Climate Change Impacts of Proposed Expansion of I-270 and I-495

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Governor Hogan is proposing an $11 Billion widening of I-270 and I-495 as part of a massive, statewide program of highway expansion (hereafter referred to as "the project"). Motorists would pay tolls to a private company, which would design, build, and operate the I-270/I-495 project under the state's public-private partnership ("P3") statute. The project is being pushed forward concerningly fast, with the state's P3 solicitation and the required federal environmental reviews happening concurrently.

We believe that construction of the Interstate widening project would represent a major step backwards for Maryland's need to build a modern, 21st Century transportation system that will meet the mobility needs of its citizens while confronting the urgent challenge of climate change.

1. **The project is contradictory to Maryland's goals in the Greenhouse Gas Reduction Act (GGRA) statute; goals for which the state is not on track to meet.**

Maryland is one of the few states in the nation to require, via a legislatively-mandated statute, a reduction in climate-altering greenhouse gas emissions. The state's Greenhouse Gas Reduction Act (passed in 2009 and strengthened 2016) requires a 25% reduction in greenhouse gas emissions by 2020 and a 40% reduction in greenhouse gas emissions by 2030, all from 2006 levels. According to the state's 2017 greenhouse gas emissions inventory, the transportation sector is the largest source of climate pollution in the state -- accounting for nearly 40 percent climate pollution emissions in the state -- surpassing emissions from even the power sector.[1]

As Maryland moves to finalize its 2030 Greenhouse Gas Reduction Act Plan, it is abundantly clear that aggressive emissions reductions are needed from the transportation sector. Throughout the coming decade the state will need to rely on a variety of strategies to reduce climate pollution from the transportation sector, including decreased vehicle miles traveled (VMT), deployment of electric vehicles, increased public transit options and ridership, smart growth development, increased fuel efficiency, and investments into more bikeable and walkable communities. Unfortunately, the state has a record of falling short of pollution reduction targets and associated goals and indicators for the transportation sector, including for VMT, electric vehicle deployment, and even for greenhouse gas emissions.

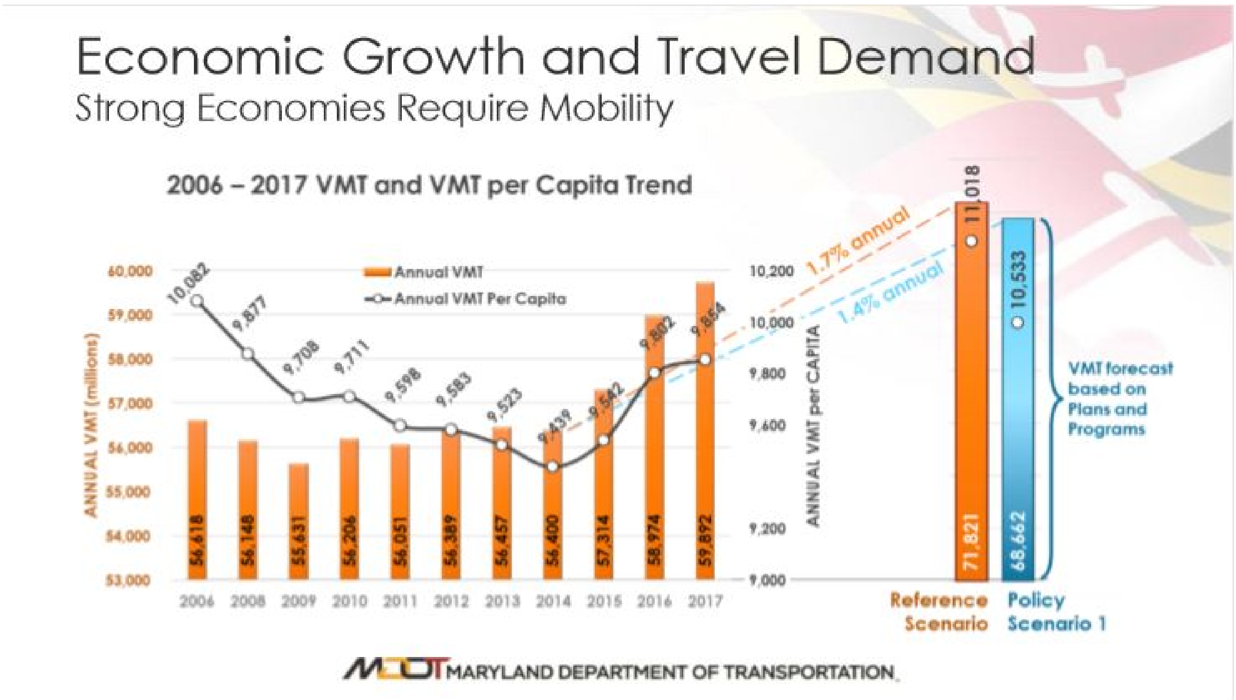
Vehicle Miles Traveled Growth

Maryland's average VMT per capita was on a downward trend from 2006 to 2014. However, beginning in 2014 the state began to experience an increase in average VMT per capita -- an

[1] https://mde.maryland.gov/programs/Air/ClimateChange/Documents/2017%20GHG%20Inventory/MD2017PeriodicGHGInventory01042019.pdf

upward trend that MDOT predicts to increase through 2030 even if base-level climate action programs are implemented (Figure 1). Gains in fuel economy are at risk of being offset by longer trips in greenhouse gas-emitting vehicles. Rather than accepting the upward trend in average VMT per capita, our state needs to be proposing bold solutions that shorten trips in vehicles and/or encourage residents to choose alternative transportation options like public transit.

Figure 1: MDOT Slide of Average VMT and projected growth with and without implementation of current plans and programs[2]

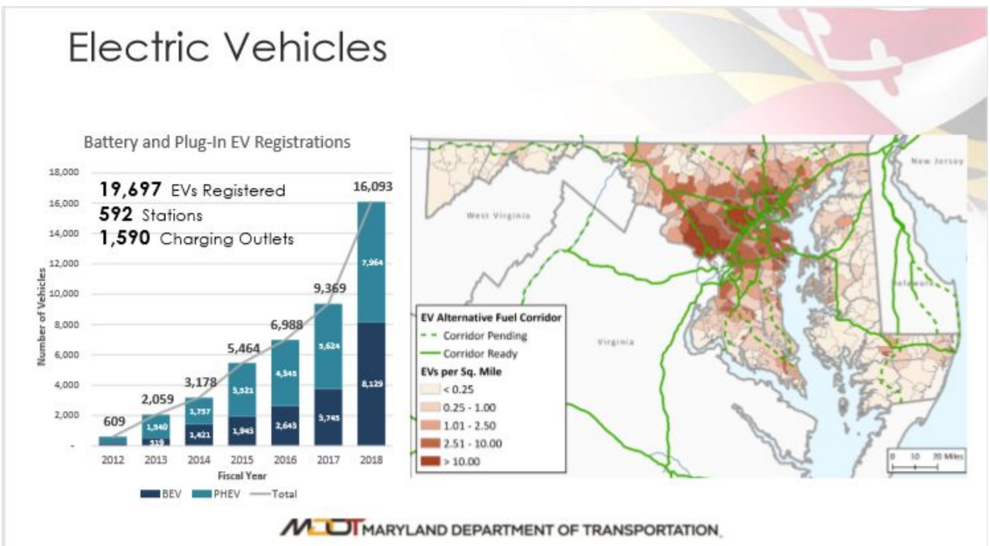


Slow Adoption of Electric Vehicles

In addition to VMT projections, Maryland's deployment of electric vehicles is not a trajectory consistent with robust climate action. As a part of the Zero Emission Vehicle (ZEV) Memorandum of Understanding (MOU), Maryland has committed to deploying nearly 300,000 ZEVs by 2025, including 60,000 by 2020. However, Maryland only has just over 8,000 battery-electric vehicles on the road at the start of 2019 (Figure 2).

[2] http://www.mdot.maryland.gov/newMDOT/Planning/Documents/MDOT_050619_ClimateChangeWorkshop_Materials.pdf

Figure 2: MDOT slide recording battery- and plug-in hybrid-electric vehicles on the road in Maryland[3]



We are very concerned that, given the upward trajectory in average VMT per capita and the slow deployment of ZEVs in the state, Maryland is not on schedule to meet our GGRA targets. This concern is stated explicitly by MDOT itself for the 2030 targets, and the data exists to show the transportation sector lagging in pollution reductions for the 2020 target.

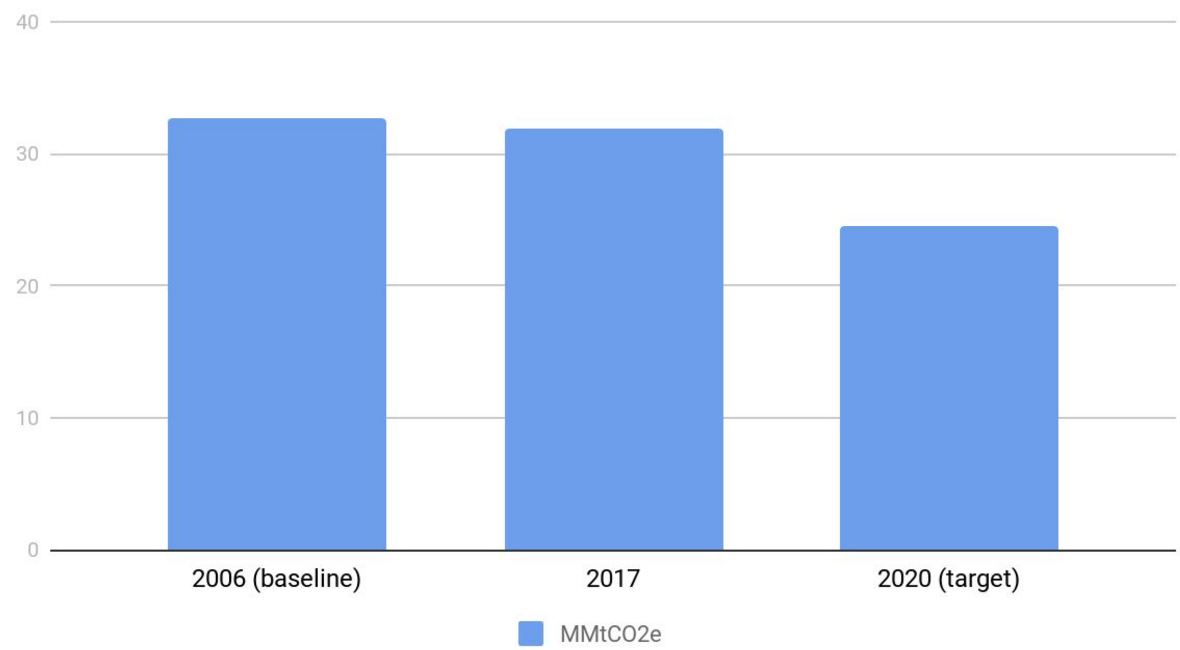
Maryland is not on trajectory to meet its climate targets for the transportation sector

MDOT's 2020 greenhouse gas emissions target, as stated in its 2012 Draft Implementation Plan for the state's Climate Action Plan, was recorded as 24.53 million metric tons of carbon dioxide equivalent (MMtCO2e), with a 2006 baseline of 32.7 MMtCO2e.[4] Unfortunately, the state's 2017 greenhouse gas emissions inventory periodic update cited the transportation sector's

[3] http://www.mdot.maryland.gov/newMDOT/Planning/Documents/MDOT_050619_ClimateChangeWorkshop_Materials.pdf
[4] http://www.mdot.maryland.gov/newMDOT/Planning/Environmental/Documents/Climate_Change_2011_Report_and_Appendix.pdf

emissions at nearly 32 MMtCO2e.[5] The transportation sector is not doing its fair share of pollution reductions to help meet our GGRA targets (Figure 3).

Figure 3: Maryland Transportation Sector Greenhouse Gas Emissions and Targets

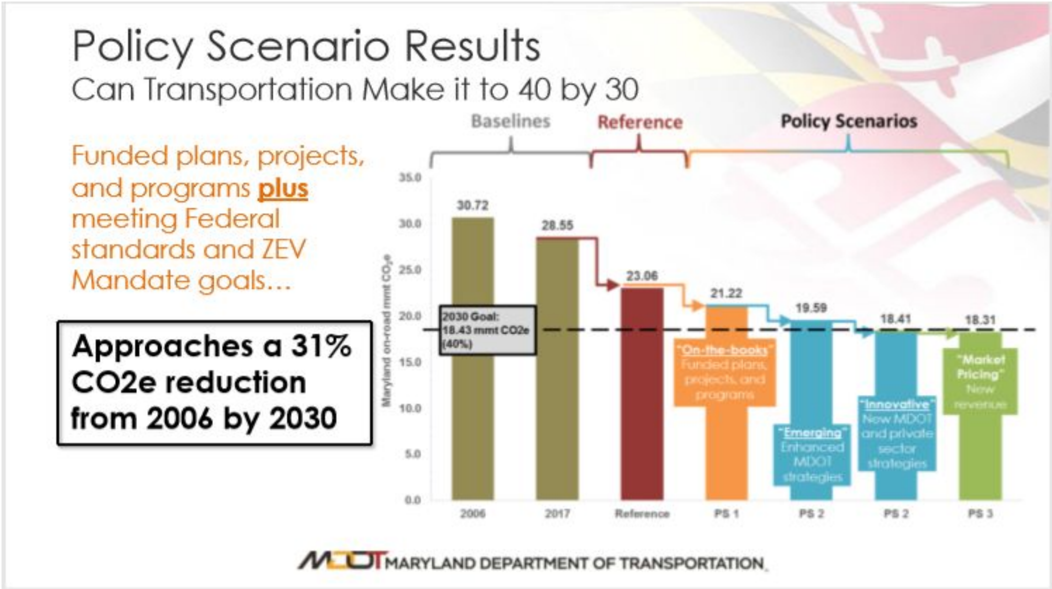


MDOT's extremely optimistic assumption of implementing all of our current policies and programs, including meeting our ZEV deployment targets and the federal government retaining Obama-era fuel economy requirements, still only gets the state to 31% pollution reductions in the transportation sector, not even close to the 40% target for the sector (Figure 4).

Figure 4: MDOT slide projecting emissions reduction scenarios[6]

5 https://mde.maryland.gov/programs/Air/ClimateChange/Documents/2017%20GHG%20Inventory/MD2017PeriodicGHGInventory01042019.pdf

6 http://www.mdot.maryland.gov/newMDOT/Planning/Documents/MDOT_050619_ClimateChangeWorkshop_Materials.pdf



The state is simply not on track to meet our climate goals for the transportation sector and we must be focused on investing billions of dollars into proven clean transportation solutions that lower pollution, reduce VMT, and reduce the number of cars on the road. Given MDOT's record of inability to meet climate action goals (expected shortfall for 2020 emission target, expected shortfall for the 2030 emission target, expected shortfall for electric vehicle registrations), completion of this project, from both a construction emissions perspective and from an operational perspective will certainly not further Maryland's climate action goals.

2. **The project, if completed, is the opposite of clean transportation investment and will only exacerbate our challenges of meeting GGRA targets.**

Concern for emissions during the construction phase of the project

The construction of new highway lanes is an intense activity using many types of equipment. The operation of this equipment will generate large amounts of greenhouse gas emissions. As the PreSolicitation Report Supplement indicates (page 7) the first phase of the project is 48 miles long and the entire project is more than 70 miles long. Thus, construction will be long-lasting and involve many different pieces of equipment. This activity will use fuel for power and will produce emissions, including greenhouse gasses. It is expected that the greenhouse gas emission tonnage will be large and will offset much of the progress the State of Maryland is trying to accomplish in dealing with climate change issues.

The following list contains common off-road equipment types commonly used in highway construction with the most common engine, fuel type, and emissions (kg) of CO_2 per 100 hours of operation (Table 1).

Table 1: Emissions and Fuels of common highway construction equipment[7]

Engine	Fuel	Emissions (kg of CO_2 per 100 hrs of operation)	Engine	Fuel	Emissions (kg of CO_2 per 100 hrs of operation)
Aerial Lifts	Diesel	739	Other Material Handling Equipment	Diesel	1,673
Air Compressors	Gas 4-Stroke	777	Pavers	Diesel	3,810
Bore/Drill Rigs	Gas 4-Stroke	326	Paving Equipment	Gas 4-Stroke	655
Cement and Mortar Mixers	Gas 4-Stroke	521	Plate Compactors	Gas 4-Stroke	367
Concrete/Industrial Saws Gas	Gas 2-Stroke	255	Pressure Washers	Gas 4-Stroke	750
Cranes	Diesel	4,600	Pumps	Gas 4-Stroke	621
Crawler Tractors	Diesel	27,030	Rollers	Diesel	3,070
Crushing/Proc. Equipment	Gas 4-Stroke	935	Rough Terrain Forklifts	Diesel	3,200
Dumpers/Tenders	Gas 4-Stroke	467	Rubber Tired Dozers	Diesel	7,815
Excavators	Diesel	5,774	Rubber Tired Loaders	Diesel	7,815
Forklifts	LPG	1,353	Scrapers	Diesel	12,412
Generator Sets	Gas 4-Stroke	830	Signal Boards	Diesel	513
Graders	Diesel	6,585	Skid Steer Loaders	Diesel	724
Off-Highway	Diesel	27,030	Surfacing	Gas 4-	543

[7] National Cooperative Highway Research Program, Greenhouse Gas Mitigation Measures for Transportation Construction, Maintenance, and Operations Activities, Program 25-25, Task 58

Tractors		
Off-Highway Trucks	Diesel	27,078
Other Construction Equipment	Diesel	10,190
Other General Industrial Equipment	Gas 4-Stroke	474

Equipment	Stroke	
Sweepers/Scrubbers	Diesel	2,220
Tractors/Loaders/Backhoes	Diesel	1,342

The actual equipment used for construction of the proposed project will depend on the needs and specifications for the project. There are tools available to calculate the emissions associated with the construction of a roadway project. Two frequently used are:

- Greenhouse Gas Calculator for State Departments of Transportation (GreenDOT) (http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP25-5(58)_FR.pdf); and
- Infrastructure Carbon Estimator (ICE) (https://www.fhwa.dot.gov/environment/sustainability/energy/tools/carbon_estimator/).

However, to apply these tools requires specific details about the project and its construction methods which are not yet available. If there is a Draft Environmental Impact Study, hopefully, it will use one of these tools (or others) to estimate actual project-specific greenhouse gas emissions associated with the project.

Examination of the literature, however, shows a number of studies that have examined greenhouse gas emissions from construction of roadways and that can be used to provide generalized estimates of greenhouse gas emissions from the construction of this project. Resources include:

- “Energy Usage and Greenhouse Gas Emissions of Pavement Preservation Processes for Asphalt Concrete Pavements” (Chehovits and Galehouse);
- “Increases in greenhouse-gas emissions from highway-widening projects” (Williams-Derry);
- “Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation A Toolkit for Developing Countries” (Egis);

Chehovits and Galehouse calculated that construction of a new roadway, which would be the case for this project, generates 24.1 lbs of greenhouse gas emissions per square yard. The PreSolicitation Report Supplement identifies alternatives that call for either one or two new lanes of construction in differing combinations, including for the full length of the project. Using this emission factor and assuming 12 foot wide lanes, 6 foot wide shoulders on each side of the roadway and new roadways in each direction from the project, yields construction greenhouse gas estimates of:

Table 2: Estimated Greenhouse Gas Emissions From Construction

	Phase 1 - 48 miles	**Entire Project – 70 miles**
One lane, each direction	8, 143 tons greenhouse gasses	11,877 tons greenhouse gasses
Two lanes each direction	12, 216 tons greenhouse gasses	17, 815 tons greenhouse gasses

While very large tonnages, these estimates are still conservative figures. They do not include several important additional considerations that would lead to higher greenhouse gas emissions:

- Bridge construction. The estimates do not include additional emissions due to bridge construction. The added greenhouse gas emissions will depend on the number of spans of the bridges and their height. FHWA estimates that bridge construction could increase construction emissions by 30% (Infrastructure Carbon Estimator Final Report and User's Guide).
- Routine Maintenance. Typically, roadways require repaving after 15 years of use and reconstruction after 30 years of use. They also require snow removal and vegetation management. This could lead to another 120 gallons of diesel fuel consumed for each lane mile of the project. These impacts have also not been added to the above estimates.
- Operational impacts on the existing facility. During construction, there will likely be impacts on the existing roadway. These include lane closures, lane narrowing, and detours. These impacts will have affect traffic speeds, causing traffic to move at a slower speed and concomitantly increasing greenhouse gas emissions. The actual increase in emissions will depend on the length and durations of the actual lane closures and detours. This impact has also not been added to the above estimates.

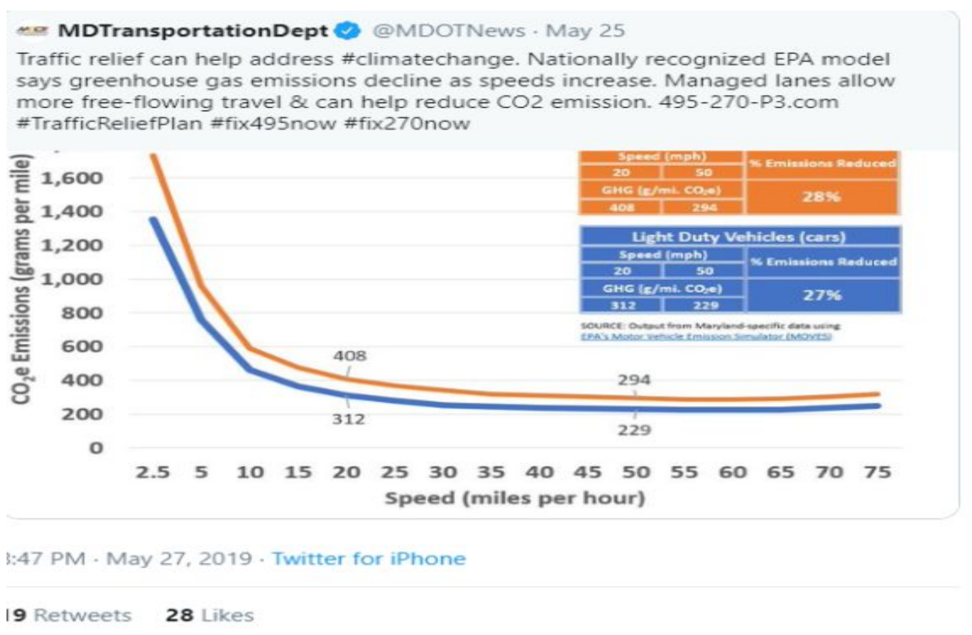
In reality, therefore, the actual greenhouse gas emissions due to the construction of the project will likely be much higher than the conservative tonnage estimates calculated above.

Concern on Increased Traffic Flow Impact on Emissions

We remain concerned that MDOT has been promoting an incomplete view of what will occur with the completion of this project. Robust analysis for a proposed express toll lanes project for the I-405 corridor in Washington state showed that the proposed project would have little impact on emissions. Washington Department Of Transportation found that "in 2025, modeling does not show any meaningful difference of GHG emissions between No Build and Build conditions. In 2045, compared to existing conditions, GHG emissions would be slightly greater under both Build and No Build. Also, in 2045, emissions from the Build conditions would be slightly lower than the No Build conditions."[8]

Further, we are concerned that information being shared publicly that suggests emissions reductions from the project are not reflective of the real-world scenario. Historically, so-called "temporary" increases in congestion and air pollution (whether criteria pollutants or greenhouse gasses) due to roadway construction have been justified by touting the expected benefits of freer flowing traffic, achieving less congestion and lower emissions. However, these assertions are based on consideration of the engine operating efficiency of a single vehicle. A single vehicle will operate most efficiently at speeds of 25 mph to 30 mph and will maintain that efficiency until speeds of 60 mph to 65 mph are reached, after which the efficiency again begins to decrease. This decrease in efficiency can be seen even in MDOT's public information in Figure 5.

Figure 5: Screenshot of MDOT Tweet Regarding Emissions from Moving Vehicles (May 25, 2019)



Yet in actual "real-world" conditions on highways and interstates, average operating speeds are rarely below 25 mph. Thus, marginal increases in operating speeds, as are being promoted for this project, will have little effect on reducing greenhouse gas emissions because improving operating speeds within the speed range of peak engine performance mode (between 25 mph and 65 mpg) will have little effect on greenhouse gas emission reduction. In addition, normal growth of traffic in a region and growth in traffic from induced demand (more vehicles are attracted to a facility due to the perception that freer flow will result in less travel time) will offset any marginal improvement in greenhouse gas emissions. The net result being that

[8] I-405, Tukwila to I-90 Vicinity Express Toll Lanes Project (MP 0.0 to 11.9) and Downtown Bellevue Vicinity Express Toll Lanes Project (MP 11.9 to 14.6), Attachment B: Air Quality Discipline Report, 2018.

greenhouse gas emissions will likely be higher as a result of the project, especially in the long run.

3. Conclusion

In conclusion, we respectfully request the Board should not go forward with the project for the following reasons:

1) It will result in excess and unnecessary greenhouse gas emissions from construction of the project, nullifying any potential benefits from the project, if any;
2) It is directly counter-productive to the State's urgent need to reduce greenhouse gas emissions from the transportation sector.

Respectfully,

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Significant portions of, and information within, these comments were sourced from a report authored by Dr. Mark Stout of Mark L. Stout Consulting and Dr. John Zamurs of Zamurs and Associates, LLC for the Sierra Club Maryland Chapter and Maryland Climate Coalition.