, including millions of emissions measurements from light-duty vehicles. Analysis of this data enhanced EPA’s understanding of how mobile sources contribute to emission inventories and the relative effectiveness of various control strategies. In addition, MOVES accounts for the significant effects that vehicle speed and temperature have on PM emission estimates, whereas MOBILE did not. MOVES2010b includes all air toxic pollutants in NATA that are emitted by mobile sources. EPA has incorporated more recent data into MOVES2010b to update and enhance the quality of MSAT emission estimates. These data reflect advanced emission control technology and modern fuels, plus additional data for older technology vehicles.

Based on an FHWA analysis using EPA’s MOVES2010b model, even if vehicle-miles traveled (VMT) increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same time period (see Figure 5-1). It should be noted that MOVES2010b does not reflect the impacts of some of the more recent heavy duty vehicle fuel economy standards or fuel standards intended to further reduce emissions. Because of this, application of MOVE2014 (which does include these impacts) would forecast even more dramatic declines.

The implications of MOVES on MSAT emissions estimates compared to MOBILE are lower estimates of total MSAT emissions, significantly lower benzene emissions, and significantly higher diesel PM emissions, especially for lower speeds. This reflects the combined impact of more recent vehicle fuel economy standards, vehicle emission standards and fuel formulation not taken into account in MOBILE but fully integrated into MOVES. As a result, diesel PM is projected to be the dominant component of the emissions total.

5.3 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 be raised on highway projects during the NEPA process. Even as the science emerges, we are duly expected by the public and other agencies to address MSAT impacts in our environmental documents. The FHWA, EPA, 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 continues to monitor the developing research in this field.

**Figure 5-1: National MSAT Emission Trends 2010-2050 for Vehicles Operating on Roadways Using EPA's MOVES 2010b Model**

*Source: EPA MOVES2010b model runs conducted during May-June 2012 by FHWA. 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, meteorology, and other factors*
5.4 PROJECT QUANTITATIVE MSAT ANALYSIS

A quantitative MSAT analysis was conducted consistent with the latest guidance developed by FHWA. These include the Interim Guidance Update mentioned earlier, and the FHWA guidance for addressing a quantitative MSAT analysis using MOVES titled “Conducting Quantitative MSAT Analysis for FHWA NEPA Documents—Frequently Asked Questions,” from September 2015. The models, methods and assumptions applied in the analysis are also consistent with those specified in the VDOT Resource Document.

Based on traffic projections for the analysis years, the segments directly associated with the project and those segments where the Annual Average Daily Traffic (AADT) is expected to change +/- 5% and greater than 50 vehicles for the Build alternative compared to the No-Build alternative were identified. In addition, the roadway segments where the travel time is expected to change +/- 10% for the Build alternative compared to the No-Build alternative as well roadway segments that would experience a change in congested speed of +/- 2.5 mph during the morning peak periods were also included. The full extent of the affected network can be seen in Figure 5-2.

Figure 5-2: 2040 Affected Roadway Network
The following describes the approach and methodology used for conducting the quantitative MSAT analysis:

- **AADT volumes, peak hour volumes and diurnal traffic distribution for I-66 and other roadways** in the affected network along with the estimated network speeds for congested periods and for free-flow conditions were obtained from the travel network data files.

- Speed distributions were based on the congested speeds provided in the Travel Demand Model (TDM) output. Eight time periods were provided with the AM and PM peak traffic broken into three periods each, plus a midday period and nighttime period. The AM peak periods include 5:30 am to 6:30 am, 6:30 am to 9 am, and 9 am to 10 am. The PM peak periods include 3 pm to 4 pm, 4 pm to 6:30 pm, and 6:30 pm to 7:30 pm. The midday period covers 10 am to 3 pm, and the nighttime periods cover 7:30 pm to 5:30 am. The developed speed distributions are specific to each evaluation year, scenario, road type, and county. The fractions of vehicle hours of travel within each speed bin were estimated from the vehicle hours of travel and vehicle speeds contained in the traffic demand model output for each link included in the affected network and were apportioned using the MOVES AvgSpeedBin table of bins (i.e., 1 through 16) for each road type and county. The calculated speed distribution representing each time period was then applied to each hour in the time period. For the hours that include two time periods, a weighted average speed distribution was created from the two applicable speed distributions.

- The road type distributions were based on the functional class of the roadways. Interstates were assigned to MOVES road type category 4 (urban restricted access roadways), while other roads were assigned to MOVES road type category 5 (urban unrestricted access roadways). Road type distributions for each county were developed using the MWCOG distribution of VMT by sourcetype for road types 4 and 5 as well as the total VMT by road type from the TDM network output.

- The MOVES2014a model was run with local parameters for the four quarters of each analysis year (using January, April, July, and October meteorological and fuel data as surrogates for each quarter). Annual MSAT emissions were then calculated by multiplying the seasonal day emissions by the number of days in the season and summing the resulting emissions from the four seasons. The resulting, existing, interim, and design year emissions for the No-Build and Build conditions were compared.

- All inputs for MOVES were consistent with those specified in the VDOT Resource Document.

- The analysis reflects only running exhaust, crankcase running exhaust, evaporative permeation, and evaporative fuel leaks, in accordance with FHWA guidance. Diesel PM exhaust consists of exhaust PM$_{10}$ emissions from diesel vehicles only. The polycyclic organic matter (POM) was summarized consistent with the pollutants listed in the FHWA guidance for POM.

The results of the quantitative MSAT analysis are presented in **Table 5-1.** **Table 5-2** shows the change in emissions between the Build and No-Build scenarios and between the Build and Existing scenarios. These tables show that all of the MSAT emissions are expected to increase slightly for both the 2025 and 2040 Build scenarios when compared to the corresponding No-Build scenario. However, when compared to the 2016 Existing conditions, emissions of all pollutants in the Build scenarios show substantial decreases. These reductions occur despite projected increases in VMT from 2016 to the 2025 and 2040 Build scenarios of 10% and 17%, respectively. In 2025, the increased emissions from the No-Build to the Build scenario are between 1.3 - 1.8% with a corresponding 2.4% increase in VMT. In 2040, the increased emissions from the No-Build to the Build scenario are between 1.1 – 1.5% with a corresponding 2.8% increase in VMT.
In all cases, the magnitude of the MSAT emissions is small in the projection years and substantially lower than exists today. Over the nine-year period from 2016 to 2025, MSAT emissions are reduced by 57% to 79%. By 2040, emissions of all pollutants are further reduced from 2016 levels. Over the 24-year period from 2016 to 2040, MSAT emissions are reduced by 71% to 99%. The air quality modeling results indicate that MSAT emissions are expected to increase slightly from the No-Build to the Build scenario in both 2025 and 2040, although these increases should not be considered substantial. However, when compared to existing conditions, emissions of all MSAT pollutants under the 2025 and 2040 Build scenarios are projected to be dramatically lower than exist today. EPA’s stringent vehicle emission and fuel regulations, combined with fleet turnover, are expected to substantially lower fleet-average emission rates for MSATs in the future relative to today.

Overall, best available information indicates that, nationwide, regional levels of MSATs are expected to decrease in the future due to fleet turnover and the continued implementation of more stringent emission and fuel quality regulations. Nevertheless, it is possible that some localized areas may show an increase in emissions and ambient levels of these pollutants due to locally increased traffic levels associated with the project.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>2016 (TPY)</th>
<th>2025 (TPY)</th>
<th>2040 (TPY)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
<td>No Build</td>
<td>Build</td>
</tr>
<tr>
<td>1,3 Butadiene</td>
<td>0.26</td>
<td>0.054</td>
<td>0.055</td>
</tr>
<tr>
<td>Acrolein</td>
<td>0.23</td>
<td>0.078</td>
<td>0.079</td>
</tr>
<tr>
<td>Benzene</td>
<td>2.95</td>
<td>1.188</td>
<td>1.207</td>
</tr>
<tr>
<td>Diesel PM</td>
<td>18.00</td>
<td>4.464</td>
<td>4.524</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>3.49</td>
<td>1.481</td>
<td>1.502</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>0.39</td>
<td>0.142</td>
<td>0.144</td>
</tr>
<tr>
<td>Polycyclic Organic Matter</td>
<td>0.21</td>
<td>0.069</td>
<td>0.069</td>
</tr>
<tr>
<td>VMT (million annual vehicle-miles)</td>
<td>1,448</td>
<td>1,562</td>
<td>1,599</td>
</tr>
</tbody>
</table>

Table 5-2: Change in Annual MSAT Emissions by Year, Scenario and Pollutant from No-Build and from Existing Emissions

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Change from No-Build</th>
<th>Change from Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2025 Build</td>
<td>2040 Build</td>
</tr>
<tr>
<td>1,3 Butadiene</td>
<td>0.001</td>
<td>1.8%</td>
</tr>
<tr>
<td>Acrolein</td>
<td>0.001</td>
<td>1.4%</td>
</tr>
<tr>
<td>Benzene</td>
<td>0.018</td>
<td>1.6%</td>
</tr>
<tr>
<td>Diesel PM</td>
<td>0.060</td>
<td>1.3%</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>0.021</td>
<td>1.4%</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>0.002</td>
<td>1.5%</td>
</tr>
<tr>
<td>Polycyclic Organic Matter</td>
<td>0.001</td>
<td>1.3%</td>
</tr>
</tbody>
</table>
### 5.5 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 CAA 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/iris/](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 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](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](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.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Change from No-Build</th>
<th>Change from Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMT (million annual vehicle-miles)</td>
<td>37 TPY 2.4%</td>
<td>47 TPY 2.8%</td>
</tr>
</tbody>
</table>
It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways to (1) determine the portion of time that people are actually exposed at a specific location; and (2) 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 (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 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 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 deemed 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, in addition to improved access for emergency response, that are better suited for a quantitative analysis.
5.6 MSAT CONCLUSIONS

The understanding of mobile source air toxics is an area of continued study. Information is currently incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with each of the project scenarios. Emissions of all MSAT pollutants were projected to increase slightly from the No-Build to the Build scenario in 2025 and 2040, although these increases are not considered substantial. However, when compared to existing conditions, emissions of all MSAT pollutants under the 2025 and 2040 Build scenarios are projected to be substantially lower than exist today.

EPA's vehicle and fuel regulations are expected to result in substantially lower MSAT levels in the future than exist today due to cleaner engine standards coupled with fleet turnover. The magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area will be substantially lower in the future than they are today, regardless of the scenario (No Build or Build) chosen.
6. CONSTRUCTION EMISSIONS ANALYSIS

The temporary air quality impacts from construction are not expected to be substantial. Emissions will be produced during the construction of this project by heavy equipment and vehicle travel to and from the site. Earthmoving and ground-disturbing operations will generate airborne dust. Construction emissions are short term or temporary in nature. In order to mitigate these emissions, all construction activities are to be performed in accordance with VDOT *Road and Bridge Specifications*. These Specifications require compliance with all applicable local, state, and federal regulations.

Comments provided by VDEQ also address mitigation, as follows: “…all reasonable precautions should be taken to limit the emissions of VOC, NOx, and particulate matter. In addition, the following VDEQ air pollution regulations must be adhered to during the construction of this project: 9 VAC 5-130, Open Burning restrictions; 9 VAC 5-45, Article 7, Cutback Asphalt restrictions; and 9 VAC 5-50, Article 1, Fugitive Dust precautions.”
7. REGIONAL CONFORMITY STATUS OF THE PROJECT

EPA transportation conformity rule requirements, including specifically 40 CFR 93.114 and 40 CFR 93.115, apply as the area in which the project is located is designated as nonattainment for ozone and maintenance for fine particulate matter\(^{22}\) as noted above. Accordingly, there must be a currently conforming transportation plan and program at the time of project approval, and the project must come from a conforming plan and program (or otherwise meet criteria specified in 40 CFR 93.109(b)). The National Capital Region Transportation Planning Board is currently updating its Constrained Long Range Plan and associated Transportation Improvement Program, and the Transform 66 project will be included in the associated regional conformity analysis.

For background, the Clean Air Act Amendments (CAAA) of 1990 mandate improvements to the nation’s air quality. The final conformity regulations promulgated by the US EPA in 1997, as part of 40 CFR Part 93, require transportation plans and programs conform to the SIP. The final conformity rule requires that transportation plans in ozone nonattainment areas be consistent with the most recent estimates of mobile source emissions; provide for the expeditious implementation of transportation control measures in the applicable implementation plan; and contribute to annual emission reductions in ozone and carbon monoxide nonattainment areas.

\(^{22}\) On July 29\(^{th}\), 2016 EPA announced that it is finalizing one of the proposed options for revoking the 1997 primary annual PM\(_{2.5}\) NAAQS, which has been replaced by the more health protective 2012 primary annual PM\(_{2.5}\) NAAQS. The EPA is finalizing the option that calls for revoking 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 (October 24, 2016), 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.
8. INDIRECT EFFECTS AND CUMULATIVE IMPACTS

Indirect effects are those effects that would be caused by the project but occur later in time or are removed in distance from the project. Cumulative effects are those effects that result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative effects include indirect effects.

The potential for indirect effects or cumulative impacts to air quality that may be attributable to this project is not expected to be substantial for several reasons. First, regarding indirect effects, much of the area in which the project is located is already highly developed, which limits the potential for incremental indirect effects.

Second, regarding the potential for cumulative impacts, the annual conformity analysis conducted by the Transportation Planning Board (MPO for the Washington, D.C. metropolitan nonattainment/maintenance area) represents a cumulative impact assessment for purposes of regional air quality.

- The existing air quality designations for the region are based, in part, on the accumulated mobile source emissions from past and present actions, and these pollutants serve as a baseline for the current conformity analysis.
- The conformity analysis quantifies the amount of mobile source emissions for which the area is designated nonattainment/maintenance that will result from the implementation of all reasonably foreseeable (i.e. those proposed for construction funding over the life of the region’s transportation plan) regionally significant transportation projects in the region.
- It is anticipated that the conformity analysis currently being conducted will demonstrate that the incremental impact of the proposed project on mobile source emissions, when added to the emissions from other past, present, and reasonably foreseeable future actions, is in conformance with the SIP and will not cause or contribute to a new violation, increase the frequency or severity of any violation, or delay timely attainment of the NAAQS established by EPA.

Therefore, the indirect and cumulative effects of the project are not expected to be substantial.
9. CONCLUSIONS

In order to meet NEPA, a quantitative CO hot-spot screening analysis was performed for the Transform 66 project. A CO screening analysis was performed using worst-case traffic and meteorological inputs to identify in order to determine if CO exceedances could occur as a result of the proposed improvements. The results of the analysis show that the worst-case CO concentrations for the Build scenarios are predicted to be well below the CO NAAQS in both the Interim/Opening Year Build (2025) and Design Year Build (2040) scenarios for each of the worst-case locations analyzed along the proposed project corridor. This screening analysis included the worst-case signalized intersections and the worst-case interchange. Therefore, it is expected that all other locations within the project corridor will remain well below the CO NAAQS and no mitigation measures are required.

Additionally, Arlington and Fairfax Counties are included in the DC-Maryland-Northern Virginia area designated by EPA as non-attainment for the 8-hour ozone and attainment/maintenance for the annual PM$_{2.5}$ standards, and therefore transportation conformity requirements apply. Following EPA regulations and guidance, and using the technical criterion specified in the VDOT Resource Document for which inter-agency consultation for conformity was completed in December 2015, the project was determined not to be one of air quality concern for PM$_{2.5}$.

Notwithstanding that inter-agency consultation for conformity purposes was already conducted on the VDOT Resource Document, on which the models, methods and assumptions were based, inter-agency was conducted for this project in September 2016. No comments were received.

The study Build scenarios were also evaluated for MSAT impacts following the latest FHWA guidance. This project was identified as one with High Potential MSAT Effects; therefore, a quantitative MSAT analysis was conducted consistent with the guidance. Emissions of all MSAT pollutants were projected to increase slightly in 2025 and 2040 between the No-Build and Build scenarios, although these changes are small and not considered to be substantial. However, when compared to existing conditions, emissions of all MSAT pollutants under the 2025 and 2040 Build scenarios are projected to be substantially lower than those estimated for 2016. EPA's vehicle and fuel regulations are expected to result in substantially lower MSAT levels in the future than exist today due to cleaner engine standards coupled with fleet turnover. The quantitative MSAT analysis demonstrated that there would be no long-term adverse impacts associated with the Build scenario, and that future MSAT emissions across the entire study corridor are expected to be substantially below today’s levels, even after accounting for projected VMT growth.
Appendix A: Interagency Consultation Webinar Presentation and Meeting Minutes
Investing in Multimodal Solutions

Virginia Air Quality Interagency Consultation Group Meeting

September 8, 2016
AGENDA

- Project Background/Overview
- Traffic Analysis
- PM$_{2.5}$ Discussion
- Next Steps
Project History

Investing in Multimodal Solutions

2009 I-66 Transit/Transportation Demand Management (TDM) Study
• June 2012 Final Report and August 2013 Supplemental Report of I-66 Multimodal Study inside the Beltway
• Recommended Multimodal Package:
  ➢ Improved transit service
  ➢ Bicycle and pedestrian access
  ➢ Transportation demand management strategies
  ➢ Integrated Corridor Management
  ➢ Tolling non HOV-3+ vehicles during peak travel-time
  ➢ Widening

Dec. 9, 2014 Letter from Secretary Layne
• Decision to advance recommendations from the 2012/2013 study effort
• Tolling
• Multimodal improvements
Project Background

Virginia General Assembly Bi-Partisan Agreement, February 10, 2016

- Moves forward on a plan to reduce congestion on I-66 inside the beltway.
  - Converts I-66 inside the beltway to Express Lanes during rush hours in the peak directions, widens I-66 eastbound from the Dulles Connector Road to Ballston and improves transit service throughout the corridor.
  - Work on the categorical exclusion for conversion of I-66 Inside the beltway to express lanes was completed in advance of the environmental review for the widening as a separate action

- Widening of eastbound I-66 from the Dulles Connector Road to Ballston is being reviewed as an Environmental Assessment.
  - Focus of today’s discussion
Tolling and Multimodal Components

Tolling during weekdays, peak hours, peak directions
- Eastbound: 5:30 a.m. – 9:30 a.m.
- Westbound: 3:00 p.m. – 7:00 p.m.
- HOV-2+ toll free in 2017, HOV-3+ toll free in 2020
- All vehicles using the lanes during tolling periods must have an E-Zpass, or E-ZPass Flex if they are HOV, mounted in vehicle

Multimodal improvements funded by toll revenue to support transit, TDM, and other multimodal improvements benefitting the I-66 Corridor (selected by NVTC under 40-year agreement with Commonwealth)
Project Overview

Current Conditions

- Significant variability in travel times and speeds on I-66 inside the Beltway during peak periods
- Recurrent traffic congestion on eastbound and westbound I-66
- Congestion at several I-66 entry/exit ramps during the peak periods
- Slower bus service due to congestion
- Overcrowded Metrorail Orange Line
I-66 Inside the Beltway Improvement Goals

Tolling project (under construction) is proposed to:

- Reduce variability in peak period traffic conditions and increase travel time reliability
- Reduce congestion on I-66 mainline and ramps
- Provide more travel choices
- Improve transit service
- Enhance person throughput
- Provide revenue stream support to future investment on I-66 and multimodal improvements

EB Widening (current NEPA study) will further enhance these goals
**Project Overview**

- 40 year Agreement between the Commonwealth of Virginia and the Northern Virginia Transportation Commission (NVTC)
- Project will be jointly implemented by NVTC and VDOT
- VDOT will manage
  - Design
  - Construction
  - Maintenance
  - Operations
  - Future widening
- NVTC will manage
  - Multimodal improvements
  - Grants allocation
  - Coordination between and among agencies
Traffic Analysis

Investing in Multimodal Solutions

• Operational analyses were performed for I-66 mainline, ramps and selected signal-controlled intersections for the AM and PM peak hours for the following scenarios:
  ➢ 2016 Existing
  ➢ 2025 No-Build
  ➢ 2025 Build
  ➢ 2040 No-Build
  ➢ 2040 Build

• Tolling and Multimodal components are background in all 2025 and 2040 scenarios

• Difference between Build and No-Build is widening

• The projected traffic volumes for 2025 and 2040 were obtained from the travel demand models, and traffic assignments were post processed using NCHRP 255/765 methodology
Traffic Analysis

- 2040 volumes, particularly for trucks, are not significantly higher than in 2025
  - The Transform 66 Inside and Outside the Beltway projects are complementary to each other from a traffic perspective.
  - The eastbound widening project Inside the Beltway is set open 2020.
  - Outside the Beltway tolling will open 2021-2022 + 3 years ramp-up period to full utilization: 2025 is the close-in year with maximum traffic impact of all the proposed improvements.
  - No more than 20% increase in traffic between 2025 and 2040 is anticipated.
  - Average Vehicle Emissions rates are 2-3 times greater than in 2025 compared to 2040.

**2025 is the anticipated year of peak emissions**
Traffic Analysis

- Clearly the areas of highest confluence of truck traffic are where highways intersect
  - Large trucks are largely prohibited inside the Beltway
  - Interchange with Dulles Toll Road/VA 267 shows highest volumes in the corridor
  - Interchange with I-495/The Washington Beltway is less impacted by this phase of the project

**Interchange with Dulles Toll Road is anticipated location of highest PM$_{2.5}$ Concentrations**
Traffic Analysis

Investing in Multimodal Solutions

- Transit improvements have been considered in the current traffic analysis
  - Transportation Demand Management and transit projects in the corridor are currently being identified and prioritized (but are not final)
  - Changes in (diesel) bus volumes on I-66 based on earlier studies (including the recent I-66 Inside the Beltway tolling study)
  - A small increase in diesel bus traffic in the build scenarios is anticipated largely as increased express service on the toll lanes
  - No project leading to significant congregation of idling buses is specifically is planned as part of this action/project (bus yard, transfer facility with the equivalent of 15 or more buses idling for at least 1 hour)
  - Any significant transit projects that would be considered part of this corridor will be subject to a separate traffic/environmental review
Traffic Analysis

- Highway capacity analysis performed for I-66 basic freeway segments, weaving areas, and merge/diverge areas.
- Synchro analyses completed for 76 selected intersections.
Average Daily Traffic Projections

Investing in Multimodal Solutions

TRANSFORM 66
Average Daily Traffic Projections

Transform 66
Investing in Multimodal Solutions
Primary Findings

- Decreased travel time variability and reduced recurring congestion on I-66 Eastbound AM and I-66 Westbound PM.
  - More consistent and reliable travel speeds during peak periods resulting from managed traffic
- 20-25% increase in total throughput through the corridor in 2040
  - No-Build scenario is HOV-3, with no lane additions.
  - Build Scenario includes Express tolling in peak direction and one additional lane in eastbound direction between the Dulles Connector and Fairfax Drive.
- Minimal impact on arterial network
  - Analysis at 76 signalized intersections shows limited number of intersections with changes
  - No significant changes anticipated
1. Addresses an existing bottleneck
2. Complements the implementation of express tolling and dynamic pricing
3. Improves traffic operations and safety
4. Benefits all users including those traveling outside tolling periods
5. Increases overall efficiency of regional transportation network
6. Reduce variability of travel time on I-66
Air Quality Overview

- Changes in conformity requirements for NoVA PM and CO
  - With the implementation of the 2012 PM$_{2.5}$ NAAQS, EPA will revoke the 1997 PM$_{2.5}$ annual primary NAAQS for which NOVA is currently in maintenance
    - Related conformity requirements would therefore no longer apply
    - Effective October 24, 2016

- CO maintenance plan expired March 16, 2016
  - Related conformity requirements no longer apply
PM$_{2.5}$ Hot-Spot Overview

- Quantitative PM$_{2.5}$ considerations are a requirement under the Transportation Conformity Requirements of the Clean Air Act
- Area already achieves the 1997, 2006 and 2012 PM$_{2.5}$ NAAQS
- Project located in area that is in maintenance for 1997 Annual Primary PM$_{2.5}$ NAAQS (revocation of this NAAQS will be effective October 24, 2016)
Air Quality Overview

- Draft Traffic Evaluation is complete (August, 2016)
- Analysis Years
  - Opening Year
    - Currently expected to be 2020
    - 2025 is the year of expected near-term peak traffic
    - Complimentary improvements outside the Beltway are complete in 2021/2022
    - Three year ramp-up expected for full utilization of the Express lanes
    - Three year period based on national experience
    - 2025 volumes estimated to exceed those in 2020
  - Design Year
    - 2040
• While diesel trucks and buses have been a primary source of transportation-related PM$_{2.5}$, they are expected to be much cleaner in future years due to more stringent EPA vehicle exhaust and fuel quality standards.
Determining a Need for a Quantitative Analysis

- Criteria in the VDOT Project-Level Air Quality Resource Document shows this not to be a project of “Air Quality Concern”

<table>
<thead>
<tr>
<th>Assessment Level</th>
<th>Who Makes Decision?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LEVEL 1</strong></td>
<td>VDOT</td>
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<tr>
<td>Is the project exempt?</td>
<td></td>
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</tbody>
</table>

| **LEVEL 2**      | VDOT (Using ICG-Reviewed Resource Document) |
| Is the project clearly not of AQ concern? | |

| **LEVEL 3**      | VDOT (Project-Specific Consultation) |
| For projects that cannot be excluded in Level 1 or 2, is the project of AQ concern? | |

Determination if Project is of “Air Quality Concern”
Air Quality Overview

VDOT Resource Document

- Developed to assist analyst in the selection of appropriate models, methods and assumptions/data for project-level air quality analyses.
- Interagency Consultation for Conformity (IACC) of the document completed in December 2015:
  - Consulted parties included FHWA, EPA and local agencies.
  - As a result, IACC for this project need only refer to the Resource Document and its IACC, unless substantive changes are planned in models, methods and/or assumptions (which are not proposed for this project).
  - IACC still being undertaken for this project, in the interest of transparency/ providing an opportunity for discussion.
- The final version of the Resource Document is available on the VDOT website: http://www.virginiadot.org/projects/environmental_air_section.asp
Determining a Need for a Quantitative Analysis

- Project meets the criteria specified in the Resource Document to be considered one not of local air quality concern for PM$_{2.5}$
  - Looked at highway capacity expansion criteria
  - Change in Opening Year AADTT < 2,000
  - Peak Near-term Year (2025) Diesel Truck Traffic Change (Build vs No-Build) < 200 AADTT
  - Highest total 2040 AADT for trucks and buses 3,180 (Between Dulles Toll Road and US 29)
  - Inter-Agency Consultation for Conformity conducted 12/14/2015
Average Daily Traffic Projections

TRANFORM 66
Average Daily Traffic Projections
### PM$_{2.5}$ Background Concentrations

*Monitors in DC and Maryland not representative of background concentrations in Virginia based on wind conditions.*

<table>
<thead>
<tr>
<th>Site</th>
<th>Region</th>
<th>Site ID</th>
<th>County/Cty</th>
<th>2011-2013 Three Year Average (µg/m$^3$)</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>NOVA</td>
<td>S10130020</td>
<td>Arlington</td>
<td>9.4</td>
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<tr>
<td>7</td>
<td></td>
<td>S10590030</td>
<td>Fairfax</td>
<td>8.8</td>
</tr>
</tbody>
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Monitored data provided by VDEQ.
Determining a Need for a Quantitative Analysis

- Additional considerations:
  - I-66 is limited to 4-tire vehicles inside the Capital Beltway
  - Congestion limits traffic growth on parallel roads (including trucks)
    - Trucks avoid the area or shift travel times to avoid congestion
    - Network is at capacity – volume increases are constrained
  - Diesel Buses
    - No significant increase in buses due to the proposed action
      » Additional Express service anticipated as part of the overall I-66 project
      » Other transit projects would be subject to individual review
**PM$_{2.5}$ Conclusions**

- The project intent is to enhance person throughput
- No new capacity for trucks.
- Trucks not permitted on I-66, prohibition will continue.
- Traffic Analysis/Modeling shows no significant changes in diesel traffic (truck or bus).
  - Both for freeway and arterial criteria
  - Existing facility, change in AADTT < 2,000
- Criteria provided in VDOT Project-Level Resource Document Indicates this is **not** a project of air quality concern.
  - Both for freeway and arterial criteria
PM$_{2.5}$ Conclusions

- Background PM$_{2.5}$ concentrations well below the NAAQS and decreasing.
- EPA will revoke the 1997 primary PM$_{2.5}$ NAAQS.
  - Conformity requirements would no longer apply as of October 24, 2016

**Weight of evidence shows this is not a project of local air quality concern for PM$_{2.5}$**
Visit
Inside.Transform66.org
Meeting Minutes
09/08/2016
(10:00 – 11:30 AM)
Interagency Consultation for Air Quality Conformity
Transform 66 Inside the Beltway – Eastbound Lane Addition

Attendees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Agency/Firm</th>
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<tbody>
<tr>
<td>Christopher Voigt</td>
<td>VDOT</td>
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<tr>
<td>Jim Ponticello</td>
<td>VDOT</td>
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<tr>
<td>Dan Grinnell</td>
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<td>Caleb Parks</td>
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<td>Norman Whitaker</td>
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<td>John Muse</td>
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<tr>
<td>Ravul Trivedi</td>
<td>VDOT</td>
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<tr>
<td>Paul Heslman</td>
<td>FHWA-Resource Center</td>
</tr>
<tr>
<td>Ed Sunda</td>
<td>FHWA-Virginia</td>
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<tr>
<td>Tim Roseboom</td>
<td>DRPT</td>
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<tr>
<td>Ron Milone</td>
<td>MWC&amp;OG</td>
</tr>
<tr>
<td>Jane Posey</td>
<td>MWC&amp;OG</td>
</tr>
<tr>
<td>Sonya Lewis-Cheatham</td>
<td>VDEQ</td>
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<tr>
<td>Rob Prunty</td>
<td>CH2M</td>
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<tr>
<td>George Lu</td>
<td>CH2M</td>
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<tr>
<td>Guri Kilim</td>
<td>CH2M</td>
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<tr>
<td>Nandita Paradkar</td>
<td>CH2M</td>
</tr>
<tr>
<td>Maureen Mullen</td>
<td>SC&amp;A, Inc.</td>
</tr>
<tr>
<td>Robert d’Abadie</td>
<td>Michael Baker International</td>
</tr>
<tr>
<td>Robyn Hartz</td>
<td>Michael Baker International</td>
</tr>
<tr>
<td>Shamsi Taghavi</td>
<td>VDOT</td>
</tr>
<tr>
<td>Angel Aymond</td>
<td>VDOT</td>
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Introduction and Roll Call (Jim Ponticello, VDOT)

- After a brief welcome and procedural overview by Robert d’Abadie, Jim Ponticello gave a brief introduction and performed a roll call.

Presentation: Description of Project and Traffic Modeling Overview (Rob Prunty, CH2M)

- A brief overview of the project, the nature of the planned improvements and the current status was provided by Rob Prunty (CH2M), lead for the traffic forecasting effort being undertaken for the project.
- During the overview a number of key aspects of the project were noted:
  - Widening is eastbound from Dulles Connector to Ballston
  - Improvements have been completed in westbound direction as part of I-66 spot improvements project. Additional widening is not anticipated in the westbound direction.
  - The focus of project presented today is on the widening. Conversion of the current HOV lanes to express toll lanes was subject to a separate environmental review that is already complete and approved.
  - The “gantry/express toll conversion project” improvements and assumptions are included in the No-Build scenarios for this phase of the project.
  - The Transform 66 Inside and Outside the Beltway projects are felt influence each other from a traffic perspective.
    - Outside beltway improvements open in 2021/2022 with an expected 3-year ramp up period, making 2025 the preferred analysis year for traffic.
    - Operational analyses were performed for I-66 mainline, ramps and selected signal-controlled intersections for the AM and PM peak hours for 2016, 2025 No-Build and Build, and 2040 No-Build and Build.
  - Analysis at 76 signalized intersections
  - A limited number of intersections showed minor impacts
  - No significant impact anticipated on the surrounding roadway network
  - Overall this project complements the implementation of express tolling and dynamic pricing
    - Improves traffic operations and safety
    - Benefits all users including those traveling outside tolling periods
    - Increases overall efficiency of regional transportation network
    - Reduce variability of travel time on I-66

No questions were posed by participants regarding the traffic analysis

Air Quality Presentation (Rob d’Abadie, Michael Baker International)

- This project is located in the counties of Arlington and Fairfax. This area is part of the Washington, DC-MD-VA maintenance area for the 1997 PM10 standard and nonattainment area for the 8 hour ozone standard.
- EPA, with the implementation of the 2012 PM NAAQS, is revoking the 1997 NAAQS
  - Since area has attained the 1997 PM NAAQS, and has always attained the 2006 and 2012 NAAQS, the area will be designated full attainment effective October 24, 2016
- Northern Virginia is classified as attainment under the current CO NAAQS.
VDOT has finalized their Project Level Air Quality Resource Document.
  - Developed to assist analyst in the selection of appropriate models, methods and assumptions/data for project-level air quality analyses.
  - Interagency Consultation for Conformity (IACC) of the document completed in December 2015.
    - Consulted parties included FHWA, EPA and local agencies.
    - As a result, IACC for this project need only refer to the Resource Document and its IACC, unless substantive changes are planned in models, methods and/or assumptions (which are not proposed for this project).
    - IACC still being undertaken for this project, in the interest of transparency/providing an opportunity for discussion.
  - The final version of the Resource Document is available on the VDOT website: http://www.virginiadot.org/projects/environmental_air_section.asp

After consideration of the available traffic forecasts VDOT determined that this was not a project of local air quality concern for PM$_{2.5}$. The remainder of the presentation provided the reasoning behind this determination and included the following main points:
  - National Ambient Air Quality Standards (NAAQS)
    - As per the Air Quality Conformity Regulations of the Clean Air Act (CAA), this project currently falls within an area that was designated as maintenance of the 1997 PM$_{2.5}$ Annual standard and presently is subject to project level conformity, including interagency consultation requirements.
    - Based on monitoring stations, the area attainment the 1997, 2006, and 2012 NAAQS for PM$_{2.5}$.
    - With the implementation of the 2012 PM NAAQS, the 1997 standard will be revoked as of October 24, 2016 at which time PM conformity would no longer apply.
  - Traffic discussion
    - The Transform 66 Inside and Outside the Beltway projects are somewhat interdependent from the traffic perspective.
    - The eastbound widening project Inside the Beltway is set open 2020
    - Outside the beltway tolling will open 2021-2022 + 3 years to ramp up to full utilization: 2025 is the close-in year with maximum utilization
    - Based on EPA MOVES2014a modeling for Fairfax County, emissions rates (2025) are 2-3 times greater than in 2040
    - If an analysis were necessary, use of 2025 traffic forecasts (peak traffic) combined with 2020 emission rates (rates when the project opens) would be used to demonstrate conformity
      - However, still does not meet traffic volume thresholds (discussed below)
      - The project intent is to optimize person throughput.
      - Trucks are not allowed on I-66, and restriction will continue.
      - Traffic analysis/modeling shows no significant changes in diesel traffic (truck or bus):
      - The criteria provided in VDOT Project-Level Resource Document are met.
        - VDOT Resource Document Appendix L Criterion for highway capacity expansion is 2,000 AADTT.
          - Forecast change in AADTT is less than 200, so easily meets criterion.
The project would also meet the VDOT Resource Document criterion for new highways (10,000 AADTT).
  - Not a new highway so strictly speaking this criterion does not apply.
  - AADT for truck and bus < 3,180, so this project would fall below this threshold (if it were applicable).

- It is not expected that any future transit projects funded through the tolls would result in significant bus activity, neither in volume of buses (as discussed above) or in congregations of 15 or more idling buses (threshold in the VDOT Project Level Air Quality Resource Guide)
  - Any major transit project would be subject to a separate environmental review including air quality
- A review of the trends in emission rates and expected traffic growth between 2016 and 2040 shows a significant decline in vehicle related emissions is expected in the corridor.
- Overall, the project meets the criteria specified in the VDOT Project Level Air Quality Resource Document to be considered one not of local air quality concern.

Overall it was noted that the weight of evidence indicated that this is not a project of local air quality concern for PM$_{2.5}$.

Comments on Air Quality

(Comment) Tim Roseboom - DRPT – The additional service is already accounted for in regional long range plan. Local bus and express bus service are also already included in the analyses, as is a robust TDM program, all which are anticipated to provide air quality benefits. In addition, the improved bus operating speeds will have a corresponding air quality benefit.

Summary (Rob d'Abadie, Michael Baker International)

- Robert d’Abadie restated that the project meets the criterion in the VDOT Project Level Air Quality Resource Document and is therefore not considered to be one on air quality concern for PM$_{2.5}$.
- Since the VDOT Resource Document have already been subjected to interagency consultation for conformity, and the interagency group has agreed to those thresholds in the document, and since the projects falls within the threshold set forth in the Resource Document, the project inherently satisfies the interagency consultation requirements.
- Today’s consultation was undertaken further emphasize a commitment to transparency and keep the agencies involved fully informed in regards this high-profile project.
- Robert d’Abadie stated that agencies were welcome to submit additional comments including support and/or concurrence that this is not a project of air quality concern for PM$_{2.5}$.
- Both Rob d’Abadie and Jim Ponticello thanked everyone for their participation.
Appendix B: Link Source Type Hour Fractions Calculation Tool
Link Source Type Hour Fractions Calculation Tool
(Optional tool to assist in calculation of VMT by MOVES Source Types)

See Appendix E1-E2/F1-F2 of VDOT's Project-Level Air Quality Resource Document. This spreadsheet supports the development of Link Source Type Hour Fraction files based on regional VDOT traffic data and Source Type Population files from the regional air quality analyses. This approach is appropriate in cases where the preferred inputs listed in Appendix E1-E2 are not available.

Instructions:

1. Update "Input County and Traffic Data" tab:
   Update cells highlighted in yellow per instructions.
   Note this spreadsheet can be applied separately for individual roadway segments or for regional averages as

2. Update "Input SourceTypePopulation" tab (columns A-C):
   Copy regional source type population inputs from SourceTypePopulation subfolders in online data

3. Review Results in "Output LinkSourceTypeHour" tab
   Extract information for development of MOVES2014 Link Source Type Hour Input files
<table>
<thead>
<tr>
<th>SourceTypeID</th>
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<tr>
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<tr>
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<td>48</td>
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<td>62</td>
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**sum**: 1.0000
Appendix C: Sample MOVES Input File
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  </geographicselections>
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processkey="15" processname="Crankcase Running Exhaust"/>
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</donotexecute>

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Appendix D: Sample CAL3QHC Input/Output Files
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| 'I-66 ITB EB Lane Add',60,108,0.0,0.0,23,0.3048,1,0 |
| 'N Leg, E Side-Corner',57.5,69.5,5.9 |
| 'N Leg, W Side-Corner',-57.5,69.5,5.9 |
| 'S Leg, E Side - 25 m',57.5,-143.5,5.9 |
| 'S Leg, E Side - 50 m',57.5,-225.5,5.9 |
| 'S Leg, E Side-Midblk',57.5,-661.5,5.9 |
| 'S Leg, W Side-Corner',-57.5,-81.5,5.9 |
| 'S Leg, W Side - 25 m',-57.5,-143.5,5.9 |
| 'S Leg, W Side - 50 m',-57.5,-225.5,5.9 |
| 'S Leg, W Side-Midblk',-57.5,-661.5,5.9 |
| 'E Leg, N Side - 25 m',119.5,69.5,5.9 |
| 'E Leg, N Side - 50 m',201.5,69.5,5.9 |
| 'E Leg, N Side-Midblk',637.5,69.5,5.9 |
| 'W Leg, N Side - 25 m',-119.5,69.5,5.9 |
| 'W Leg, N Side - 50 m',-201.5,69.5,5.9 |
| 'W Leg, N Side-Midblk',-637.5,69.5,5.9 |
| 'E Leg, S Side - 25 m',119.5,-81.5,5.9 |
| 'E Leg, S Side - 50 m',201.5,-81.5,5.9 |
| 'E Leg, S Side-Midblk',637.5,-81.5,5.9 |
| 'W Leg, S Side - 25 m',-119.5,-81.5,5.9 |
| 'W Leg, S Side - 50 m',-201.5,-81.5,5.9 |
| 'W Leg, S Side-Midblk',-637.5,-81.5,5.9 |
| 'Interchange 2016',6,1,0,'CO' |
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| 'S Leg App - FreeFlow', 'AG',20,26,20,-1200,7200,5.4,0,0,0,55.7 |
| 1 |
| 'S Leg Dep - FreeFlow', 'AG',-20,26,-20,-1200,7200,5.4,0,0,0,55.7 |
| 1 |
| 'E Leg App - FreeFlow', 'AG',0,26,1200,26,8800,5.4,0,0,0,67.7 |
| 1 |
| 'E Leg Dep - FreeFlow', 'AG',0,-32,1200,-32,11000,5.4,0,0,0,79.7 |
| 1 |
| 'W Leg App - FreeFlow', 'AG',0,-32,-1200,32,11000,5.4,0,0,0,79.7 |
| 1 |
| 'W Leg Dep - FreeFlow', 'AG',0,26,-1200,26,8800,5.4,0,0,0,67.7 |
| 1.0,0,4,1000,0.0,'Y',10,1,36 |
The MODE flag has been set for calculating concentrations for POLLUTANT: CO

SITE & METEOROLOGICAL VARIABLES

\[ \begin{align*}
VS & = 0.0 \text{ CM/S} \\
VD & = 0.0 \text{ CM/S} \\
Z0 & = 108. \text{ CM} \\
U & = 1.0 \text{ M/S} \\
CLAS & = 4 \text{ (D)} \\
ATIM & = 60. \text{ MINUTES} \\
MIXH & = 1000. \text{ M} \\
AMB & = 0.0 \text{ PPM}
\end{align*} \]

LINK VARIABLES

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<th>Y1</th>
<th>X2</th>
<th>Y2</th>
<th>(FT)</th>
<th>(DEG)</th>
<th>(G/MI)</th>
<th>(FT)</th>
<th>(FT)</th>
<th>(VEH)</th>
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<td>180. AG</td>
<td>7200.</td>
<td>5.4</td>
<td>0.0</td>
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<tr>
<td>S Leg Dep - FreeFlow</td>
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<td>26.0</td>
<td>-20.0</td>
<td>-1200.0</td>
<td>1226.</td>
<td>180. AG</td>
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<td>26.0</td>
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<td>-32.0</td>
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<td>1200.</td>
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## ADDITIONAL QUEUE LINK PARAMETERS

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<th>LINK DESCRIPTION</th>
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<th>RED CLEARANCE</th>
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<th>IDLE SIGNAL ARRIVAL</th>
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<tbody>
<tr>
<td>LENGTH (SEC)</td>
<td>TIME (SEC)</td>
<td>LOST TIME (SEC)</td>
<td>VOL (VPH)</td>
<td>FLOW RATE (VPH)</td>
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## RECEPTOR LOCATIONS

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<th>COORDINATES (FT)</th>
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<tbody>
<tr>
<td>X</td>
<td>Y</td>
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1. N Leg, E Side-Corner | 57.5 | 69.5 | 5.9 |
2. N Leg, E Side - 0 m | 0.0 | 69.5 | 5.9 |
3. N Leg, W Side-Corner | -57.5 | 69.5 | 5.9 |
4. S Leg, E Side-Corner | 57.5 | -81.5 | 5.9 |
5. S Leg, E Side - 25 m | 57.5 | -143.5 | 5.9 |
6. S Leg, E Side - 50 m | 57.5 | -225.5 | 5.9 |
7. S Leg, E Side-Midblk | 57.5 | -661.5 | 5.9 |
8. S Leg, W Side-Corner | -57.5 | -81.5 | 5.9 |
9. S Leg, W Side - 25 m | -57.5 | -143.5 | 5.9 |
10. S Leg, W Side - 50 m | -57.5 | -225.5 | 5.9 |
11. S Leg, W Side-Midblk | -57.5 | -661.5 | 5.9 |
12. E Leg, N Side - 25 m | 119.5 | 69.5 | 5.9 |
13. E Leg, N Side - 50 m | 201.5 | 69.5 | 5.9 |
14. E Leg, N Side-Midblk | 637.5 | 69.5 | 5.9 |
15. W Leg, N Side - 25 m | -119.5 | 69.5 | 5.9 |
16. W Leg, N Side - 50 m | -201.5 | 69.5 | 5.9 |
17. W Leg, N Side-Midblk | -637.5 | 69.5 | 5.9 |
18. E Leg, S Side - 25 m | 119.5 | -81.5 | 5.9 |
19. E Leg, S Side - 50 m | 201.5 | -81.5 | 5.9 |
20. E Leg, S Side-Midblk | 637.5 | -81.5 | 5.9 |
21. W Leg, S Side - 25 m | -119.5 | -81.5 | 5.9 |
22. W Leg, S Side - 50 m | -201.5 | -81.5 | 5.9 |
23. W Leg, S Side-Midblk | -637.5 | -81.5 | 5.9 |
MODEL RESULTS

REMARKS: In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 10.-360.

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</table>

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DEGR: * 190 180 170 280 300 330 340 80 60 30 20 250 250 260 110
MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 10.-360.

WIND * CONCENTRATION
ANGLE * (PPM)
(DEGR)*  16  17  18  19  20  21  22  23
---------*-------------------------------------------
  20.  *  0.0000  0.0000  2.1713  2.1713  2.1713  2.2001  2.1518  2.1713
  30.  *  0.0078  0.0078  2.2705  2.2705  2.2705  2.4528  2.2679  2.2705
  40.  *  0.0274  0.0274  2.4185  2.4184  2.4176  2.8904  2.4576  2.4178
  50.  *  0.0367  0.0369  2.6458  2.6457  2.6405  3.4045  2.8077  2.6453
  60.  *  0.0519  0.0536  2.9165  2.9139  2.8692  3.9040  3.2854  2.9310
  70.  *  0.1895  0.2027  3.2646  3.2479  3.0452  4.3523  3.8646  3.3935
  80.  *  0.8306  0.9045  3.2368  3.1872  2.7200  4.4049  4.0641  3.6557
  90.  *  2.3028  2.4525  2.1126  2.0613  1.6190  3.3009  3.0085  2.6994
 100. *  3.5872  3.6376  0.7935  0.7711  0.5958  1.9128  1.5882  1.2449
 110. *  3.7697  3.5870  0.2127  0.2090  0.1784  1.2504  0.9184  0.5515
 120. *  3.6059  3.2306  0.0761  0.0758  0.0734  1.1418  0.8323  0.4064
 130. *  3.4016  2.9790  0.0584  0.0584  0.0583  1.1770  0.8314  0.3933
 140. *  3.2837  2.7587  0.0463  0.0463  0.0463  1.2501  0.8726  0.3606
 150. *  3.1883  2.5593  0.0185  0.0181  0.0181  1.3084  0.8878  0.2215
 160. *  3.0357  2.3044  0.0136  0.0020  0.0007  1.3367  0.8308  0.0661
 170. *  2.8006  2.2110  0.1296  0.0262  0.0000  1.1202  0.5548  0.0074
 180. *  2.4916  2.2615  0.5601  0.1933  0.0002  0.5596  0.1927  0.0002
 190. *  2.2293  2.1953  1.1202  0.5548  0.0074  0.1296  0.0262  0.0000
 200. *  2.2038  2.2020  1.3367  0.8308  0.0661  0.0136  0.0020  0.0007
 210. *  2.3059  2.3058  1.3084  0.8878  0.2215  0.0185  0.0181  0.0181
 220. *  2.4226  2.4223  1.2501  0.8726  0.3606  0.0463  0.0463  0.0463
 230. *  2.6407  2.6349  1.1770  0.8314  0.3933  0.0584  0.0584  0.0583
 240. *  2.8928  2.8504  1.1418  0.8323  0.4064  0.0761  0.0758  0.0734
 250. *  3.1957  2.9947  1.2504  0.9184  0.5515  0.2127  0.2090  0.1784
 260. *  3.0901  2.6214  1.9128  1.5882  1.2449  0.7935  0.7711  0.5958
 270. *  1.9647  1.5246  3.3009  3.0085  2.6990  2.1126  2.0613  1.6185
 280. *  0.7199  0.5469  4.4049  4.0641  3.6557  3.2368  3.1872  2.7200
 290. *  0.1795  0.1503  4.3523  3.8646  3.3935  3.2646  3.2479  3.0452
 300. *  0.0529  0.0511  3.9040  3.2854  2.9310  2.9165  2.9139  2.8692
 310. *  0.0369  0.0368  3.4045  2.8077  2.6453  2.6458  2.6457  2.6405
320. * 0.0274 0.0274 2.8904 2.4576 2.4178 2.4185 2.4184 2.4176
330. * 0.0078 0.0078 2.4528 2.2679 2.2705 2.2705 2.2705 2.2705
340. * 0.0000 0.0000 2.2001 2.1518 2.1713 2.1713 2.1713 2.1713
360. * 0.0000 0.0000 2.2707 2.2705 2.2705 2.2707 2.2705 2.2705

DEGR. * 110 100 280 280 280 80 80 80

THE HIGHEST CONCENTRATION OF 5.5125 PPM OCCURRED AT RECEIVER 2.
Appendix E: CO Modeling Layout