219 Meyersdale to Old Salisbury Rd

Air Quality Memorandum

October 2024

US 6219, Section 050
Transportation Improvement Project
Meyersdale, PA to Old Salisbury Road, MD

pennsylvania
DEPARTMENT OF TRANSPORTATION

MDOT
MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

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1.0 INTRODUCTION

Following the passage of the Clean Air Act of 1963 (CAA), the Air Quality Act of 1967, and the Federal Clean Air Act Amendments of 1990, the U.S. Environmental Protection Agency (EPA) was required to set National Ambient Air Quality Standards (NAAQS) for wide-spread pollutants from numerous and diverse sources considered harmful to public health and the environment. These pollutants include ozone, particulate matter (PM), sulfur dioxide, lead, carbon monoxide (CO), and nitrogen dioxide. The NAAQS compels states to implement additional steps to reduce airborne pollutants and improve local and regional conditions.

2.0 AFFECTED ENVIRONMENT

Both Somerset County, Pennsylvania and Garrett County, Maryland are in attainment for all criteria pollutants, including ozone (8-hour and 1-hour); PM ≤2.5µ (2.5) and ≤10µ (10), sulfur dioxide, lead, CO, nitrogen dioxide and the multipollutant category. Attainment, means that they consistently stay below the NAAQS for transportation-related pollutants

3.0 ALTERNATIVES

3.1 No Build Alternative

The no build alternative involves taking no action, except routine maintenance, along U.S. 219. The existing two-lane alignment of U.S. 219 between Meyersdale, Pennsylvania and Garrett County, Maryland would remain. No new alignments or additional roadway would be constructed. The no build alternative would experience lower levels of service in the design year (2050) along the existing roadway compared to the proposed alignment. These conditions could lead to increased congestion and potentially result in poorer air quality.

3.2 Proposed Roadway Alternatives

Each of the proposed build alternatives Alternative DU, DU-Shift, E, and E-Shift, were evaluated with a consistent roadway layout, also known as a typical section. The typical section for each build alternative provides a four-lane divided limited access highway with 12-foot wide travel lanes, 8-foot wide inside shoulders and 10-foot wide outside shoulders. The width of the median between the inside edges of northbound and southbound travel lanes is between 36 to 60 feet.

The northern three miles in Pennsylvania all follow the same alignment, starting from the existing Meyersdale interchange. Alternative DU starts at the southern end of the Meyersdale Bypass, proceeding in a southerly direction to just south of the Mast Farm, where it heads westward toward existing U.S. 219. The alternative crosses between the Deal and Mast Farms, then turns in a southern direction, towards the Mason-Dixon Line.

As it crosses the Mason-Dixon Line. Alternative DU continues southwest and ties into the newly constructed section of U.S. 219 in Maryland. Alternative DU-Shift mimics the alternative of Alternative DU from Meyersdale until south of the Mason-Dixon Line, where Alternative DU-Shift is shifted eastward and away from Old Salisbury Road.

Alternative E starts at the southern end of the Meyersdale Bypass and proceeds in a southerly direction along the face of Meadow Mountain. At the Pennsylvania/Maryland border, Alternative E extends in a southwesterly direction, east of the existing U.S. 219. Alternative E-Shift follows Alternative E, with the exception of a small shift in Maryland, slightly eastward, away from the homes along Old Salisbury Road.

3.3 NAAQS Pollutants

The National Environmental Policy Act (NEPA) requires consideration of air quality impacts and a project-level analysis of CO pollutants and mobile source air toxics (MSAT). A qualitative analysis was conducted for potential CO and MSAT impacts. No qualitative analysis was necessary for PM, because the project area is within a U.S. EPA attainment area for PM standards. This analysis was guided by the *PennDOT Publication No. 321, Project-Level Air Quality Handbook* and MSAT analysis was guided by FHWA's *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents* (FHWA, 2023).

3.4 CO, PM, and MSATs

CO is a component of motor vehicle exhaust and carbon fuel, and it is released when the fuel is not completely burned. FHWA and PennDOT have developed a project traffic threshold that determines the need for CO quantitative analysis of project impacts. The threshold is a design year AADT of 125,000 vehicles.

Traffic analysis for the U.S. 219 Transportation Improvement Project was completed using 2022 traffic counts to determine existing conditions and an assumed linear growth rate of 1.5 percent between 2022 and the project's design year, 2050, to determine 2050 traffic volumes. Cell phone data was utilized to determine the origin and/or destination of travelers along existing U.S. 219, which informed a projection of how many travelers may divert on to the proposed roadway and how many may remain on the existing U.S. 219 alignment, representing 2050 build conditions. These traffic volumes fall under the 125,000 AADT threshold specified in *PennDOT Publication No. 321, Project-Level Air Quality Handbook*. The analysis determined that the total AADT of the 2022 base condition is 4,811. The projected total AADT in 2050, the design year, for the build and no build condition is 6,832. This AADT for the build conditions includes traffic traveling along the proposed U.S. 219 alignment and along the existing U.S. 219 within the project area. Additional information from the analysis is included in Table 1.

Table 1: U.S.219 Base and Projected Traffic Conditions (2022-2050)[1]

Conditions	AADT of Existing Alignment	Projected AADT of Proposed Alignment	Total AADT
2022 Base	4,811	N/A	4,811
2050 No Build	6,832	N/A	6,832
2050 Build	3,269	3,563	6,832

[1] Traffic volumes are for roadway segment(s) between Ord Street and Clark Road.

Based on the AADT described above, the U.S. 219 project does not include or directly affect any roadways for which the 20-year forecasted daily volume would exceed the threshold level of 125,000 vehicles per day established in *PennDOT Publication No. 321, Project-Level Air Quality Handbook*. Projected AADT associated with the No Build Alternative is also below 125,000 vehicles per day. Therefore, the project would have no significant adverse impact on air quality as a result of CO emissions. This satisfies the qualitative analysis for CO2 based on AADT that is required in *PennDOT Publication No. 321, Project-Level Air Quality Handbook*. U.S. EPA monitoring shows that CO levels in the project area are well below associated standards, and the estimated traffic volumes will remain under 125,000 ADT. While Maryland does not have an established traffic threshold for quantitative analysis of potential CO impacts, coordination with FHWA and SHA indicated the anticipated AADT of the project would have no significant adverse impact on air quality as a result of transportation related CO emissions.

PM is the term used for a mixture of solid particles and liquid droplets found in the air. These particles are a range of sizes, including particles that are less than 2.5 micrometers in diameter (PM2.5) and less than 10 micrometers in diameter (PM10). Sources of PM include vehicle emissions of dust, dirt, soot, smoke, and liquid droplets. The proposed project is located in a U.S. EPA attainment area for PM2.5 and PM10 standards. The project therefore does not require a project-level PM conformity determination. No further project-level air quality analysis for these pollutants is required according to the PM2.5 and PM10 hot-spot analysis requirements established in the March 10, 2006, final transportation conformity rule (71 CFR 12468).

MSATs are hazardous air pollutants with significant contributions from mobile vehicles. These pollutants include benzene and other hydrocarbons such as 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, and naphthalene. FHWA's *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents* (FHWA, 2023) established a tiered approach with three categories for analyzing MSAT in NEPA documents. The three tiers are: no analysis for projects with no potential for meaningful MSAT effects, qualitative analysis for projects with low potential MSAT effects, and quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects. This project would be considered a project with low potential MSAT effects because the projected design year traffic is less than 140,000 to 150,000 AADT. The roadway proposed by the project is projected to have an AADT of 6,832, significantly below 140,000 to 150,000 AADT, as previously discussed and as identified in Table 1. Therefore, the project would be considered a project with low potential MSAT effects.

For the build condition associated with project implementation, the amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT), assuming that other variables such as fleet mix are the same for each build alternative. Indirect effects of the project such as associated access traffic, emissions of evaporative MSAT (e.g., benzene) from parked cars, and emissions of diesel particulate matter from trucks could also cause localized differences in the MSAT.

It is expected that there would be no appreciable difference in projected AADT or overall MSAT emissions among the build alternatives. As previously discussed, the design year AADT is projected to be the same for the proposed alternatives, with similar proposed roadway lengths for each alternative as well. For all alternatives, emissions are virtually certain to be lower than present levels in the design year of 2050 as a result of the U.S. EPA's national control programs. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. The magnitude of the U.S. EPA-projected reductions however is so great (even after accounting for VMT growth) that MSAT emissions in the project area are likely to be lower in the future than they are today. According to U.S. EPA's Motor Vehicle Emission Simulator (MOVES), FHWA estimates that even if VMT increases by 31% from 2020 to 2060, as forecasted nationally, a 76% combined reduction of the total annual MSATs emissions across the country is projected. Because the estimated VMT under each of the proposed build alternatives are nearly the same, varying by approximately five percent, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives

Construction activities may generate temporary increases in emission of MSATs or other pollutants. However, air quality impacts resulting from roadway construction activities are typically not a concern when contractors utilize appropriate control measures. In Pennsylvania and Maryland, contractors must perform all construction activities in accordance with 25 PA Code Article III (Chapters 121-145, Air Resources) or 26 MD Code Subtitle 11 (Chapters 1-41, Air Quality) to ensure adequate control measures are in place.

3.4.1. Incomplete/Unavailable Information for Project-Specific MSAT 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 U.S. EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The U.S. 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, https://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). A number of HEI studies are summarized in Appendix D of FHWA’s *Updated Interim Guidance 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 Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects) or in the future as vehicle emissions substantially decrease.

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts – each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxicscritical-review-literature-exposure-and-health-effects). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA states that with respect to diesel engine exhaust, “[t]he absence of adequate data to develop a sufficiently confident dose-response relationship from the epidemiologic studies has prevented the estimation of inhalation carcinogenic risk.” (EPA IRIS database, Diesel Engine Exhaust, Section II.C. https://iris.epa.gov/static/pdfs/0642_summary.pdf).

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine 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 (https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD598525780000 5 0C9DA/$file/07-1053-1120274.pdf).

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

3.5 Greenhouse Gases

Increases in atmospheric greenhouse gas (GHG) concentrations from the incremental addition of GHG emissions generated from a vast multitude of individual sources affects climate change. The totality of climate change impacts is not attributable to any single action but a series of actions including actions taken pursuant to decisions of the federal government intensifies it. It is therefore crucial to analyze and consider the potential climate change effects of proposed actions.

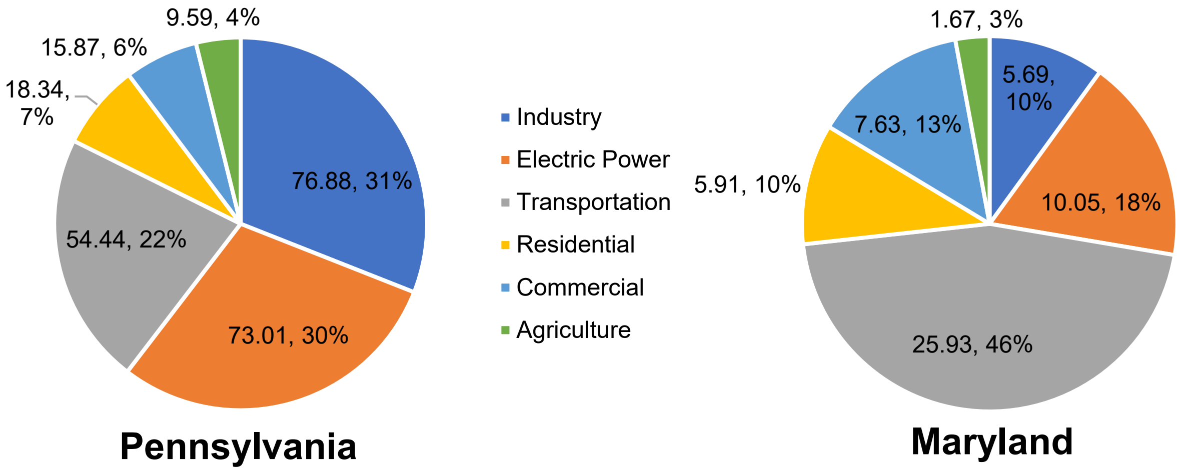
The U.S. Council on Environmental Quality (CEQ) issued guidance for analyzing GHG and climate change under NEPA on January 9, 2023. The CEQ guidance does not establish specific GHG emission quantities as significantly affecting the quality of human environment but directs agencies to estimate projected GHG emissions in context with the affected environment.

GHG emission analysis should also consider federal and state GHG reduction goals. On January 10, 2023, the Biden-Harris Administration released the U.S. National Blueprint for Transportation Decarbonization, which lays out a strategy to eliminate transportation GHG emissions by 2050. The strategy focuses on improving community and land use planning, increasing access to efficient travel options, and transitioning to zero emission vehicles. This aligns with *The Long-Term United States Strategy: Pathways to Net-Zero Greenhouse Gas Emissions by 2050* (November 2021). In Pennsylvania, Governor Tom Wolf issued an Executive Order on January 8, 2019, announcing a statewide goal of a 26% GHG emission reduction by 2025 (compared to 2005 emission levels), and an 80% GHG emissions reduction by 2050. On April 8, 2022, the Maryland General Assembly passed the Climate Solutions Now Act, setting an interim goal of a 60% GHG emission reduction by 2031 (compared to 2006 emission levels) and net-zero emissions by 2045.

GHG emission impacts associated with the project were estimated by using the projected AADT of the alternatives to determine approximate gasoline consumption. Subsequently, U.S. EPA’s *Greenhouse Gas Equivalencies Calculator* was used to determine the metric tons of Carbon Dioxide (CO2) equivalent emissions released annually based on the AADT. The Institute for Policy Integrity’s *Social Cost of GHG Calculator* approximated the social cost associated with GHG emissions. FHWA’s *Infrastructure Carbon Estimator* was used to approximate the metric tons of CO2 equivalent potentially released by the construction of the build alternatives. The social cost of lost forestland was also considered.

According to Figure 1, Pennsylvania released 54.44 million metric tons of transportation related GHG emissions in 2020. Maryland released 25.93 metric tons of transportation related GHG emissions. CO2 is the principal GHG component which comprised 96.9% of transportation related GHG emitted in Pennsylvania and 96.8% in Maryland. Transportation is the largest source of emissions in Maryland, while it is the third largest in Pennsylvania, behind industrial sources and electric power generation.

Figure 1: Emissions by Economic Sector in PA and MD, Million Metric Tons of CO² Equivalent, 2020[1]



[1]U.S. EPA's Inventory of U.S. GHGs Emissions and Sinks by State

3.5.1. GHG Traffic Emissions

GHG emission impacts associated with the project were estimated by using the projected AADT and VMT of the proposed and existing U.S. 219 roadway to determine approximate CO2 equivalent emissions. This was completed using FHWA's Infrastructure Carbon Estimator.

Table 2 shows an approximation of GHG released by vehicles travelling along U.S. 219 through the project area in the no build or project build scenarios. The 2022 base condition represents existing traffic conditions, while the 2050 no build and 2050 build conditions represent projected traffic conditions in 2050 based on a linear growth rate. The build conditions include traffic along existing U.S. 219 and the proposed U.S. 219 roadway associated with Alternatives DU, DU-Shift, E, and E-Shift Modified.

Table 2: Approximate Cumulative Traffic GHG Emissions through 2050

Traffic Conditions and Emissions	2022 Base	2050 No Build	2050 Build Alternatives			
			DU Mod.	DU Shift Mod.	E Mod.	E Shift Mod.
Projected AADT	4,811	6,832	6,832	6,832	6,832	6,832
Projected VMT	46,667	66,270	56,706	56,706	53,973	53.973
2050 Cumulative CO2 Equivalent Released (Metric Tons)[1]	N/A	208,515	178,423	178,423	169,823	169,823

[1]According to FHWA Infrastructure Carbon Estimator, based on construction in 2030 and project design year 2050. The 2030 AADT for the No Build and Build Conditions is projected to be 5,389.

While emission increases are associated with any increase in VMT, there is significant uncertainty in the GHG projections related to numerous variables, including roadway length, vehicle types, vehicle speed, routing behaviors, fuel prices, economic and population growth, seasonal temperatures, vehicle technology, and fuel economy. These approximations indicate a 14 to 19% decrease in CO_2 equivalent emissions in the build conditions compared to the no build. This results from a consistent AADT between the two conditions, but a decrease in VMT resulting from a shorter roadway segment length along the proposed U.S. 219 compared to the existing U.S. 219 north-south travel route within the project area. Projected traffic emissions through 2050 associated with Alternatives E and E-Shift are the lowest of the alternatives, with 169,823 metric tons of CO_2 equivalent, as these alternatives have the shortest proposed roadway. The No Build has the highest projected CO_2 equivalent emissions with 208,515 metric tons.

3.5.2. Social Cost of GHG Traffic Emissions

In accordance with U.S. Executive Order 13990, the approximate social costs of GHG emissions associated with the proposed project were calculated. The costs were determined using the Institute for Policy Integrity's *Social Cost of GHG Calculator*, which is based on the Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide (February 2021), issued by the Interagency Working Group on the Social Cost of Greenhouse Gases. The Interagency Working Group utilizes discount rates (DR) of 2.5%, 3%, 5%, or the 95th percentile of simulations (based on a 3% DR). A DR attempts to quantify the costs of emissions at a future date by accounting for inflation and weighing the value of current investments versus future costs. A larger DR decreases future social costs, while a smaller DR increases future social costs.

According to these social cost calculations, as shown in Table 3, there is a decrease in social costs related to build condition traffic emissions as compared to the no build condition. This parallels the trend from due to the decrease in VMT associated with the build conditions, and traffic social costs for Alternatives DU and DU-Shift Modified are approximately $4.7 million less than the No Build Alternative, and social costs for Alternatives E and E-Shift Modified are approximately $6 million less than the No Build.

Table 3: Approximate Social Cost of Cumulative Traffic GHG Emissions

Conditions	2050 No Build	2050 Build Alternatives			
		DU Mod.	DU Shift Mod.	E Mod.	E Shift Mod.
Social Cost with 5% Discount Rate (DR)[2]	$3,012,827	$2,578,028	$2,578,028	$2,453,767	$2,453,767
Social Cost with 3% DR[2]	$10,785,726	$9,229,175	$9,229,175	$8,784,329	$8,784,329
Social Cost with 2.5% DR[2]	$16,088,848	$13,766,973	$13,766,973	$13,103,404	$13,103,404
Social Cost based on 95th Percentile[2]	$32,605,149	$27,899,712	$27,899,712	$26,554,944	$26,554,944

[1] According to U.S. EPA's Greenhouse Gas Equivalencies Calculator, rounded to nearest whole number for use with the Institute for Policy Integrity's Social Cost of GHG Calculator.
[2] According to the Institute for Policy Integrity's Social Cost of GHG Calculator and Interagency Working Group on the Social Cost of Greenhouse Gases estimates, based on analysis in 2024 and emission in 2030.

3.5.3. Construction and Maintenance GHG Emissions

Similarly, FHWA's *Infrastructure Carbon Estimator* approximated the social costs associated with construction and operations/maintenance of the build alternatives through the full roadway lifespan. The *Infrastructure Carbon Estimator* provides lifecycle estimates of energy and GHG emissions based on national emission and energy use factors for materials and construction activities.

According to this estimator tool, the construction and maintenance of the new roadway associated with the build alternatives would result in the emission of approximately 14,617 to 15,357 metric tons of CO_2 equivalent, as shown in Table 4. Alternatives E and E-Shift Modified have lower construction and maintenance emissions than Alternatives DU and DU-Shift Modified as a result of the shorter proposed roadway associated with Alternatives E and E-Shift Modified. Approximately one-third of these emissions results from maintenance/operations of the roadway, approximately one-third of the emissions results from production of construction materials, and approximately one-third of the emissions results from construction and transportation of materials for construction purposes.

Table 4: Approximate GHG Emissions Associated with Construction and Maintenance

Activity and Estimated Emissions in Metric Tons	Build Alternatives			
	DU Mod.	DU Shift Mod.	E Mod.	E Shift Mod.
Total Proposed Lane Miles	33.2	33.2	31.6	31.6
CO_2 Equivalent -Construction[1]	4,506	4,506	4,289	4,289
CO_2 Equivalent - Construction Materials[1]	5,161	5,161	4,912	4,912
CO_2 Equivalent - Construction Transportation[1]	730	730	694	694
CO_2 Equivalent - Maintenance for Full Roadway Lifespan[1]	4,961	4,961	4,722	4,722
Total CO_2 Equivalent from Construction and Maintenance[1]	**15,357**	**15,357**	**14,617**	**14,617**

[1] According to the FHWA Infrastructure Carbon Estimator.

3.5.4. Social Cost of GHG Construction and Maintenance Emissions

The Institute for Policy Integrity's *Social Cost of GHG Calculator* was used to calculate the social cost of the GHG construction and maintenance emissions. Table 5 details the social cost of these construction and maintenance emissions, which ranges from $207,496 to $2,321,196 for Alternatives DU and DU-Shift Modified and $197,484 to $2,209,196 for Alternatives E and E-Shift Modified, depending on the discount rate.

Table 5: Approximate GHG Emissions Associated with Construction and Maintenance

Conditions and Social Cost	Build Alternatives			
	DU Mod.	DU Shift Mod.	E Mod.	E Shift Mod.
Social Cost with 5% DR[2]	$207,496	$207,496	$197,484	$197,484
Social Cost with 3% DR[2]	$764,111	$764,111	$727,243	$727,243
Social Cost with 2.5% DR[2]	$1,146,813	$1,146,813	$1,091,478	$1,091,478
Social Cost based on 95th Percentile[2]	$2,321,196	$2,321,196	$2,209,196	$2,209,196

[1] According to the FHWA Infrastructure Carbon Estimator.
[2] According to the Institute for Policy Integrity's Social Cost of GHG Calculator and Interagency Working Group on the Social Cost of Greenhouse Gases estimates, based on analysis in 2024, construction emissions in 2030, and maintenance emissions in 2040.

3.5.5. Forestland Impacts and Social Cost

Construction of the proposed project would also impact forestland. Consequently, these forestland impacts would affect carbon sequestration and the social cost of the project. The amount of forestland impacted by the project would vary depending on the alternative selected, ranging from 388.8 acres to 431.4 acres.

Table 6 shows the forestland impacted and the social cost for each alternative according to the Institute for Policy Integrity's *Social Cost of GHG Calculator*. Of the four build alternatives, Alternatives E and E-Shift Modified would have the lowest approximate social cost related to impacted forestland, ranging from $70,506 to $846,007, and Alternative DU Modified would have highest approximate social cost, ranging from $78,066 to $936,756, depending on the discount rate utilized.

Table 6: Approximate GHG Emissions Associated with Construction and Maintenance

Cumulative Social Cost through 2050	DU Mod.	DU-Shift Mod.	E Mod.	E-Shift Mod.
Forestland Impacted (acres)	431.4	430.0	389.7	388.8
Annual Approximate CO2 Sequestration Impacted2 (metric tons)[1]	320	319	289	289
Social Cost through 2050 with 5% DR2	$78,066	$77,824	$70,506	$70,506
Social Cost through 2050 with 3% DR2	$306,266	$305,308	$276,595	$276,595
Social Cost through 2050 with 2.5% DR2	$466,106	$464,648	$420,952	$420,952
Social Cost through 2050 based on 95th Percentile[2]	$936,756	$933,827	$846,007	$846,007

[1] Assuming 0.5 metric tons of carbon sequestration per hectare of forestland per year (Mendelsohn, Sedjo, and Sohngen, 2012). For every 1 metric ton of carbon stored annually, approximately 3.67 metric tons of CO2 are sequestered per year.
[2] According to the Institute for Policy Integrity's Social Cost of GHG Calculator. Social cost was calculated based on analysis in 2024 and annual impact between 2030, when construction is scheduled to begin, and 2050.

3.5.6. Cumulative GHG Emissions and Social Cost

The total GHG impact from the proposed project through 2050 was summarized in Table 7, accounting for traffic, construction, maintenance, and forestland loss. This analysis indicates that the alternative with the highest estimated GHG emissions is the No Build Alternative, which totals 208,515 metric tons. This results from the longer roadway segment and higher VMT of the no build. Alternatives E and E-Shift Modified have the lowest estimated GHG emissions with 190,220 metric tons, resulting from the shortest proposed roadway segment and smallest forestland impacts.

Table 7: Cumulative GHG Impacts through 2050

Activity and CO_2 Equivalent Impact in Metric Tons through 2050	2050 No Build	2050 Build Alternatives			
		DU Mod.	DU Shift Mod.	E Mod.	E Shift Mod.
Traffic[1]	208,515	178,423	178,423	169,823	169,823
Construction of Proposed Roadway[1]	0	10,397	10,397	9,895	9,895
Maintenance of Proposed Roadway[1]	0	4,961	4,961	4,722	4,722
Forestland and Carbon Sequestration Loss	0	6,400	6,380	5,780	5,780
Total CO_2 Equivalent Impact	**208,515**	**200,181**	**200,161**	**190,220**	**190,220**

Table 8 provides a summary of cumulative social costs through 2050 from the proposed project and associated GHG impacts. The No Build Alternative is projected to have the highest social cost, from $3,012,827 to $32,605,149, depending on the discount rate utilized. Alternatives E and E-Shift Modified have the lowest social cost, ranging from $2,721,757 to $29,610,147.

Table 8: Cumulative Social Costs Resulting from GHG Impacts through 2050

Activity and Social Cost through 2050	**2050 No Build**	**2050 Build Alternatives**			
		DU Mod.	**DU Shift Mod.**	**E Mod.**	**E Shift Mod.**
Using 5% DR					
Traffic	$3,012,827	$2,578,028	$2,578,028	$2,453,767	$2,453,767
Construction of Proposed Roadway	$0	$150,226	$150,226	$142,973	$142,973
Maintenance of Proposed Roadway	$0	$57,270	$57,270	$54,511	$54,511
Forestland and Carbon Sequestration Loss	$0	$78,066	$77,824	$70,506	$70,506
Total Social Cost	**$3,012,827**	**$2,863,590**	**$2,863,348**	**$2,721,757**	**$2,721,757**
Using 3% DR					
Traffic	$10,785,726	$9,229,175	$9,229,175	$8,784,329	$8,784,329
Construction of Proposed Roadway	$0	$537,799	$537,799	$511,833	$511,833
Maintenance of Proposed Roadway	$0	$226,312	$226,312	$215,410	$215,410
Forestland and Carbon Sequestration Loss	$0	$306,266	$305,308	$276,595	$276,595
Total Social Cost	**$10,785,726**	**$10,299,552**	**$10,298,594**	**$9,788,167**	**$9,788,167**
Using 2.5% DR					
Traffic	$16,088,848	$13,766,973	$13,766,973	$13,103,404	$13,103,404
Construction of Proposed Roadway	$0	$802,224	$802,224	$763,490	$763,490
Maintenance of Proposed Roadway	$0	$344,589	$344,589	$327,988	$327,988
Forestland and Carbon Sequestration Loss	$0	$466,106	$464,648	$420,952	$420,952
Total Social Cost	**$16,088,848**	**$15,379,892**	**$15,378,434**	**$14,615,834**	**$14,615,834**
Based on 95th Percentile					
Traffic	$32,605,149	$27,899,712	$27,899,712	$26,554,944	$26,554,944
Construction of Proposed Roadway	$0	$1,625,762	$1,625,762	$1,547,265	$1,547,265
Maintenance of Proposed Roadway	$0	$695,434	$695,434	$661,931	$661,931
Forestland and Carbon Sequestration Loss	$0	$936,756	$933,827	$846,007	$846,007
Total Social Cost	**$32,605,149**	**$31,157,664**	**$31,154,735**	**$29,610,147**	**$29,610,147**

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