Attachment F:
Air Quality Technical Report

AIR QUALITY TECHNICAL REPORT

US 29 Bus Rapid Transit Improvements Project

From Burtonsville to Silver Spring Transit Center

Montgomery County, Maryland

GetOnBoardBRT
BUS RAPID TRANSIT IN MONTGOMERY COUNTY

May 2017

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List of Acronyms

ADT	Average daily traffic
BRT	Bus Rapid Transit
CAA	Clean Air Act
CLRP	Constrained Long-Range Plan
CO	Carbon monoxide
FHWA	Federal Highway Administration
FTA	Federal Transit Administratoin
GGRA	Greenhouse Gas Reduction Act
GHG	Greenhouse Gas
MCCC	MD Climate Change Commission
MCDOT	Montgomery County Department of Transportation
MDOT	Maryland Department of Transportation
MOVES	Motor Vehicle Emission Simulator
MSAT	Mobile source air toxics
MTA	Maryland Transit Administration
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_2	Nitrogen dioxide
NO_x	Nitrogen
O_3	Ozone
Pb	Lead
$PM_{2.5}$	Fine particulate matter
PM_{10}	Coarse particulate matter
PPM	Parts per million

SIP	State implementation plan
SO_2	Sulfur dioxide
TIGER	Transportation Investment Generating Economic Recovery
TIP	Transportation Improvement Program
USEPA	United States Environmental Protection Agency
VMT	Vehicle miles traveled
VOCs	Volatile organic compounds

PROJECT DESCRIPTION

The project proposes a new, 14-mile Bus Rapid Transit (BRT) service along US 29 from the Silver Spring Transit Center (SSTC) to the Burtonsville Park and Ride. The project includes new BRT service along existing travel lanes and shoulders; design and construction of eleven station stops along the corridor; implementation of Transit Signal Priority (TSP) at several signalized intersections; and improvements to landscapes, sidewalk, and bicycle facilities. This project is to receive a federal Transportation Investment Generating Economic Recovery (TIGER) grant from the FTA.

PURPOSE AND NEED

The purpose of the project is to improve mobility options by accommodating a high frequency, reliable transit service operating within existing right-of-way (ROW) on US 29 between the SSTC and the Burtonsville Park and Ride. The project will satisfy the following study corridor needs: growing transit demand and attractiveness; impeded bus and rider mobility due to traffic congestion; and lack of transit system connectivity and choice.

REGULATORY CONTEXT

Transportation projects are regulated by the Clean Air Act Amendments (CAA) of 1990 and the Final Transportation Conformity Rule [40 CFR Parts 51 and 93]. These regulations allow the United States Environmental Protection Agency (USEPA) to implement policies in order to ensure and maintain acceptable levels of air quality.

The CAA requires the USEPA to establish National Ambient Air Quality Standards (NAAQS), based on the latest science, to protect public health and welfare. These standards were put in place to control and minimize the escalating levels of pollution from the increase of motor vehicles and new stationary sources. The USEPA sets and revises the NAAQS for common and widespread pollutants. Currently, there are standards for six pollutants known as "criteria pollutants". These include: carbon monoxide (CO), ozone (O_3), particulate matter (fine particulate matter [$PM_{2.5}$] and coarse particulate matter [PM_{10}]), nitrogen dioxide (NO_2), lead (Pb), and sulfur dioxide (SO_2).

The NAAQS, as defined by the USEPA, are shown in **Table 1**. The primary standards are set to protect the public health which includes the health of sensitive subpopulations (where there is a safety margin built into the standard). The secondary standards are set to protect adverse effects on soil, water, crops, and buildings, in addition to other aspects of the general welfare.

Table 1: National Ambient Air Quality Standards[1]

Pollutant	Averaging Time	Primary Standards [1,2]	Secondary Standards [1,3]
CO	8- hour	9 ppm (10 mg/m^3)	None
	1-hour	35 ppm	
Lead	Rolling 3-Month Average[5]	0.15 µg/m^3	Same as Primary

[1] US Environmental Protection Agency. *National Ambient Air Quality Standards Table.* https://www.epa.gov/criteria-air-pollutants/naaqs-table

Pollutant	Averaging Time	Primary Standards [1,2]	Secondary Standards [1,3]
NO_2	Annual Arithmetic Mean	0.053 ppm (100 µg/m^3)	Same as Primary
	1-hour	0.100 ppm[6]	None
O_3	8-hour (2015 standard)[10]	0.070 ppm	Same as Primary
	8-hour (2008 standard)	0.075 ppm	Same as Primary
	8-hour (1997 standard)	0.08 ppm	Same as Primary
	8-hour (2015 standard)[10]	0.070 ppm	Same as Primary
$PM_{2.5}$	Annual Arithmetic Mean	12 µg/m^3[3,9]	15 µg/m^3
	24-hour	35 µg/m^3	Same as Primary
PM_{10}	Annual Arithmetic Mean	12 µg/m^3[3,9]	15 µg/m^3
	24-hour	35 µg/m^3	Same as Primary
SO_2	1-hour	75 ppb[8]	None
	3-hour	None	0.5 ppm

Notes:

1. National standards (other than ozone, particulate matter, and those based on annual averages) are not to be exceeded more than once per year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over three years, is equal to or is less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 ug/m^3 is equal to or is less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over three years, are equal to or are less than the standard.

2. Lead is categorized as a "toxic air contaminant" with no threshold exposure level for adverse health effects determined.

3. National lead standard, rolling three-month average: final rule signed October 15, 2008.

4. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

5. USEPA revoked the 1-hour ozone standard in all areas; however, some areas have continuing obligations under that standard.

6. Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

7. USEPA updated the NAAQS for $PM_{2.5}$ to strengthen the primary annual standard to 12 ug/m^3.

8. USEPA updated the NAAQS for Ozone to strengthen the primary 8-hour standard to 0.07 ppm on October 1, 2015. An area will meet the standard if the fourth-highest maximum daily 8-hour ozone concentration per year, averaged over three years is equal to or less than 70 ppb.

The US EPA issues the determinations on whether or not areas (typically counties) meet the NAAQS. These determinations are based on air quality monitoring data from stations located around the country. If an area does not meet the standard, it is classified as a *nonattainment* area. An area that meets the standard is classified as an *attainment* area. Areas that are nonattainment can be re-designated to attainment areas once they show they meet the standard. However, these areas are classified as *maintenance* areas for a period of ten years after the re-designation. Maintenance areas are subject to the same requirements as nonattainment areas. The nonattainment and attainment designations are completed for each criteria pollutant.

Transportation Conformity provisions require that transportation projects, plans, or programs funded or approved by the Federal Highway Administration (FHWA) or Federal Transit Administration (FTA) are consistent with air quality goals set forth in the CAA. Transportation Conformity applies to the previously mentioned transportation activities in areas that do not meet or previously have not met the NAAQS, nonattainment, and maintenance areas. The transportation activities must conform to the approved state implementation plan (SIP) for the nonattainment or maintenance areas. Federal actions occurring in areas that are in attainment of the NAAQS are not subject to the conformity rule. Conformity to an implementation plan means (USC 42 Sec. 7506):

a) Conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards and achieving expeditious attainment of such standards; and

b) that such activities will not –
   i. cause or contribute to any new violation of any standard in any area;
   ii. increase the frequency or severity of any existing violation of any standard in any area; or
   iii. delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

EXISTING CONDITIONS

The project study areas are located within Montgomery County, which is classified in the *USEPA Green Book*[2] as nonattainment for O_3, partial maintenance area for CO (**Figure 1**), and attainment for all other criteria pollutants.[3] This project is included in the currently approved National Capital Region Transportation Planning Board's Fiscal Year 2017-2022 Transportation Improvement Program[4] (TIP) (ID 6397) and the 2016 Constrained Long-Range Plan[5] (CLRP), as an amendment (SR17-2017)[6] to include $39.1 million from a TIGER grant and locals funds for implementation. The Project is not considered to be regionally significant and does not need to be included in the current Air Quality Conformity Analysis[7] in order to be included in the TIP and CLRP. The increased service levels would normally be addressed in the transit assumptions used in the Air Quality Conformity Analysis, and it was required by the Maryland Department of Transportation (MDOT) that those details be incorporated into the transit assumptions during the next analysis.

Ground level O_3 is formed when intense sunlight interacts with oxides of nitrogen (NO_x) and volatile organic compounds (VOC). Ozone forming NO_x and VOCs come from sources, including vehicle and power

[2] US Environmental Protection Agency. February 2017. *Nonattainment Areas for Criteria Pollutants (Green Book)*. https://www.epa.gov/green-book

[3] Note: On August 24, 2016, USEPA issued a final rule (81 FR 58010), effective October 24, 2016, that revoked the 1997 primary annual $PM_{2.5}$ NAAQS in areas that have always been in attainment for that NAAQS, and in maintenance areas for the 1997 annual $PM_{2.5}$ NAAQS. Therefore, effective October 24, 2016 the region is no longer classified as attainment-maintenance for the 1997 primary annual $PM_{2.5}$ standard.

[4] National Capital Region Transportation Planning Board. November 2016. *Transportation Improvement Program FY 2017 – 2022*. http://www1.mwcog.org/clrp/resources/KeyDocs_2016.asp

[5] National Capital Region Transportation Planning Board. November 2016. *2016 Constrained Long-Range Transportation Plan*. http://www1.mwcog.org/clrp/resources/KeyDocs_2016.asp

[6] National Capital Regional Transportation Planning Board. March 2017. *Resolution on an Amendment to the CLRP and the FY 2017 – 2022 TIP to Include Funding for the US 29 BRT Improvements Project, as Requested by MDOT*. https://www.mwcog.org/assets/1/28/SR17-2017_-_MDOT_MTA_CLRP_TIP_Amendment_-_March_3_-_TIP_ID_6397.pdf

[7] National Capital Region Transportation Planning Board. November 2016. *Air Quality Conformity Analysis of the 2016 CLRP Amendment and FY 2017 – 2022 Transportation Improvement Program*. http://www1.mwcog.org/clrp/resources/KeyDocs_2016.asp

plant emissions; lawn mowers and other fuel burning equipment; and vapors from gasoline, paints, and industrial processes. O_3 pollution is of particular concern during the summer months as the strong sunlight and hot weather can result in harmful concentrations. Breathing O_3, a primary component of urban smog, can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. As shown in **Figure 2**, the number of days when the O_3 concentrations reached an unhealthy level for sensitive groups or greater on the air quality index varied ranged from 11 to 77 between 2000 and 2012, with a median value of 49 days per year in that time frame. From 2013 to 2015, there has been a dramatic decrease in the number of days where the concentrations reached an unhealthy level for sensitive populations as the maximum was 14 days and the minimum was 10 days.

CO is a colorless, odorless gas that can be harmful when inhaled in large amounts. CO is released when something is burned. The greatest sources of CO to outdoor air are cars, trucks, and other vehicles or machinery that burn fossil fuels. Breathing air with a high concentration of CO reduces the amount of oxygen that can be transported in the blood stream to critical organs like the heart and brain. As shown in **Table 2**, the maximum 1-hour and 8-hour concentrations of CO from 2012 to 2015 are far below the standards of 35 parts per million (ppm) (1-hour) and 9 ppm (8-hour).

Table 2: USEPA-Monitored Carbon Monoxide Concentrations 2012 -2015[8]

CO Concentrations (ppm)			2012	2013	2014	2015	Average
Site: 24-031-3001 12003 Old Baltimore Pike Beltsville, MD	1-Hour	Maximum	1.3	1	1.5	1.5	1.3
		2nd Maximum	1.2	0.9	1	1	1.0
		# of Exceedances	0	0	0	0	0.0
	8-Hour	Maximum	1.2	0.9	0.9	1	1.0
		2nd Maximum	0.9	0.9	0.8	0.9	0.9
		# of Exceedances	0	0	0	0	0.0
Site: 11-001-0023 2055 L St. N.W. Washington DC	1-Hour	Maximum	2.5	5.8	2.1	2.1	3.1
		2nd Maximum	2.2	4.4	2	2	2.7
		# of Exceedances	0	0	0	0	0.0
	8-Hour	Maximum	2	2.8	1.6	1.8	2.1
		2nd Maximum	1.9	2.5	1.5	1.7	1.9
		# of Exceedances	0	0	0	0	0.0
Site: 11-001-0043 2500 1st Street NW Washington DC	1-Hour	Maximum	2.5	2.1	1.6	1.7	2.0
		2nd Maximum	2.4	1.4	1.6	1.6	1.8
		# of Exceedances	0	0	0	0	0.0
	8-Hour	Maximum	1.9	1.2	1.5	1.5	1.5
		2nd Maximum	1.8	1	1.2	1.5	1.4
		# of Exceedances	0	0	0	0	0.0
Site: 51-013-0020 S 18th And Hayes St Arlington, VA	1-Hour	Maximum	1.7	1.2	1.8	1.9	1.7
		2nd Maximum	1.6	1.2	1.6	1.9	1.6
		# of Exceedances	0	0	0	0	0.0
	8-Hour	Maximum	1.6	1.1	1.3	1.8	1.5
		2nd Maximum	1.4	1	1.1	1.7	1.3
		# of Exceedances	0	0	0	0	0.0

[8] US Environmental Protection Agency. March 2017. *Monitor Values Report.* https://www.epa.gov/outdoor-air-quality-data/monitor-values-report.

Figure 1: Study Corridor Carbon Monoxide Maintenance Areas

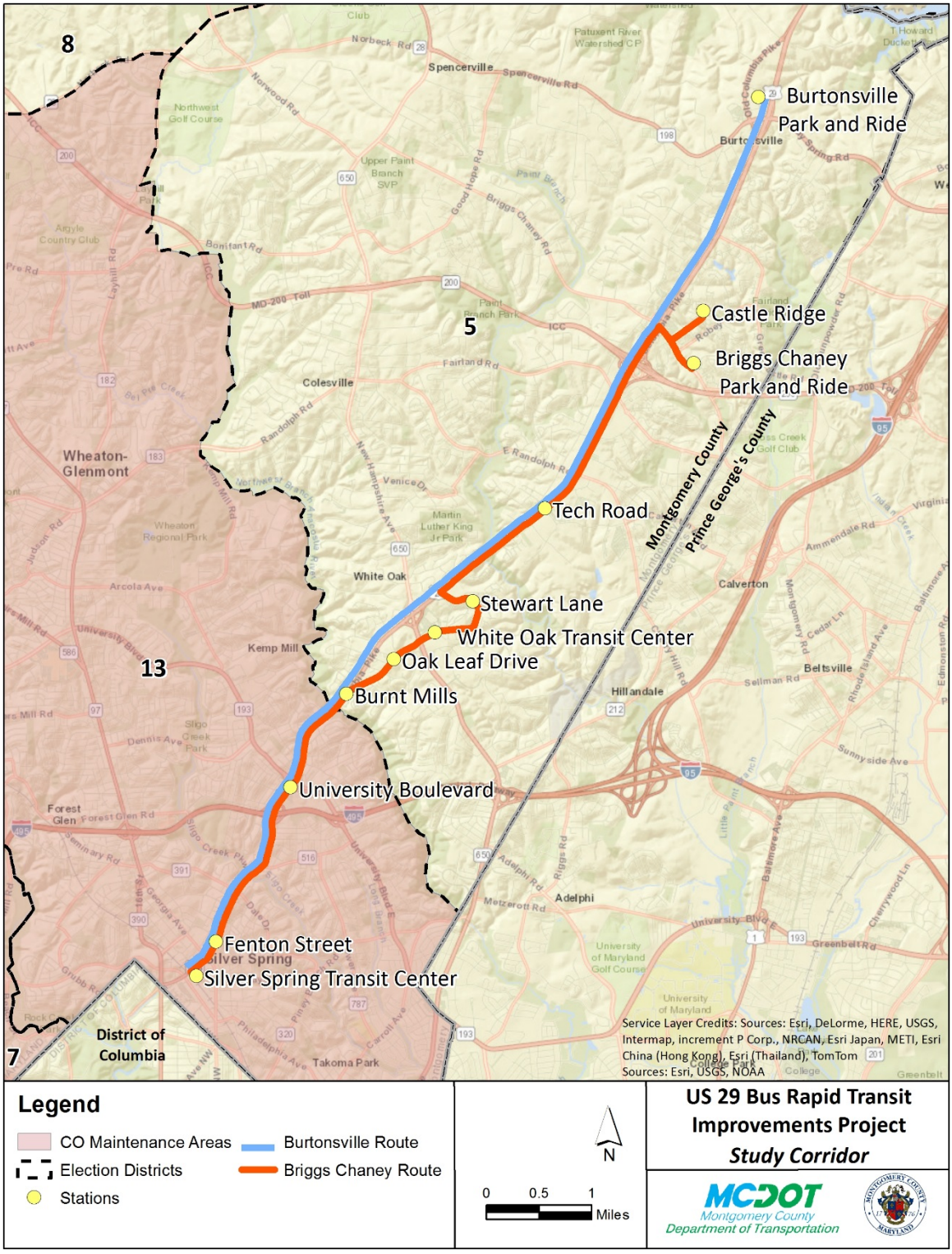
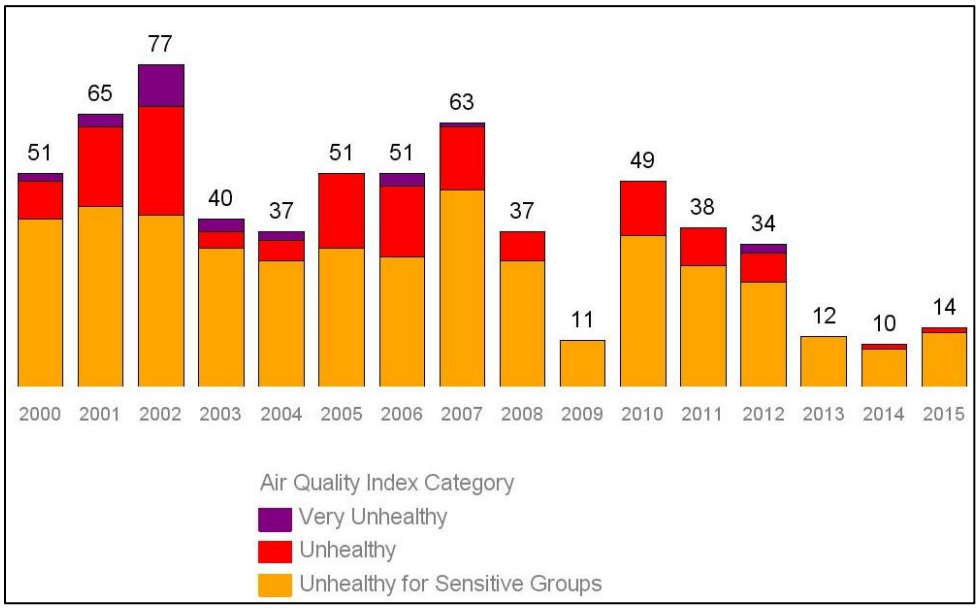


Figure 2: Ozone Air Quality Index for the Washington-Arlington-Alexandria, DC-VA-MD-WV Region[9]



Source: Preliminary air quality data as reported to USEPA's Air Quality System and AirNow.gov.

CARBON MONOXIDE ASSESSMENT

A review of the existing (2015) and future no-build (2040) traffic data (**Table 3**) demonstrates that average daily traffic (ADT) along the US 29 corridor is projected to increase between four and thirteen percent. These increases would occur regardless of the Project being constructed as the Project would not add roadway capacity, nor increase traffic volumes. The heavy truck percentages (**Table 4** and **Figure 3**) are relatively low and the Project would not impact the vehicle mix within the corridor. The BRT service would operate in the existing travel lanes and roadway shoulders. These factors in combination with the low, monitored concentrations (**Table 2**) do not warrant a detailed quantitative CO analysis. In conclusion, the Project would not cause or contribute to a new violation of the CO standard and it is suggested that the Project not be considered one of air quality concern.

Table 3: Existing (2015) and Future No Build (2040) Average Daily Traffic[10]

Roadway Section	2015 Existing ADT	2040 No-Build ADT
	Low to High	Low to High
MD 198 to E. Randolph Rd.	70,900 - 73,700	73,900 - 82,900
E. Randolph Rd. to MD 650	59,800 - 71,600	67,700 - 79,300
MD 650 to MD 193	65,500 - 79,400	72,600 - 88,100
MD 193 to I-495	74,000	81,900
I-495 to MD 97	39,600 - 65,200	41,700 - 72,400

Source: 2015 Existing Data from Vehicle counts. 2040 No-Build Data from TPB/MWCOG regional transportation model Version 2.3.57, with land use forecast Round 8.3.

[9] See: https://gispub.epa.gov/OAR_OAQPS/SeasonReview2015/index.html?appid=bc823213d0ae41ab9445efbf48ad6b94

[10] Maryland Department of Transportation. January 2017. *US 29 Bus Rapid Transit Draft Corridor Study Report.* https://mta.maryland.gov/us29brt

Table 4: Average Annual Daily Traffic and Truck Percentages[11]

Map ID	Roadway Section	2015 AADT	Passenger Car[1]	Heavy Truck[2]	Heavy Truck Volume
1	BRIGGS CHANEY RD TO MD 198	62,622	96.5%	3.4%	2,129
2	FAIRLAND RD TO BRIGGS CHANEY RD	60,752	N/A	N/A	N/A
3	RANDOLPH RD TO FAIRLAND RD	59,561	95.9%	4.2%	2,502
4	STEWART LA TO RANDOLPH RD	67,472	95.3%	4.5%	3,036
5	MD 650 TO STEWART LA	61,382	96.1%	3.8%	2,333
6	LOCKWOOD DR TO MD 650	61,332	96.4%	3.5%	2,147
7	MD 193 EB/L TO LOCKWOOD DR	67,822	95.6%	3.9%	2,645
8	IS 495 TO MD 193 EB/L	61,342	95.8%	4.0%	2,454
9	DALE DR TO IS 495	60,452	96.5%	3.4%	2,055
10	MD 97/MD 384 TO DALE DR	34,132	93.0%	6.7%	2,287

Notes:

1. *Passenger Car data does not include motorcycles.*
2. *Heavy Truck data includes single unit and combination unit vehicles*

Fine Particulate Matter Assessment

The Project is located in an attainment area for $PM_{2.5}$; therefore, Transportation Conformity requirements do not apply and no further analysis is needed.

Mobile Source Air Toxics Assessment

Though not a criteria pollutant, mobile source air toxics (MSAT) are emitted by motor vehicles as well. The USEPA has designated nine prioritized MSATs, which are known or probable carcinogens or can cause respiratory effects. The prioritized MSATs include: acrolein, benzene, 1,3-butidiene, diesel particulate matter plus diesel exhaust organic gases, formaldehyde, naphthatlene, acetaldehyde, ehthylbenzene, and polycyclics.

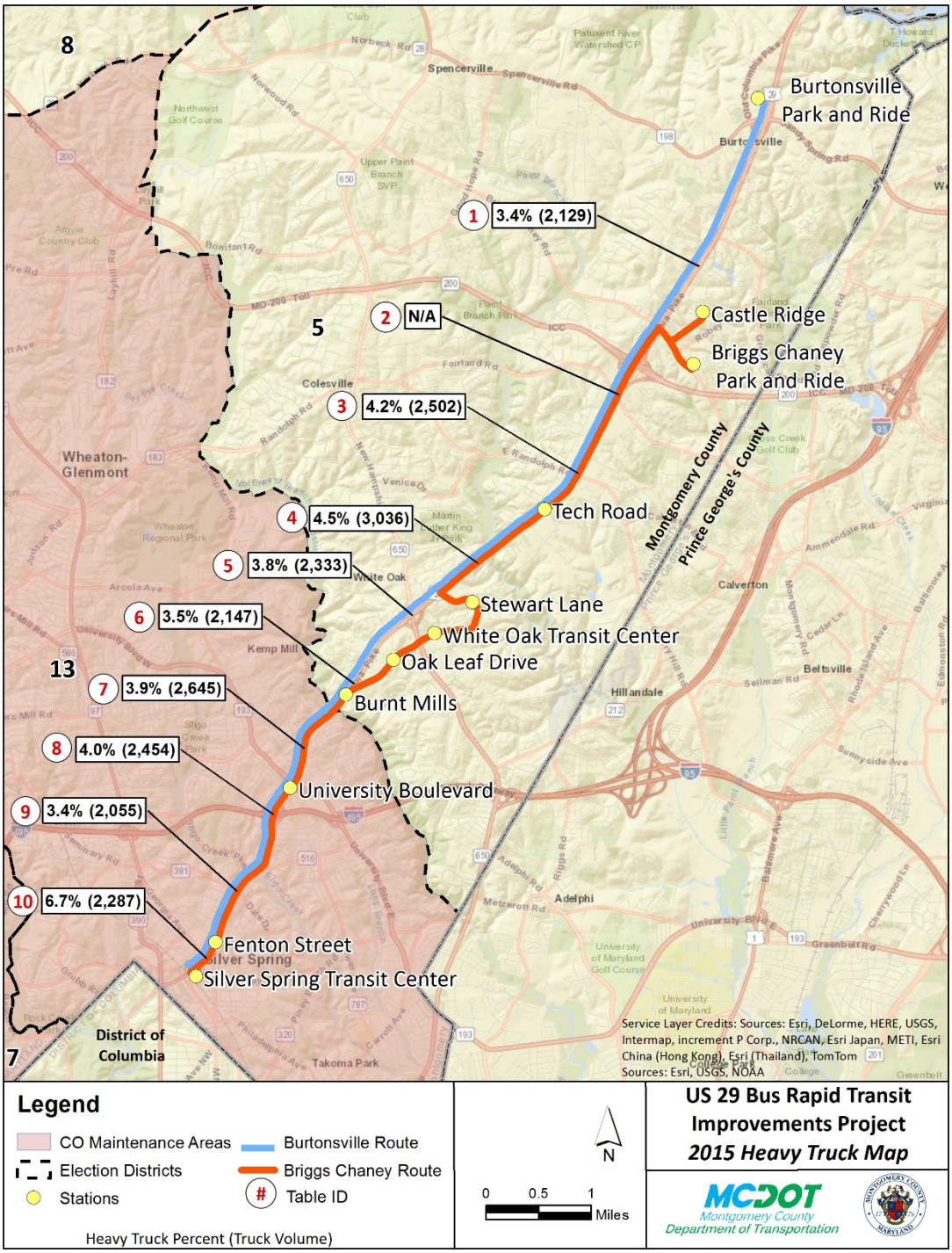
FHWA provides guidance for analyzing MSATs: *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents* (October, 2016)[12]. The guidance categorizes projects into three levels: projects with No Meaningful MSAT Effects, Low Potential MSAT Effects, and High Potential MSAT Effects. Qualitative analyses are required for projects with Low Potential for MSAT Effects and quantitative analyses are required for projects with High Potential for MSAT Effects.

For projects that are categorically excluded under 23 CFR 771.117(c), or are exempt from conformity requirements under the CAA under 40 CFR 93.126, no analysis or discussion of MSATs is necessary. Therefore, this Project, as defined under 23 CFR 771.117(c), would be considered a project with No Potential for MSAT Effects.

[11] Maryland Department of Transportation State Highway Administration. *GIS Traffic Count Data: Traffic by Roadway Segments*. http://www.roads.maryland.gov/Index.aspx?PageId=838

[12] US Department of Transportation: Federal Highway Administration. October, 2016. *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents.* https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/

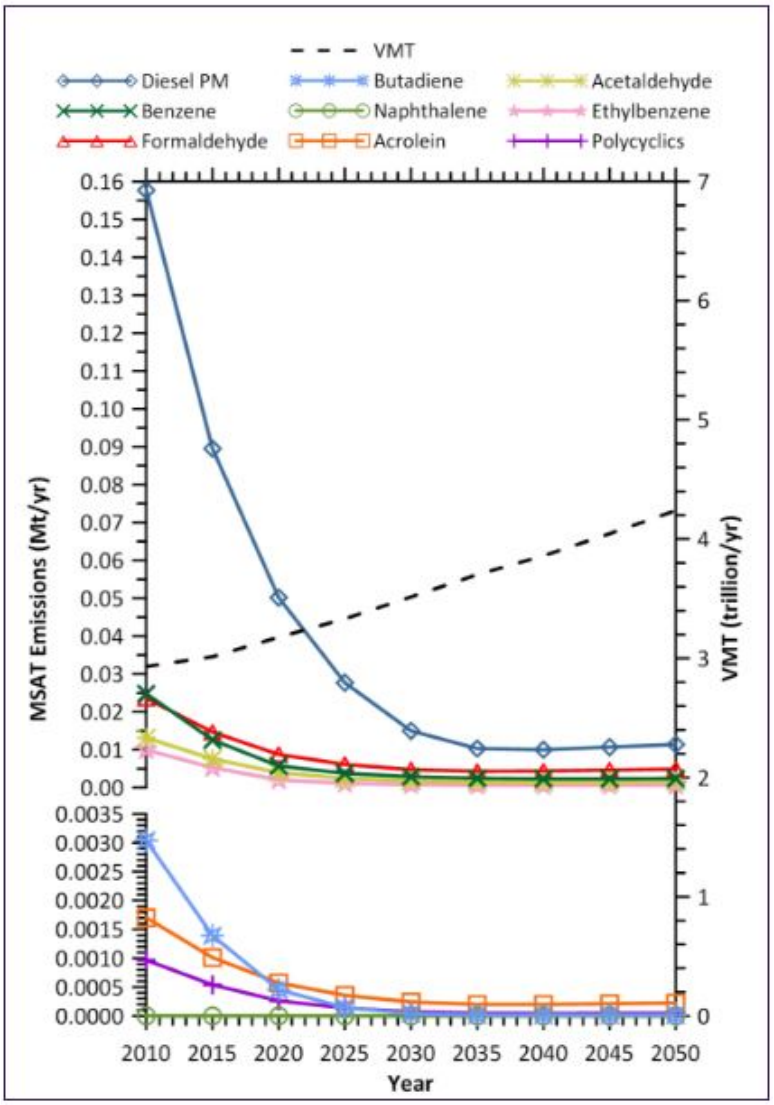
Figure 3: Heavy Truck Traffic[13]



[13] Maryland Department of Transportation State Highway Administration. *GIS Traffic Count Data: Traffic by Roadway Segments*. http://www.roads.maryland.gov/Index.aspx?PageId=838

Moreover, USEPA regulations for vehicle engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades (**Figure 4**). Based on regulations now in effect, an analysis of national trends with USEPA's MOVES 2014 model forecasts a combined reduction of over 90 percent in the total annual emissions rate for priority MSAT from 2010 – 2050 while vehicle miles traveled (VMT) are projected to increase by over 45 percent. This will both reduce the background level of MSAT as well as the possibility of even minor MSAT emissions from this Project.

Figure 4: FHWA Projected National MSAT Trends 2010 - 2050[14]



Note: Trends for specific locations may be different, depending on locally derived information representing vehicle miles traveled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

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

[14] US Department of Transportation: Federal Highway Administration. October, 2016. *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents.*
https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/

GREENHOUSE GAS ASSESSMENT

Maryland's Greenhouse Gas Emission Reduction Act of 2009 (GGRA) seeks a reduction in greenhouse gas (GHG) emissions of 25 percent from the 2006 baseline by 2020. The Greenhouse Gas Reduction Plan was published in October 2013, and puts the State on track to achieve the 25 percent GHG reduction required by the law. The Maryland Climate Change Commission (MCCC) was signed into law by Governor Hogan in 2015. The MCCC is charged with assessing future year goals for GHG emissions in Maryland.

The Maryland Department of Transportation (MDOT) recognizes that highway transportation accounts for approximately 28 percent of the GHGs in Maryland. In response to the GGRA, MDOT is exploring and implementing transportation and land use strategies to reduce GHG emissions programmatically as described in the Plan. The general GHG reduction strategies presented for the transportation sector in the Plan include: Transportation Technologies, such as vehicle emission and fuel standards, on-road technologies, and low emission vehicle initiatives; Public Transportation Initiatives; Pricing Initiatives; GHG Emission Impact evaluation of Major New Transportation Projects; and Bike and Pedestrian Initiatives. Initiatives outlined in the Plan will also help with restoration of the Chesapeake Bay, improving air quality and improving water quality throughout the State.

Much like environmental habitats, Maryland's transportation system is a network of interdependent elements and the interactions and synergy between each part impact the transportation system as a whole. GHG emissions from major transportation projects need to be considered as part of the planning process and recognition needs to be made that all projects may not reduce GHG emissions but, as a whole, the network needs to focus on reductions. Consequently, project-level emissions analyses are less informative than analysis conducted at the regional, state, and national scale. The USEPA has not identified NAAQS for GHGs, but has finalized standards and adopted regulations to enable the production of a new generation of clean vehicles, along with implementing cleaner fuel standard regulations to achieve significant reductions of GHG emissions.

CONSTRUCTION EMISSIONS ASSESSMENT

The construction phase of the proposed Project has the potential to impact the local ambient air quality by generating fugitive dust though activities such as demolition and materials handling. The State Highway Administration has addressed this possibility by establishing *Specifications for Construction and Materials*, which specifies procedures to be followed by contractors involved in site work. The Maryland Air and Radiation Management Administration was consulted to determine the adequacy of the Specifications in terms of satisfying the requirements of the *Regulations Governing the Control of Air Pollution in the State of Maryland*. The Maryland Air and Radiation Management Administration found the specifications to be consistent with the requirements of these regulations. Therefore, during the construction period, all appropriate measures (Code of Maryland Regulations 10.18.06.03 D) would be incorporated to minimize the impact of the proposed transportation improvements on the air quality of the area. Construction-related emissions for the Project were considered to be temporary since construction-related emission would last less than five years at any one site, meeting the criterion of 40 CFR 93.123 (c)(5).

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US Environmental Protection Agency. *National Ambient Air Quality Standards Table.* https://www.epa.gov/criteria-air-pollutants/naaqs-table