Appendix H: Air Quality

INDOT	2200078		Greenfield		US 40	US 40 From Philadelphia to Centerville Dist:N/A	Other Type Project (Miscellaneous)	Y	CON	FY 2027	STPSM	$300,000	$240,000	80%	$0	0%	$60,000	20%	$400,000	$400,000
									PE/PL	FY 2024	STPSM	$100,000	$80,000	80%	$0	0%	$20,000	20%	$400,000	$400,000
INDOT	2300274		Multiple			Electric vehicle charging infrastructure at various locations along Indiana interstates, TBD. Dist:N/A	Other Type Project (Miscellaneous)	Y	CON	FY 2024	NHPP	$21,215,670	$16,972,536	80%	$0	0%	$4,243,134	20%	$74,326,212	$74,326,212
									CON	FY 2026	NHPP	$21,215,732	$16,972,586	80%	$0	0%	$4,243,146	20%	$74,326,212	$74,326,212
									CON	FY 2025	NHPP	$21,215,688	$16,972,550	80%	$0	0%	$4,243,138	20%	$74,326,212	$74,326,212
									PE/PL	FY 2024	NHPP	$5,339,561	$4,271,649	80%	$0	0%	$1,067,912	20%	$74,326,212	$74,326,212
									~~PE/PL~~	~~FY 2025~~	~~NHPP~~	~~$5,555,561~~	~~$4,271,649~~	~~80%~~	~~$0~~	~~0%~~	~~$1,067,912~~	~~20%~~	~~$74,326,212~~	~~$74,326,212~~
Indianapolis DPW	2002553	2100121, 2100122	Greenfield	Marion Co.	County Line Rd.	This project will widen from 2-lane to 4-lane divided from ~700' east of SR 37 (Future I-69) to ~700' east of Morgantown Rd, and includes a crossing of Pleasant Run Creek. With the construction of I-69 Section 6, there will be an interchange at County Line Road. This project is adjacent to the interchange, where added capacity is needed to funnel traffic to and from the future interstate. The roadway will be widened from two lanes to five lanes including TWLTL; enclosed storm drainage system; a 6' sidewalk on the north side and a 10' multiuse path on the south side throughout the project limits. Dist:0.5	Existing Roadway Widening	N	CE	FY 2024	STP3UM	$3,490,000	$0	0%	$3,490,000	100%	$0	0%	$49,590,000	$49,590,000
									CON	FY 2024	STP3UM	$39,900,000	$10,000,000	25%	$29,900,000	75%	$0	0%	$49,590,000	$49,590,000
~~Indianapolis DPW~~	~~2300775~~		~~Greenfield~~	~~Marion Co.~~	~~Eagle Creek Greenway~~	~~Phase B1 is a 1.2 mile extension of the Eagle Creek Greenway that starts at the B&O Trail and ends at Washington St and the future IndyGo Blue Line BRT. From the B&O Trail and Big Eagle Creek, the trail continues south on the eastern levee to 10th & Whitcomb, connecting to the existing on-street bikelanes on 10th Street. A full traffic count analysis will determine if we can remove travel lanes at this intersection to narrow the pedestrian crossing or provide a pedestrian refuge island. The trail will then continue south along the levee to Lynhurst Drive bridge over Big Eagle Creek with a physically separated facility on the west side of the bridge. It will go under the south side of Lynhurst for a fully separated trail and proceed east along the levee on the south side of the creek to Vermont Street. At Vermont St., the trail will continue south on the levee, go under the Holt Road bridge, connect to Washington Street and Rockville Road, and the future Blue Line BRT. The current design of the IndyGo Blue Line provides a wide multi-use path on the south side of~~	~~Bicycle Enhancement~~	~~Y~~	~~CE~~	~~FY 2026~~	~~STATE~~	~~$888,988~~	~~$991,998~~	~~80%~~	~~$97,888~~	~~20%~~	~~$991,998~~	~~80%~~	~~$5,555,823~~	~~$5,555,823~~
									CON	FY 2026	STATE	$8,809,893	$3,915,508	80%	$978,877	20%	$3,915,508	80%	$5,833,823	$5,833,823
Indianapolis DPW	1801448	1902638	Greenfield	Marion Co.	Emerson Avenue	Roadway widening/resurfacing, storm structures, curb/sidewalk, signals/signage + bridge over Pleasant Run Creek Dist:1.1	Existing Roadway Widening	N	CE	FY 2023	STBG	$12,500	$10,000	80%	$2,500	20%	$0	0%	$14,903,875	$14,903,875
									CE	FY 2024	STBG	$1,249,625	$999,700	80%	$249,925	20%	$0	0%	$14,903,875	$14,903,875
									CON	FY 2023	STBG	$11,418,000	$9,132,800	80%	$2,285,200	20%	$0	0%	$14,903,875	$14,903,875
Indianapolis DPW	1601001		Greenfield	Marion Co.		The project is in Center and Washington Townships, Marion County, Indianapolis, Indiana. It begins at the intersection of Meridian Street and Fall Creek Parkway North Drive, continues north along Meridian Street to 38th Street, continues east along 38th Street to College Avenue, continues north along College Avenue to the intersection of College Avenue and 71st Street. Dist:N/A	Pedestrian Enhancement	Y	CE	FY 2021	HSIP	$111,111	$100,000	90%	$11,111	10%	$0	0%	$6,312,749	$6,312,749
									CE	FY 2024	HSIP	$113,305	$101,975	90%	$11,330	10%	$0	0%	$6,312,749	$6,312,749
									CE	FY 2023	HSIP	$116,667	$105,000	90%	$11,667	10%	$0	0%	$6,312,749	$6,312,749
									CE	FY 2022	HSIP	$131,666	$105,000	39%	$26,666	10%	$0	0%	$6,312,749	$6,312,749
									CON	FY 2021	HSIP	$4,863,000	$4,375,800	90%	$487,200	10%	$0	0%	$6,312,749	$6,312,749
									CE	FY 2022	Other	$161,666	$135,000	51%	$26,666	10%	$0	0%	$6,312,749	$6,312,749
Indianapolis DPW	1700936		Greenfield	Marion Co.		Curb, sidewalk, pavement marking, signage and signalization improvements focused within 1/2 mile radius of Red Line bus stops located between Lawrence St to 25th St. Dist:N/A	Pedestrian Enhancement	Y	CE	FY 2022	HSIP	$111,111	$100,000	90%	$11,111	10%	$0	0%	$4,001,624	$4,473,000
									CE	FY 2024	HSIP	$133,652	$120,287	90%	$13,365	10%	$0	0%	$4,001,624	$4,473,000
									CE	FY 2023	HSIP	$111,111	$100,000	90%	$11,111	10%	$0	0%	$4,001,624	$4,473,000
									CON	FY 2022	HSIP	$2,847,000	$2,560,320	90%	$286,680	10%	$0	0%	$4,001,624	$4,473,000
Indianapolis DPW	2200141		Greenfield	Marion Co.	Eagle Creek Greenway	1.2 mile extension of existing Eagle Creek Greenway. Phase B1 will largely run atop the Eagle Creek Levee from Dandy Trail & Oceanline Drive to US-136. This trail project is an extension of the existing Eagle Creek Greenway - Phase A. This project will extend the trail to the southeast, along Eagle Creek to where it crosses US 136. The project will consist of on and off-road trail facilities for pedestrians, cyclists, and other non-motorized forms of transportation. Project includes sidewalks, bicycle infrastructure, pedestrian and bicycle signals, traffic calming techniques, lighting and other safety-related infrastructure, bikeshare system, and ADA compliance. Dist:1.2	Bicycle Enhancement	Y	CE	FY 2024	STBG	$232,500	$186,000	80%	$46,500	20%	$0	0%	$2,142,500	$2,142,500
									CON	FY 2024	STBG	$1,860,000	$1,488,000	80%	$372,000	20%	$0	0%	$2,142,500	$2,142,500

Federal Transit Administration
Region V
200 West Adams St., Suite 320
Chicago, IL 60606-5253

U.S. Department of Transportation

Federal Highway Administration
Indiana Division
575 N. Pennsylvania St., Rm 254
Indianapolis, IN 46204-1576

September 1, 2023

Mr. Michael Smith
Commissioner
Indiana Department of Transportation
100 N Senate Ave. N955
Indianapolis, IN 46204

SUBJECT: Indiana FY2024-2028 STIP Approval and Associated Federal Planning Finding

Dear Mr. Smith:

The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) have completed our review of the FY2024-2028 Indiana Statewide Transportation Improvement Program (INSTIP), which was submitted by the Indiana Department of Transportation (INDOT) request letter dated August 23, 2023.

Based on our review of the information provided, certifications of the Statewide and Metropolitan transportation planning processes for and within the state of Indiana, and our participation in those transportation planning processes (including planning certification reviews conducted in Transportation Management Areas), FHWA and FTA are jointly approving the FY2024-2028 STIP, including the Metropolitan Planning Organization (MPO) Transportation Improvement Programs (TIPs) incorporated into the STIP by reference, subject to the corrective actions identified in the attached Federal Planning Finding (FPF) report. FHWA and FTA consider the projects in the 5th year for informational purposes only, and our approval does not exceed four years per 23 CFR 450.220(c).

FHWA and FTA are required under 23 CFR 450.220(b) to document and issue an FPF in conjunction with the approval of the FY2024-2028 STIP. At a minimum, the FPF verifies that the development of the STIP is consistent with the provisions of both the Statewide and Metropolitan transportation planning requirements. FHWA and FTA find that the Indiana FY2024-2028 STIP substantially meets the transportation planning requirements and are approving the STIP subject to the corrective actions outlined in the FPF. This approval is effective September 1, 2023 and is given with the understanding that an eligibility determination of individual projects for funding must be met, and INDOT must ensure the satisfaction of all administrative and statutory requirements, as well as address the corrective actions outlined in the attached report.

If you have questions or need additional information concerning our approval and the FPF, please contact Ms. Erica Tait of the FHWA Indiana Division at (317) 226-7481, or by email at erica.tait@dot.gov, or Mr. Tony Greep of the FTA Region 5 Office at (312) 353-1646, or by email at anthony.greep@dot.gov.

Sincerely,

KELLEY BROOKINS
Digitally signed by KELLEY BROOKINS
Date: 2023.08.31 17:33:15 -05'00'

Kelley Brookins
Regional Administrator
FTA Region V

Sincerely,

JERMAINE R HANNON
Digitally signed by JERMAINE R HANNON
Date: 2023.09.01 11:46:31 -04'00'

Jermaine R. Hannon
Division Administrator
FHWA Indiana Division

INDIANA DEPARTMENT OF TRANSPORTATION

100 North Senate Avenue
Room N758-Executive Office
Indianapolis, Indiana 46204

PHONE: (855) 463-6848

Eric Holcomb, Governor
Michael Smith, Commissioner

August 28, 2023

Mr. Jermaine R. Hannon, Division Administrator
FHWA Indiana Division
575 North Pennsylvania St., Room 254
Indianapolis, IN 46204

Ms. Kelley Brookins, Regional Administrator
FTA Region 5
200 West Adams St.
Suite 320
Chicago, IL 60606-5253

Dear Mr. Hannon /Ms. Brookins:

The Indiana Department of Transportation is pleased to submit its FY 2024-2028 Statewide Transportation Improvement Program (STIP) for review and approval by your offices.

Included in the final submitted document is a listing of the state's expansion/preservation and local small urban and rural and rural transit projects. The following Metropolitan Planning Organization TIPs will be included in the FY 2024-2028 STIP by reference.

Area Plan Commission of Tippecanoe County (APCTC) FY 2024-2028
- https://www.tippecanoe.in.gov/DocumentCenter/View/40728/FY-2024-2028-TIP-including-0-amendments

Bloomington-Monroe County Metropolitan Planning Organization (BMCMPO) FY 2024-2028
- https://bloomington.in.gov/sites/default/files/2023-08/BMCMPO%20FY%202024%20-%202028%20TIP%20-%2006-30-23%20-%20ADOPTED%20FINAL.pdf

Columbus Area Metropolitan Planning Organization (CAMPO) FY 2024-2028
- https://www.columbus.in.gov/planning/tip/

Delaware-Muncie Metropolitan Plan Commission (DMMPC) FY 2022-2025
- *Including Amendments/modifications through 2/14/23*
- https://www.co.delaware.in.us/egov/documents/1692987897_47263.pdf

Evansville Metropolitan Planning Organization (EMPO) FY 2024-2028
- http://www.evansvillempo.com/Docs/TIP/TIP_2024-2028/TIP_2024-2028.pdf

Kokomo-Howard County Governmental Coordinating Council (KHCGCC) FY 2022-2026
- *Including Amendments/modification through 7/28/23*
- https://www.kokomompo.com/project/tip-2020-2024/

Kentuckiana Regional Planning and Development Agency (KIPDA) FY 2023-2026
- https://www.kipda.org/wp-content/uploads/2023/05/FY2023-TIP-FINAL-5-25.pdf

Indianapolis Metropolitan Planning Organization (IMPO) FY 2024-2027
- https://www.indympo.org/whats-underway/irtip

Michiana Area Council of Governments (MACOG) FY 2024-2028
- http://www.macog.com/docs/transportation/tip/approved/fy2028tip_projects.pdf

Madison County Council of Governments (MCCOG) FY 2022-2026
- *Including Amendments/modifications through 7/28/23*
- https://irp.cdn-website.com/65a760a0/files/uploaded/TIP%202022-2026%20-%20updated%205-1-23.pdf

Northeastern Indiana Regional Coordinating Council (NIRCC) FY 2024-2028
- https://www.nircc.com/uploads/1/2/9/8/129837621/final_2024-2028_tip_5-25-23.pdf

Northwestern Indiana Regional Planning Commission (NIRPC) FY 2022-2026
- *Including Amendments/modifications through 7/25/23*
- https://nirpc.org/2040-plan/mobility/transportation-improvement-program/

Ohio-Kentucky-Indiana Regional Council of Governments (OKI) FY 2024-2027
- https://www.oki.org/transportation-planning/transportation-improvement-program-tip/

Terre Haute Area Metropolitan Planning Organization (THAMPO) FY 2024-2028
- https://www.terrehautempo.com/images/THAMPO_2024_2028_AdoptionTIP.pdf

In addition, INDOT has expanded our public involvement process by taking advantage of virtual meeting techniques and allowing accessibility to online documents, materials, virtual meeting registration, recorded virtual meetings, and comment forms. INDOT also leveraged our planning partner contacts (MPOs, RPOs, LTAP), social media, and notifications sent to local libraries, housing authorities, senior aging centers, and local newspapers across the state.

We greatly appreciate FHWA/FTA support in the development of the STIP 2024-2028 and look forward to working together to achieve our mutual goals. Should you have any questions pertaining to this amendment, please contact April Leckie, STIP Administration at 317-232-5466 or at aleckie@indot.in.gov.

Sincerely,

Michael Smith, Commissioner
Indiana Department of Transportation

Attachments have been removed for the purposes of this NEPA document.

cc: (w/enclosure): Angelica Salgado, FTA
Cecilia Crenshaw, FTA
Erica Tait, FHWA
Lyndsay Quist, INDOT
Kristin Brier, INDOT
Kathy Eaton-McKalip, INDOT
Louis Feagans, INDOT
April Leckie, INDOT
Roy Nunnally, INDOT
Larry Buckel, INDOT
Jay Mitchell, INDOT
Jason Casteel, INDOT
Michael McNeil, INDOT

TO: **Mary Margaret Moffett**
Indiana Department of Transportation
100 North Senate Ave., N758
Environmental Services Division
Indianapolis, IN 46204

FROM: **Jack Sinton**
HNTB Corporation
111 Monument Circle, Suite 1200
Indianapolis, IN 46204

DATE: **October 12, 2023**

SUBJECT: **Des. No. 2002553, South County Line Road Expansion**
Draft Greenhouse Gas Analysis

1 Introduction

On January 9, 2023, the Council on Environmental Quality (CEQ) issued the *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change.* This is interim guidance to assist agencies in analyzing greenhouse gas (GHG), the climate change effects of their proposed actions, and the potential impacts of climate change on the proposed action under the National Environmental Policy Act (NEPA). CEQ issued the guidance as interim guidance, is seeking public comment on the guidance, and intends to either revise it in response to public comments or finalize it. CEQ's intent with the interim guidance is to provide greater clarity and more consistency in how agencies address climate change in NEPA reviews. CEQ intended the interim guidance to be immediately implemented upon its release.

Following CEQ guidance, this analysis compares the global warming potential (GWP) and the social cost of greenhouse gas (GHG) emissions between project alternatives across the lifespan of the project. The analysis considers the preferred alternative and the no build alternative in the opening year (2025) and design year (2045) for the County Line Road project. While traffic studies had considered additional build alternatives, this alternative is not the preferred build alternative and had not been required to go through other areas of the CE guidance. This analysis finds that GHG emissions under the build alternative will be less than the no-build alternative.

2 Project Overview

South County Line Road links I-69/SR 37 and SR 135 on the south side of Indianapolis, Indiana and is a primary arterial serving both Marion and Johnson counties. SR 37 is being upgraded to a new segment of I-69, which is projected for completion in 2024. Traffic forecasts indicated County Line Road is at or near its capacity as well as is a bottleneck in the regional transportation system. To ensure continued accessibility and mobility, Indianapolis Department of Public Works (DPW) intends to upgrade County Line Road from its existing two-lane configuration to four through-lanes plus a two-way turn lane. DPW also will construct a new sidewalk and a separated bike path alongside the upgraded roadway. The project is planned to cost $38,590,000 and will be constructed beginning in 2024.

3 Analysis Framework

The following analysis compares build and no-build alternatives for GHG emissions from two primary sources: vehicular traffic and infrastructure. The US Environmental Protection Agency (USEPA) identifies three major types of GHGs: carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4)[1]. These gases do not contribute to climate change equally. There is both a difference in the amount of each gas that is emitted by an activity, and there is a difference in the amount of heat that a given quantity of gas can trap in the atmosphere. The latter is known as a gas' Global Warming Potential (GWP). GWP is used to compare and aggregate the effects of these gases.

To understand the project's influence on climate change, the total GWP is calculated for the build and no-build alternatives. Vehicular traffic emissions are calculated from traffic forecasts for the study area and USEPA guidance on GHG emissions by gallon of fuel consumed and miles traveled (Table 1)[2]. Emissions from construction and operations and maintenance are calculated using the Federal Highway Administration (FHWA) Infrastructure Carbon Estimator (ICE) tool.[3] Overall, vehicular emissions result in a substantial majority of GHG emissions. Ultimately, this analysis finds that overall GHGs will *decrease* under the build alternative when compared to the no-build, primarily due to a decrease in system-wide VMT.

3.1 Vehicular Emissions

Estimates of vehicular GHG hinge on fuel consumption forecasts. These forecasts consider three aspects: vehicle fuel efficiency, vehicle-miles-traveled (VMT), and vehicle speed.

Fuel efficiency, measured in miles traveled per gallon of fuel (MPG), may be considered under both existing fuel efficiencies and projected improvements in fuel efficiency due to emissions standards and electric vehicle adoption. The US Energy Information Administration (EIA) projects fleet fuel efficiency to steadily increase through 2050.[4] Projected equivalent miles-per-gallon (MPGe) for the US auto and truck fleet is shown in Figure 1. Existing fuel efficiencies are modeled as the initial year (2022) of the EIA forecasts: 24.4 MPG for autos and 7.5 MPG for trucks.

[1] https://www.epa.gov/ghgemissions/understanding-global-warming-potentials

[2] USEPA. (2016). *Greenhouse Gas Inventory Guidance: Direct Emissions from Mobile Combustion Sources*. https://www.epa.gov/sites/default/files/2016-03/documents/mobileemissions_3_2016.pdf

[3] https://www.fhwa.dot.gov/environment/sustainability/energy/tools/carbon_estimator/index.cfm

[4] US EIA. (2023). *Annual Energy Outlook 2023: Table 40: Light-Duty Vehicle Miles per Gallon by Technology Type; Case: Reference Case.* See entry under "Average Vehicle Stock Miles per Gallon"
US EIA. (2023). *Annual Energy Outlook 2023: Table 49: Freight Transportation Energy Use; Case: Reference Case.* See entry under "Average Fuel Efficiency"

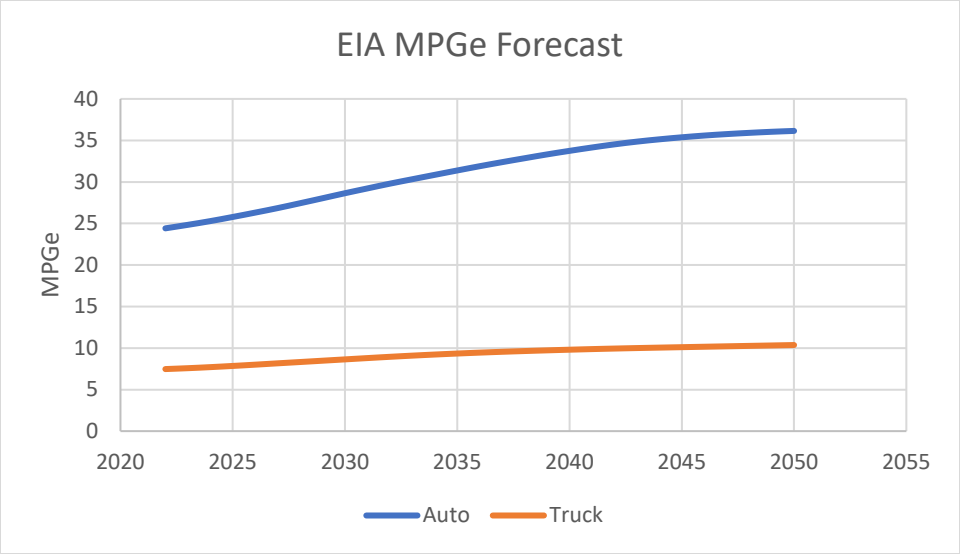


Figure 1: US EIA Annual Energy Outlook 2023 forecasts for fleet MPGe

Fuel efficiency values are combined with VMT projections to estimate total gallons of fuel consumed and the subsequent GHG emissions. The VMT projections were determined in a previous traffic forecasting analysis[5] and consider automobile and truck VMT under both the no-build and build alternatives. The original traffic analysis utilized the Indianapolis Regional Travel Demand Model. The use of a regional model accounts for induced effects outside of the direct project area. An extended study area gives better estimates of true emissions impacts due to traffic volume changes as a result of the project. Traffic projections anticipate both auto and truck VMT to decrease at the network level in the build alternative when compared to the no-build alternative.

CO_2 emissions may be determined on a per gallon basis utilizing the rates in Table 1, and N_2O and CH_4 emissions are determined on a per mile traveled basis. This assumes that autos primarily use gasoline as their fuel source while trucks use diesel fuel. As the USEPA does not provide N_2O and CH_4 emissions rates per gallon, any improvements in fuel efficiency are assumed to apply to N_2O and CH_4 on a proportional basis (i.e., if fuel efficiency improves by 4%, emissions would improve by 4%).

Table 1: GHG emissions rates

Vehicle Type	Fuel Type	GHG Source	Emission Rate per Gallon (g/gal)	Emission Rate per Mile (g/mi)
Auto	Gasoline	Carbon Dioxide (CO_2)	8,780[6]	N/A
		Nitrous Oxide (N_2O)	N/A	0.0066[7]

[5] Indianapolis DPW, South County Line Road: 2022 INFRA Grant. May 2022.

[6] CO_2 emissions are given in grams per gallon in table A-1 of the *Greenhouse Gas Inventory Guidance.* They are converted to grams per mile using an average 22 miles per gallon of gasoline for automobiles and 6.6 miles per gallon of diesel for trucks.

[7] NO_2 and CH_4 rates are from Table B-1 of the *Greenhouse Gas Inventory Guidance.* The gasoline rate for N_2O is obtained from the value for vans, pickups, and SUVs from the years 2008-present. The gasoline rate for CH_4 is obtained from the value for passenger cars from the years 2009-present. These years are used because the majority of automobiles on the road are from years post-2009. The higher emissions value between passenger car versus van/pickup/SUV is chosen to provide a reasonable worst-case scenario.

5. Traffic Analysis included in the 2022 INFRA Grant, May 2022 included in this document on pages H 17-38 for reference.

		Methane (CH_4)	N/A	0.0173
Trucks	Diesel	Carbon Dioxide (CO_2)	10,210	N/A
		Nitrous Oxide (N_2O)	N/A	0.0048[8]
		Methane (CH_4)	N/A	0.0051[6]

Speed effects consider the impacts on emissions due to changes in congestion between the no-build and build alternatives. Traffic projections for VMT are combined with estimates of vehicle-hours-traveled (VHT) to determine average vehicle speed. This is done for trucks and autos in the no-build and build alternatives. The most recent Cal-B/C tool[9] provides a lookup table of fuel consumption rates (in gallons per vehicle mile) as a function of vehicle speed. From this, one may determine MPG as a function of speed and an appropriate adjustment coefficient (k) for fuel efficiency (Figure 2). The adjustment coefficient for speed (s) may be calculated as the ratio of the MPG at that speed to the maximum MPG.

$$k_s = \frac{MPG_s}{\max(MPG)}$$

Adjustment factors for non-integer speed values are determined via interpolation. This adjustment factor is applied to estimated total gallons consumed prior to calculating total emissions. The N_2O and CH_4 emissions rates are similarly adjusted in the same manner as for fuel efficiency improvements. In general, the traffic forecasts predict slightly more fuel-efficient speeds under the build alternative than the no-build.

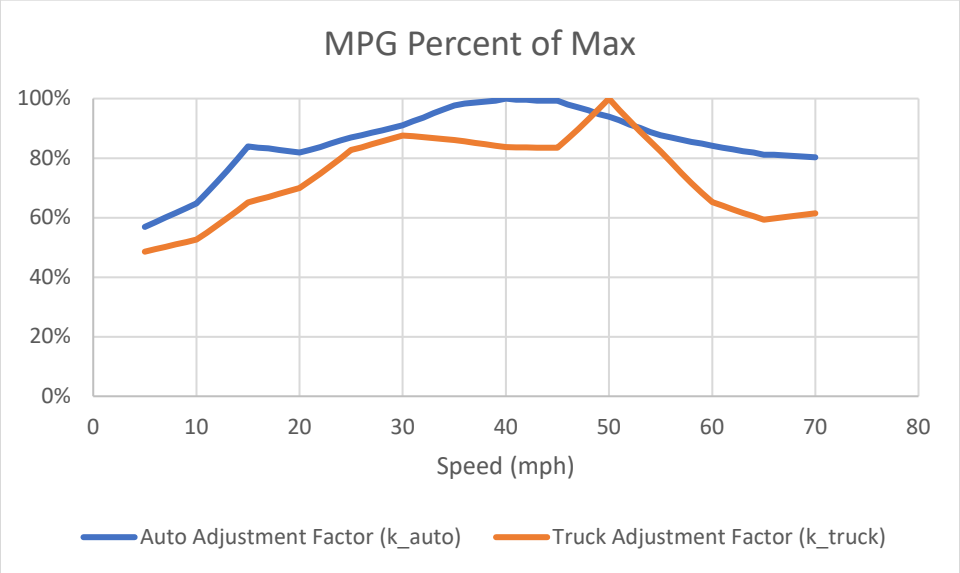


Figure 2: MPG adjustment factor for speed (derived from Cal-B/C data)

Emissions are then converted to GWP via Table 2. Conversion of GHG emissions to social costs is accomplished by applying the Social Cost of Greenhouse Gas estimates provided by the Interagency

[8] Diesel rates for N_2O and CH_4 are for medium/heavy-duty vehicles.

[9] Fuel Consumption Rates Table from Cal-B/C SB-1 Emissions Calculator (XLSM), found at https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/data-analytics-services/transportation-economics. Downloaded on August 21, 2023.

Working Group on Social Cost of Greenhouse Gases (2021)[10]. Social costs account for real-world impacts of climate change, such as rising sea levels, increased wildfire and flooding activity, and droughts. However, it should be noted that social cost estimates are inherently conservative as they are unable to account for all types of societal damages, such as ocean acidification.

Table 2: GWP values[11]

	Carbon Dioxide (CO_2)	Nitrous Oxide (N_2O)	Methane (CH_4)
GWP Factor (per metric ton of GHG)	1	273	28.5

The guidance from the Interagency Working Group[10] provides values of social cost for the three GHGs in 2020 dollars per metric ton at a variety of discount rates (Table 3). The discount rate of 3% has been chosen to follow the USDOT's 2023 benefit-cost analysis guidance. The discount rate is used to adjust future impacts of GHG emissions to a current dollar value. As rates are provided on a five-year basis from 2020-2050, values have been linearly interpolated between the five year-values to obtain costs for all years of the analysis.

Table 3: Social cost of GHGs at a 3% discount rate[10]. Units are 2020 dollars per metric ton of gas.

Emissions Year	CO_2 ($)	N_2O ($)	CH_4 ($)
2020	51	18,000	1,500
2025	56	21,000	1,700
2030	62	23,000	2,000
2035	67	25,000	2,200
2040	73	28,000	2,500
2045	79	30,000	2,800
2050	85	33,000	3,100

When not adjusting for improved fuel efficiency/electrification, the build alternative is projected to result in an average annual decrease of 3,543 GWP compared to the no-build alternative. This is an average annual decrease in social cost of $251,775. However, when considering improvements in fuel efficiency/electrification, the average annual decrease in emissions is only 2,649 GWP; the average annual decrease in social cost is $186,816. See Figure 3 for annual values.

The decrease in emissions is greater without adjusting for fuel efficiency improvements. This is because the build scenario is projected to reduce VMT. Thus, lower fuel efficiencies will result in larger reductions in gallons consumed for the same reduction in miles traveled. Regardless of the build or no-build scenario, total regional emissions under both alternatives are projected to drop below current levels when accounting for fuel efficiency/electrification improvements (Figure 4).

[10] https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

[11] Compiled from https://www.epa.gov/ghgemissions/understanding-global-warming-potentials. As the EPA provides a GWP range for CH_4, the median value is used.

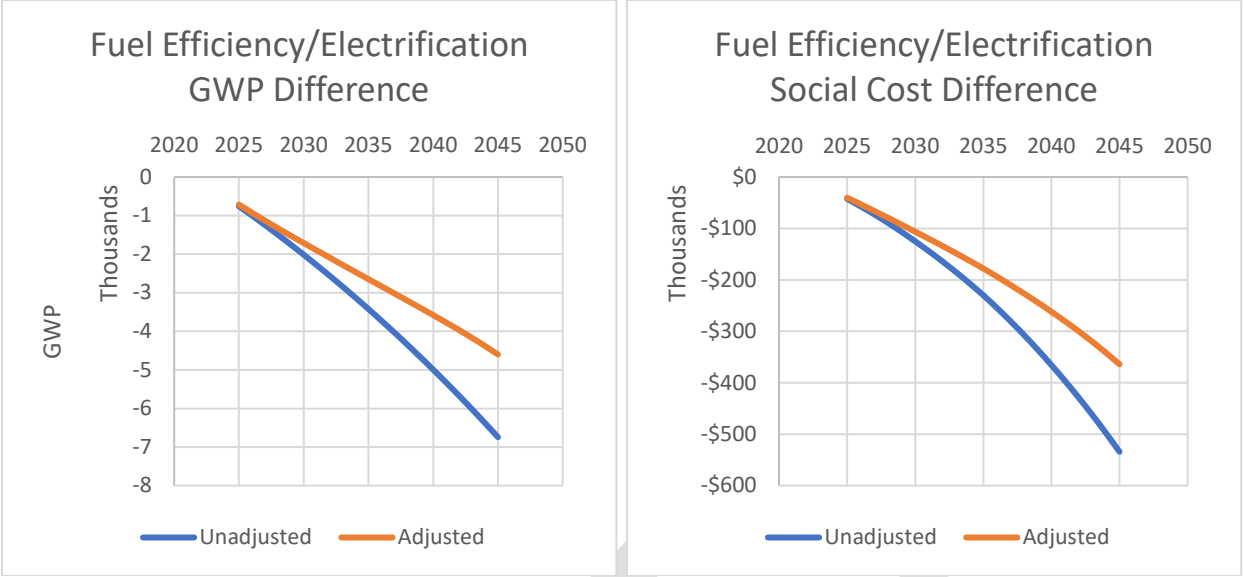


Figure 3: Difference between build and no-build vehicular GWP and social costs with and without adjusting for improvements in fuel efficiency/electrification

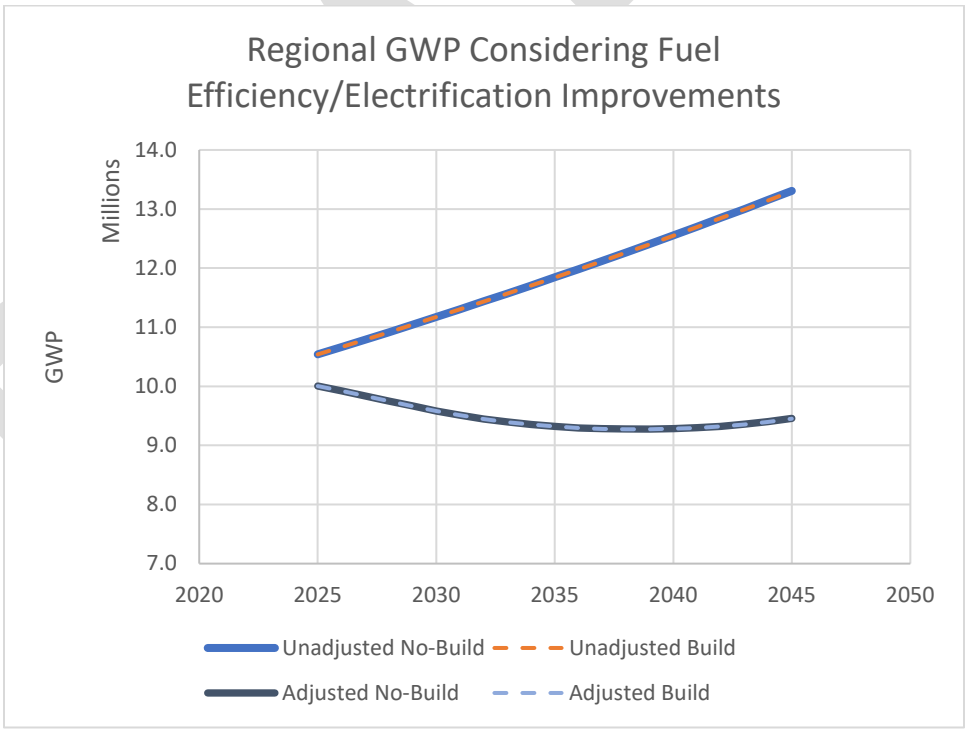


Figure 4: Effects of fuel efficiency and electrification improvements on GWP

3.2 Infrastructure Emissions

Infrastructure emissions – considered herein as construction and roadway operations and maintenance (O&M) – area determined via the FHWA ICE tool. The estimates pertain to a project's lifetime. In this case, the lifetime is determined to be 20 years, from 2025-2045. The construction year is defined as 2024.

Critical inputs to the ICE tool for the build alternative are listed in Table 4. Inputs for the no-build include only O&M of the existing infrastructure.

Table 4: ICE tool inputs

Category	Input	Value
General	Infrastructure location	Indiana
	Project lifetime (years)	20
Bridge	Number of single-span bridges	2
	Average number of lanes per structure	5
Culvert	Number of culverts	66
	Average culvert length (ft)	55
Bike/Ped	Off-street bicycle or pedestrian path – new construction (mi)	2.32
	On-street sidewalk – new construction (mi)	2.32
Roadway	Total existing centerline miles	2.32
	Total newly constructed centerline miles	0.1
	Existing roadway – urban principal arterials (lane-miles)	4.64
	Construct additional lane – urban principal arterials (lane-miles)	6.96
	Lane widening – urban principal arterials (lane-miles)	4.64
	New roadway – urban minor arterials/collectors (lane-miles)	0.2
	Include roadway rehabilitation activities	Yes

The tool's outputs in GWP[12] are listed in Table 5. The tool's outputs include emissions from materials production, transportation of construction materials, construction itself, and operations and maintenance. As the materials, transportation, and construction emissions are all directly related to the construction of the build alternative, these emissions are wholly allocated to 2024. As O&M is an ongoing procedure, annual emissions are considered and allocated evenly across all post-construction years. O&M is expected to result in slightly higher emissions under the build scenario due to the proposed increase in lane-miles.

Social costs for infrastructure GHGs are determined in the same way as for vehicular GHGs; construction under the build alternative results in $245,555 in social costs, while O&M social costs vary between $2,000-$8,000 (Figure 3).

Table 5: GHG emissions (GWP) from construction, and O&M

	No Build	Build	Difference
Materials (Total)	0	2,805	2,805
Transportation (Total)	0	301	301
Construction (Total)	0	1,358	1,358
Total Construction-Related Emissions (2024)	0	4,465	4,465
Annual O&M Emissions (2025-2045)	41	102	62

[12] The Infrastructure Carbon Estimation tool provides outputs in metric tons of CO2e, which is equivalent to GWP.

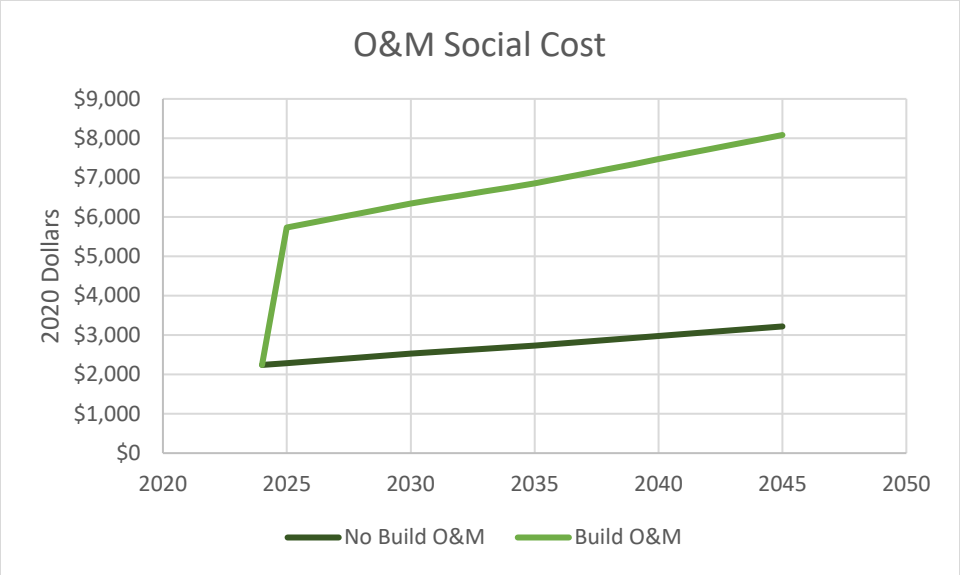
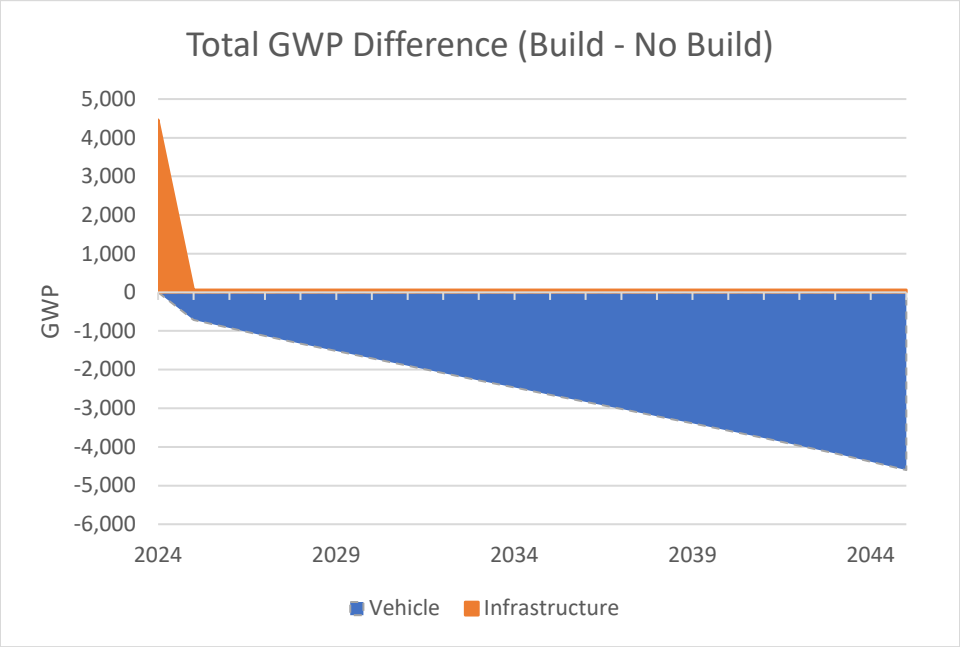


Figure 5: Social cost of infrastructure O&M

3.3 Total Emissions Effects

As noted above, the foremost GHG emissions sources from this project are anticipated to be vehicular and infrastructure emissions. Emissions are analyzed by considering the anticipated change in the build alternative over the no-build. The significant majority of infrastructure emissions (and social cost) are anticipated in the construction year (2024), and subsequent infrastructure emissions in the form of O&M are anticipated to be minimal. Vehicular emissions are anticipated to decrease throughout the project's lifetime when comparing the build to the no-build (Figure 6). Diminishing vehicular emissions are due to decreased auto and truck network-level VMT and more fuel-efficient speeds as a result of the project.



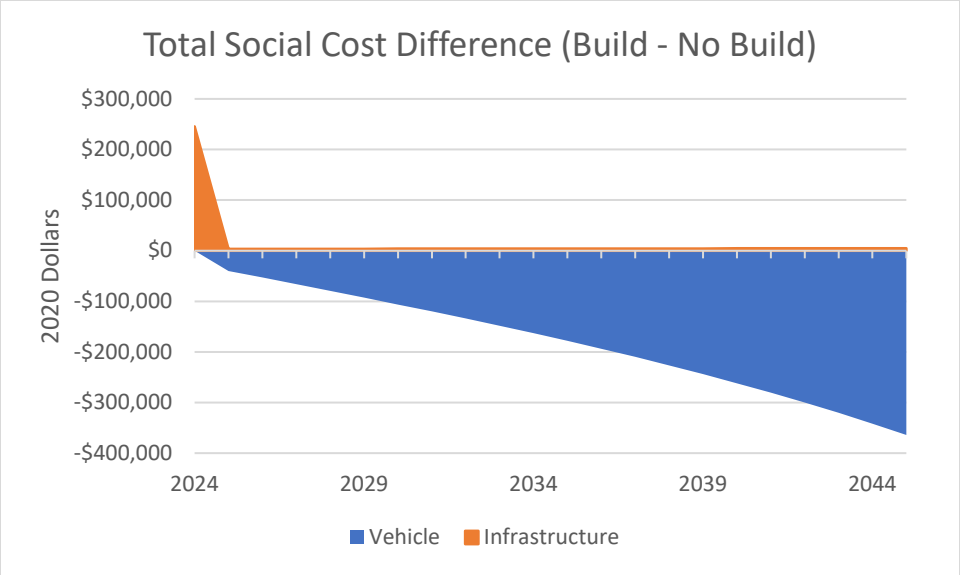


Figure 6: The annual change in the build scenario's GWP and social cost over the no-build by emissions source (when adjusting for fuel efficiency/electrification improvements)

While the construction emissions in 2024 are substantially higher than the initial years' improvements in vehicular emissions, the long-run vehicular improvements significantly outweigh the initial GHG outlay from construction. Across the 20-year project lifespan, cumulative emissions are anticipated to decrease by nearly 50,000 GWP, which is approximately a $3.77 million savings in social cost (Figure 7)[13]. In general, it may be said that this project produces a net benefit with respect to GHGs.

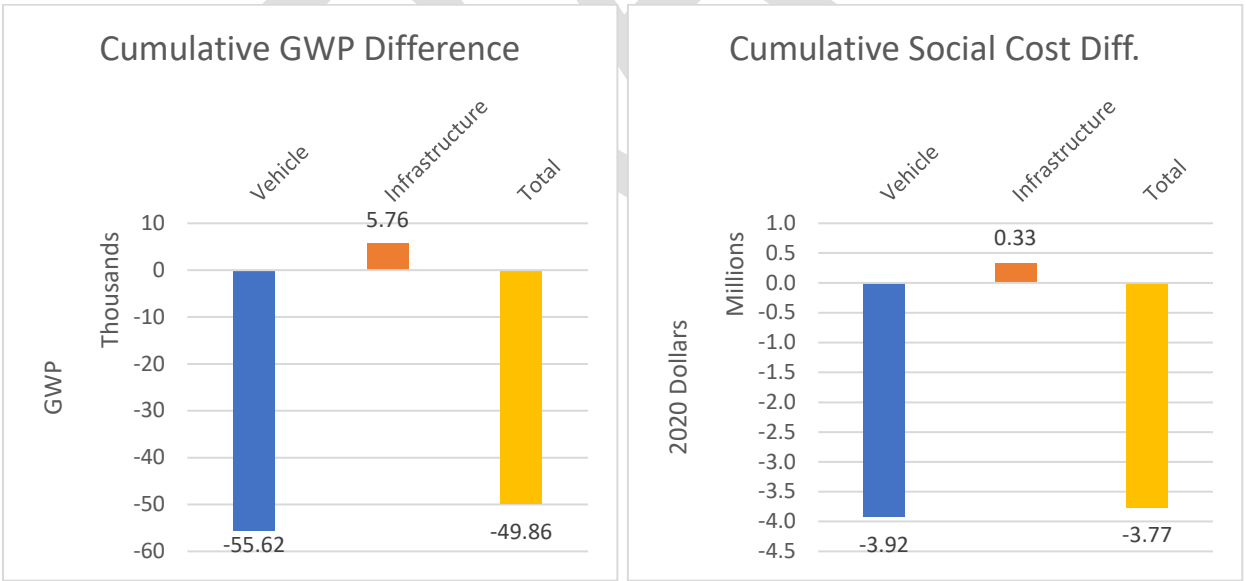


Figure 7: The cumulative change in the build scenario's GWP and social cost over the no-build by emissions source (when adjusting for fuel efficiency/electrification improvements)

4 Mitigation Procedures

In alignment with federal requirements and guidelines established in the Bipartisan Infrastructure Law (BIL) and other federal policies, INDOT is developing a carbon reduction strategy (CRS) to support efforts

[13] When adjusting for improvements in fuel efficiency/electrification

to reduce carbon dioxide (CO_2) emissions from the transportation sector in Indiana. The CRS is being developed in consultation with Metropolitan Planning Organization (MPO) partners and FHWA. It is anticipated the CRS will identify different potential transportation projects and/or strategies that can support carbon reduction. These may include, but may not be limited to, electric vehicles/alternatives fuels, active transportation, transportation demand management, and other technology solutions.

Mitigation for stream, wetland, and floodway habitat impacts will be completed using the Indiana Department of Natural Resources (IDNR) In-Lieu Fee Mitigation Program. This program involves the restoration, establishment, enhancement and/or preservation of aquatic resources through funds paid to the IDNR to satisfy compensatory mitigation requirements for permits. Impacts to suitable bat habitat impacts beyond 100 feet from a road will be mitigated through payment to the Range-wide In-Lieu Fee Program, The Conservation Fund. The Conservation Fund creates consolidated landscape-level mitigation for multiple smaller impacts for bats.

4.1 Special Considerations for Biological GHG Sources and Sinks

Tree removal as a part of this project will be mitigated with tree planting. The project team anticipates approximately 13.5 acres plus an additional 1,000 trees removed. Approximately 4 acres plus 2,000 trees will be planted as a part of the project. The GHG impacts of the removal/planting of these quantities of trees are negligible when compared to the vehicular and infrastructure emissions. The study team does not anticipate additional changes in land use within the study area that would interrupt biological processes that emit/reduce carbon.

5 Climate Resiliency

5.1 Affected Environment

The affected environment under the no-build scenario has an annual emissions rate of 10.5 million GWP across the Indianapolis region[14] in 2025 when considering status-quo fuel efficiency/electrification rates. Under the no build, GWP is anticipated to increase 26% to 13.3 million by 2045.

The above values represent an emissions future that does not see substantial improvements in vehicle fuel efficiency over current values. However, fuel efficiency values from the US EIA (as detailed in Section 3.1) project improving fuel efficiency across the US automobile and truck fleets through 2045. When these fuel efficiency improvements are applied to the analysis, this results in a -5% decrease in GWP region-wide by 2045.

5.2 Effects

Indianapolis Department of Public Works (DPW) will maintain County Line Rd within the study area. Climate change could potentially impact County Line Rd within the project area. Increased frequency and size of storm events could cause flooding. Upgrades to culverts and detention basins within the project area as part of the preferred alternative will help alleviate this compared to the existing condition. Extreme heat could result in damage to the pavement. The project will add an additional 10 acres of impervious surface to the project area. Indianapolis is approximately 368 square miles (257,920 acres). The additional impervious surface would be less than 0.005% of the total size of the city. Although the

[14] As mentioned in Section 3.1, traffic analyses were performed using the Indianapolis Regional Travel Demand Model

additional impervious surface could contribute to heat island effects, it would be a small percentage of the city size and other impervious sources.

Additional roadway maintenance may be required to account for the effects of climate change. It is anticipated this would be required for the build and no-build conditions.

5.3 Using Available Assessments and Scenarios to Assess present and Future Impacts

A National Oceanic and Atmospheric Administration (NOAA) assessment of daily temperature forecasts in Marion County[15] forecasts temperature trends under two scenarios: low and high future emissions. The low scenario predicts a future where emissions stop increasing by 2040 and reduce through 2100. The high scenario predicts a future where emissions continually increase through 2100. The NOAA tool compares temperature forecasts to an average from 1961-1990. The high forecast results in an average growth of 11.0° F (6.1° C) by 2100, while the low forecast yields a growth of 6.3° F (3.5° C) by 2100.

Both values are above global goals of limiting climate change to 1.5° and 3° C. Thus, to approach the global goal of 3° C in Marion and Johnson counties, it is necessary to be below to the low temperature forecast. The build scenario predicts lower overall GHG emissions than the no-build. This would surpass NOAA's low scenario, which projects emissions to stop increasing by 2040.

5.4 Resilience and Adaptation

The Count Line Road project includes new culverts and stormwater detention to avoid increasing the rate at which water leaves the project area. Flows leaving the project area will match or be reduced (where not contributing to a stream) from the existing condition. This will minimize impacts from potential flooding related to increased impervious surface from the project.

New culverts will be sized in accordance with INDOT design standards which account for 100-year storm event. INDOT utilizes the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 2, Volume 3 to determine precipitation rates for their standards. INDOT design standards are based on historical precipitation events and do not account for projected rainfall events.

6 Conclusion

This analysis compares the build and no-build alternatives for the County Line Road project. The primary emissions sources are from vehicular traffic and from infrastructure (construction and O&M) sources. While construction is anticipated to cause increased GHGs in 2024, the following years expect less emissions in the build scenario than the no-build due to a relative decrease in network-wide VMT. Ultimately, the build alternative results in nearly 50,000 less GWP and social cost savings of $3.77 million.

[15] The NOAA Climate Explorer: https://crt-climate-explorer.nemac.org/climate_graphs/

Existing ADT Information for County Line ATL Project

Station U49201
County Line Road, between SR 37 and Morgantown Road

	2014	2019 Estimate*
Pos	2723	
Neg	2854	
	5577	9650

Station U49202
County Line Road, between Railroad Road and SR 135

	2014	2019 Estimate*
Pos	6169	
Neg	5872	
	12041	14450

Station 491553
County Line Road, 100 feet east of Illinois Street

	2009	2013	2016	2019
Pos	8329	7632	10843	9635
Neg	7855	6914	11229	8640
Total	16184	14546	22072	18275

Station 41W074
Morgantown Road, 0.1 miles south of County Line Road

	2011	2012	2016	2019
Pos	3042	2971	3532	3721
Neg	3160	3155	3940	4374
	6202	6126	7472	8095

Station 41W009
Morgantown Road, between County Line Road and Bluff Road

	2013	2019
Pos	2592	2451
Neg	2791	3037
	5383	5488

Station 41W016
Railroad Road, between County Line Road and Stop 11 Road

	2013	2019
Pos	2132	2630
Neg	2388	2988
	4520	5618

*See following pages for 2019 ADT Estimates

2019 ADT Estimate for County Line Road near Morgantown Road
(Based on 2014 24-hr counts and 2019 peak period counts)

	West of Morgantown			East of Morgantown		
Hour	2019 Count	Percent of 2014 Daily Count	Estimated Daily Count	2019 Count	Percent of 2014 Daily Count	Estimated Daily Count
7-8	591	3.21%	18,399	626	3.21%	19,488
8-9	592	5.73%	10,330	629	5.73%	10,976
4-5	691	7.16%	9,646	755	7.16%	10,540
5-6	741	8.25%	8,983	810	8.25%	9,819

Eliminate 7am-8am hour from above as outlier. Average the estimated daily count from the remaining 3 hours:

Estimated 2019 ADT =	**9,653**	**West of Morgantown Road**
	10,445	**East of Morgantown Road**

September 4-5, 2014 Daily Count Volumes, SR 37 to Morgantown Road

Hour	EB	WB	Sum	% of Daily Volume
00:00 - 01:00	26	29	55	0.83%
01:00 - 02:00	27	20	47	0.71%
02:00 - 03:00	11	13	24	0.36%
03:00 - 04:00	13	11	24	0.36%
04:00 - 05:00	7	5	12	0.18%
05:00 - 06:00	20	34	54	0.81%
06:00 - 07:00	47	72	119	1.79%
07:00 - 08:00	97	116	213	3.21%
08:00 - 09:00	187	193	380	5.73%
09:00 - 10:00	238	188	426	6.42%
10:00 - 11:00	186	154	340	5.13%
11:00 - 12:00	157	154	311	4.69%
12:00 - 13:00	194	147	341	5.14%
13:00 - 14:00	180	172	352	5.31%
14:00 - 15:00	190	189	379	5.72%
15:00 - 16:00	195	222	417	6.29%
16:00 - 17:00	219	256	475	7.16%
17:00 - 18:00	265	282	547	8.25%
18:00 - 19:00	291	307	598	9.02%
19:00 - 20:00	268	257	525	7.92%
20:00 - 21:00	188	187	375	5.66%
21:00 - 22:00	126	170	296	4.46%
22:00 - 23:00	70	130	200	3.02%
23:00 - 24:00	53	68	121	1.82%
TOTAL	3255	3376	6631	100.00%

2019 ADT Estimate for County Line Road near Railroad Road
(Based on 2014 24-hr counts and 2019 peak period counts)

	West of Railroad			East of Railroad		
Hour	2019 Count	Percent of 2014 Daily Count	Estimated Daily Count	2019 Count	Percent of 2014 Daily Count	Estimated Daily Count
7-8	636	0.73%	87,558	902	0.73%	124,178
8-9	649	1.77%	36,769	913	1.77%	51,725
4-5	846	5.72%	14,780	888	5.72%	15,514
5-6	821	6.72%	12,219	899	6.72%	13,380

Eliminate am peak hours from above, as patterns have changed. Average the estimated daily count from the PM peak hours:

Estimated 2019 ADT =	**13,500**	**West of Railroad Road**
	14,447	**East of Railroad Road**

September 9-10, 2014 Daily Count Volumes, Morgantown Road to Railroad Road

Hour	EB	WB	Sum	% of Daily Volume
00:00 - 01:00	83	180	263	1.91%
01:00 - 02:00	61	79	140	1.02%
02:00 - 03:00	31	55	86	0.62%
03:00 - 04:00	18	19	37	0.27%
04:00 - 05:00	17	19	36	0.26%
05:00 - 06:00	7	11	18	0.13%
06:00 - 07:00	28	42	70	0.51%
07:00 - 08:00	58	42	100	0.73%
08:00 - 09:00	177	66	243	1.77%
09:00 - 10:00	602	191	793	5.76%
10:00 - 11:00	621	231	852	6.19%
11:00 - 12:00	512	247	759	5.51%
12:00 - 13:00	399	247	646	4.69%
13:00 - 14:00	407	293	700	5.08%
14:00 - 15:00	366	355	721	5.24%
15:00 - 16:00	434	411	845	6.14%
16:00 - 17:00	373	415	788	5.72%
17:00 - 18:00	413	512	925	6.72%
18:00 - 19:00	489	670	1159	8.42%
19:00 - 20:00	523	727	1250	9.08%
20:00 - 21:00	532	622	1154	8.38%
21:00 - 22:00	410	510	920	6.68%
22:00 - 23:00	307	425	732	5.32%
23:00 - 24:00	185	345	530	3.85%
TOTAL	7053	6714	13767	100.00%

Location Info	
Location ID	U49201_POS
Type	I-SECTION
Functional Class	3
Located On	COUNTY LINE RD S
Between	SR 37 and Morgantown Road
Direction	POS
Community	Indianapolis
MPO_ID	
HPMS ID	
Agency	Indiana Department of Transportation

Count Data Info	
Start Date	9/4/2014
End Date	9/5/2014
Start Time	11:00 AM
End Time	11:00 AM
Direction	
Notes	indot
Count Source	CO LINE RD S
File Name	U49201_POS_Co Line Rd S.prn
Weather	
Study	
Owner	jdunn

Interval: 60 mins	
Time	**Hourly Count**
00:00 - 01:00	26
01:00 - 02:00	27
02:00 - 03:00	11
03:00 - 04:00	13
04:00 - 05:00	7
05:00 - 06:00	20
06:00 - 07:00	47
07:00 - 08:00	97
08:00 - 09:00	187
09:00 - 10:00	238
10:00 - 11:00	186
11:00 - 12:00	157
12:00 - 13:00	194
13:00 - 14:00	180
14:00 - 15:00	190
15:00 - 16:00	195
16:00 - 17:00	219
17:00 - 18:00	265
18:00 - 19:00	291
19:00 - 20:00	268
20:00 - 21:00	188
21:00 - 22:00	126
22:00 - 23:00	70
23:00 - 24:00	53
TOTAL	3255

Location Info	
Location ID	U49201_NEG
Type	I-SECTION
Functional Class	3
Located On	COUNTY LINE RD S
Between	SR 37 and Morgantown Road
Direction	NEG
Community	Indianapolis
MPO_ID	
HPMS ID	
Agency	Indiana Department of Transportation

Count Data Info	
Start Date	9/4/2014
End Date	9/5/2014
Start Time	11:00 AM
End Time	11:00 AM
Direction	
Notes	indot
Count Source	CO LINE RD S
File Name	U49201_NEG_Co Line Rd S.prn
Weather	
Study	
Owner	jdunn

Interval: 60 mins	
Time	**Hourly Count**
00:00 - 01:00	29
01:00 - 02:00	20
02:00 - 03:00	13
03:00 - 04:00	11
04:00 - 05:00	5
05:00 - 06:00	34
06:00 - 07:00	72
07:00 - 08:00	116
08:00 - 09:00	193
09:00 - 10:00	188
10:00 - 11:00	154
11:00 - 12:00	154
12:00 - 13:00	147
13:00 - 14:00	172
14:00 - 15:00	189
15:00 - 16:00	222
16:00 - 17:00	256
17:00 - 18:00	282
18:00 - 19:00	307
19:00 - 20:00	257
20:00 - 21:00	187
21:00 - 22:00	170
22:00 - 23:00	130
23:00 - 24:00	68
TOTAL	3376

Location Info	
Location ID	U49202_POS
Type	I-SECTION
Functional Class	3
Located On	COUNTY LINE RD S
Between	Railroad Rd and SR 135
Direction	POS
Community	Indianapolis
MPO_ID	
HPMS ID	
Agency	Indiana Department of Transportation

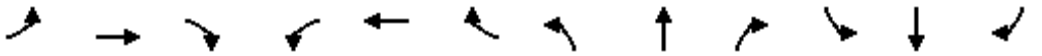
Count Data Info	
Start Date	9/9/2014
End Date	9/10/2014
Start Time	3:00 PM
End Time	3:00 PM
Direction	
Notes	indot
Count Source	CO LINE RD S
File Name	U49202_POS_Co Line Rd S.prn
Weather	
Study	
Owner	jdunn

Interval: 60 mins	
Time	**Hourly Count**
00:00 - 01:00	83
01:00 - 02:00	61
02:00 - 03:00	31
03:00 - 04:00	18
04:00 - 05:00	17
05:00 - 06:00	7
06:00 - 07:00	28
07:00 - 08:00	58
08:00 - 09:00	177
09:00 - 10:00	602
10:00 - 11:00	621
11:00 - 12:00	512
12:00 - 13:00	399
13:00 - 14:00	407
14:00 - 15:00	366
15:00 - 16:00	434
16:00 - 17:00	373
17:00 - 18:00	413
18:00 - 19:00	489
19:00 - 20:00	523
20:00 - 21:00	532
21:00 - 22:00	410
22:00 - 23:00	307
23:00 - 24:00	185
TOTAL	7053

Location Info	
Location ID	U49202_NEG
Type	I-SECTION
Functional Class	3
Located On	COUNTY LINE RD S
Between	Railroad Rd and SR 135
Direction	NEG
Community	Indianapolis
MPO_ID	
HPMS ID	
Agency	Indiana Department of Transportation

Count Data Info	
Start Date	9/9/2014
End Date	9/10/2014
Start Time	3:00 PM
End Time	3:00 PM
Direction	
Notes	indot
Count Source	CO LINE RD S
File Name	U40202_NEG_Co Line Rd S.prn
Weather	
Study	
Owner	jdunn

Interval: 60 mins	
Time	**Hourly Count**
00:00 - 01:00	180
01:00 - 02:00	79
02:00 - 03:00	55
03:00 - 04:00	19
04:00 - 05:00	19
05:00 - 06:00	11
06:00 - 07:00	42
07:00 - 08:00	42
08:00 - 09:00	66
09:00 - 10:00	191
10:00 - 11:00	231
11:00 - 12:00	247
12:00 - 13:00	247
13:00 - 14:00	293
14:00 - 15:00	355
15:00 - 16:00	411
16:00 - 17:00	415
17:00 - 18:00	512
18:00 - 19:00	670
19:00 - 20:00	727
20:00 - 21:00	622
21:00 - 22:00	510
22:00 - 23:00	425
23:00 - 24:00	345
TOTAL	6714



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	242	28	40	200	27	100	355	23	28	60	7
Future Volume (veh/h)	14	242	28	40	200	27	100	355	23	28	60	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1796	1856	1856	1900	1841	1841	1900	1900	1900	1737	1900	1900
Adj Flow Rate, veh/h	15	266	31	45	227	31	111	394	26	32	68	8
Peak Hour Factor	0.91	0.91	0.91	0.88	0.88	0.88	0.90	0.90	0.90	0.88	0.88	0.88
Percent Heavy Veh, %	7	3	3	0	4	4	0	0	0	11	0	0
Cap, veh/h	317	382	45	313	414	57	534	470	31	245	377	44
Arrive On Green	0.02	0.23	0.23	0.05	0.26	0.26	0.08	0.27	0.27	0.04	0.23	0.23
Sat Flow, veh/h	1711	1631	190	1810	1585	216	1810	1763	116	1654	1668	196
Grp Volume(v), veh/h	15	0	297	45	0	258	111	0	420	32	0	76
Grp Sat Flow(s),veh/h/ln	1711	0	1821	1810	0	1802	1810	0	1879	1654	0	1865
Q Serve(g_s), s	0.3	0.0	7.9	1.0	0.0	6.5	2.4	0.0	11.1	0.8	0.0	1.7
Cycle Q Clear(g_c), s	0.3	0.0	7.9	1.0	0.0	6.5	2.4	0.0	11.1	0.8	0.0	1.7
Prop In Lane	1.00		0.10	1.00		0.12	1.00		0.06	1.00		0.11
Lane Grp Cap(c), veh/h	317	0	426	313	0	471	534	0	501	245	0	421
V/C Ratio(X)	0.05	0.00	0.70	0.14	0.00	0.55	0.21	0.00	0.84	0.13	0.00	0.18
Avail Cap(c_a), veh/h	448	0	633	402	0	626	582	0	703	344	0	684
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.1	0.0	18.4	14.6	0.0	16.8	13.7	0.0	18.2	15.4	0.0	16.4
Incr Delay (d2), s/veh	0.1	0.0	2.1	0.2	0.0	1.0	0.2	0.0	6.3	0.2	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	3.0	0.3	0.0	2.4	0.9	0.0	5.0	0.3	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.1	0.0	20.5	14.8	0.0	17.8	13.9	0.0	24.5	15.7	0.0	16.6
LnGrp LOS	B	A	C	B	A	B	B	A	C	B	A	B
Approach Vol, veh/h		312			303			531			108	
Approach Delay, s/veh		20.3			17.3			22.3			16.4	
Approach LOS		C			B			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.9	17.8	9.5	17.4	6.5	19.2	7.4	19.5
Change Period (Y+Rc), s	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Max Green Setting (Gmax), s	5.0	18.3	5.4	19.3	5.0	18.3	5.0	19.7
Max Q Clear Time (g_c+I1), s	3.0	9.9	4.4	3.7	2.3	8.5	2.8	13.1
Green Ext Time (p_c), s	0.0	2.5	0.0	0.2	0.0	2.4	0.0	0.9

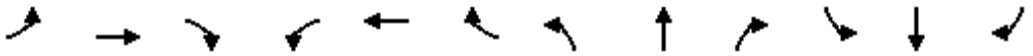
Intersection Summary	
HCM 6th Ctrl Delay	20.1
HCM 6th LOS	C

Intersection	
Intersection Delay, s/veh	52.4
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑			↑			↑	
Traffic Vol, veh/h	31	368	13	31	195	49	23	165	217	83	68	26
Future Vol, veh/h	31	368	13	31	195	49	23	165	217	83	68	26
Peak Hour Factor	0.92	0.92	0.92	0.84	0.84	0.84	0.86	0.86	0.86	0.90	0.90	0.90
Heavy Vehicles, %	3	3	0	0	5	6	0	0	0	0	0	4
Mvmt Flow	34	400	14	37	232	58	27	192	252	92	76	29
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	67.1	31.8	66	20.4
HCM LOS	F	D	F	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	8%	11%	47%
Vol Thru, %	41%	89%	71%	38%
Vol Right, %	54%	3%	18%	15%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	405	412	275	177
LT Vol	23	31	31	83
Through Vol	165	368	195	68
RT Vol	217	13	49	26
Lane Flow Rate	471	448	327	197
Geometry Grp	1	1	1	1
Degree of Util (X)	0.988	0.985	0.745	0.489
Departure Headway (Hd)	7.551	7.916	8.193	9.052
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	480	461	439	401
Service Time	5.583	5.955	6.284	7.052
HCM Lane V/C Ratio	0.981	0.972	0.745	0.491
HCM Control Delay	66	67.1	31.8	20.4
HCM Lane LOS	F	F	D	C
HCM 95th-tile Q	12.9	12.5	6.1	2.6



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	276	80	90	298	27	24	134	69	50	475	44
Future Volume (veh/h)	19	276	80	90	298	27	24	134	69	50	475	44
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1841	1885	1885	1900	1900	1900
Adj Flow Rate, veh/h	21	310	90	102	339	31	27	152	78	54	511	47
Peak Hour Factor	0.89	0.89	0.89	0.88	0.88	0.88	0.88	0.88	0.88	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	0	0	0	4	1	1	0	0	0
Cap, veh/h	282	376	109	274	520	48	191	366	188	431	563	52
Arrive On Green	0.02	0.27	0.27	0.06	0.30	0.30	0.03	0.31	0.31	0.05	0.33	0.33
Sat Flow, veh/h	1810	1415	411	1810	1715	157	1753	1174	603	1810	1714	158
Grp Volume(v), veh/h	21	0	400	102	0	370	27	0	230	54	0	558
Grp Sat Flow(s),veh/h/ln	1810	0	1826	1810	0	1872	1753	0	1777	1810	0	1872
Q Serve(g_s), s	0.6	0.0	14.4	2.8	0.0	12.0	0.7	0.0	7.2	1.4	0.0	19.9
Cycle Q Clear(g_c), s	0.6	0.0	14.4	2.8	0.0	12.0	0.7	0.0	7.2	1.4	0.0	19.9
Prop In Lane	1.00		0.22	1.00		0.08	1.00		0.34	1.00		0.08
Lane Grp Cap(c), veh/h	282	0	485	274	0	568	191	0	553	431	0	615
V/C Ratio(X)	0.07	0.00	0.82	0.37	0.00	0.65	0.14	0.00	0.42	0.13	0.00	0.91
Avail Cap(c_a), veh/h	371	0	557	295	0	570	267	0	674	479	0	710
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.5	0.0	24.1	18.4	0.0	21.1	18.0	0.0	19.0	15.2	0.0	22.4
Incr Delay (d2), s/veh	0.1	0.0	8.8	0.8	0.0	2.6	0.3	0.0	0.5	0.1	0.0	14.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	6.8	1.1	0.0	5.1	0.3	0.0	2.8	0.5	0.0	10.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.6	0.0	32.9	19.2	0.0	23.8	18.4	0.0	19.5	15.4	0.0	36.6
LnGrp LOS	B	A	C	B	A	C	B	A	B	B	A	D
Approach Vol, veh/h		421			472			257			612	
Approach Delay, s/veh		32.2			22.8			19.4			34.7	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.8	24.1	7.5	28.5	7.2	26.7	8.7	27.3
Change Period (Y+Rc), s	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Max Green Setting (Gmax), s	5.1	21.3	5.1	26.5	5.1	21.3	5.1	26.5
Max Q Clear Time (g_c+I1), s	4.8	16.4	2.7	21.9	2.6	14.0	3.4	9.2
Green Ext Time (p_c), s	0.0	2.2	0.0	1.0	0.0	2.8	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	28.7
HCM 6th LOS	C

Intersection	
Intersection Delay, s/veh	64.1
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑			↑			↑	
Traffic Vol, veh/h	25	293	22	67	325	37	68	102	109	68	188	88
Future Vol, veh/h	25	293	22	67	325	37	68	102	109	68	188	88
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.87	0.87	0.87	0.93	0.93	0.93
Heavy Vehicles, %	0	0	5	0	1	0	2	1	1	0	1	0
Mvmt Flow	27	315	24	72	349	40	78	117	125	73	202	95
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	51.3	102	38.8	51.4
HCM LOS	F	F	E	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	24%	7%	16%	20%
Vol Thru, %	37%	86%	76%	55%
Vol Right, %	39%	6%	9%	26%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	279	340	429	344
LT Vol	68	25	67	68
Through Vol	102	293	325	188
RT Vol	109	22	37	88
Lane Flow Rate	321	366	461	370
Geometry Grp	1	1	1	1
Degree of Util (X)	0.785	0.882	1.096	0.884
Departure Headway (Hd)	9.267	9.105	8.552	9.048
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	394	402	424	403
Service Time	7.267	7.105	6.633	7.048
HCM Lane V/C Ratio	0.815	0.91	1.087	0.918
HCM Control Delay	38.8	51.3	102	51.4
HCM Lane LOS	E	F	F	F
HCM 95th-tile Q	6.7	8.9	15.8	9

LOS D threshold for existing County Line Road configuration = 17,700 vpd x 90% x 80% = 12,744 vpd

TABLE 1

Generalized **Annual Average Daily** Volumes for Florida's **Urbanized Areas**

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	16,800	17,700	**
4	Divided	*	37,900	39,800	**
6	Divided	*	58,400	59,900	**
8	Divided	*	78,800	80,100	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	7,300	14,800	15,600
4	Divided	*	14,500	32,400	33,800
6	Divided	*	23,300	50,000	50,900
8	Divided	*	32,000	67,300	68,100

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways	- 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	2,900	7,600	19,700
50-84%	2,100	6,700	19,700	>19,700
85-100%	9,300	19,700	>19,700	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	2,800	9,500
50-84%	*	1,600	8,700	15,800
85-100%	3,800	10,700	17,400	>19,700

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	> 5	≥ 4	≥ 3	≥ 2
85-100%	> 4	≥ 3	≥ 2	≥ 1

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Core Urbanized

Lanes	B	C	D	E
4	47,400	64,000	77,900	84,600
6	69,900	95,200	116,600	130,600
8	92,500	126,400	154,300	176,600
10	115,100	159,700	194,500	222,700
12	162,400	216,700	256,600	268,900

Urbanized

Lanes	B	C	D	E
4	45,800	61,500	74,400	79,900
6	68,100	93,000	111,800	123,300
8	91,500	123,500	148,700	166,800
10	114,800	156,000	187,100	210,300

Freeway Adjustments

Auxiliary Lanes Present in Both Directions	Ramp Metering
+ 20,000	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
2	Undivided	8,600	17,000	24,200	33,300
4	Divided	36,700	51,800	65,600	72,600
6	Divided	55,000	77,700	98,300	108,800

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

[1]Values shown are presented as two-way annual average daily volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 1
(continued)

Generalized **Annual Average Daily** Volumes for Florida's **Urbanized Areas**

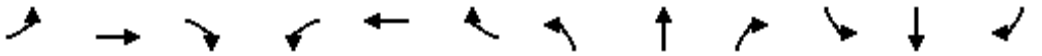
12/18/12

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities				Interrupted Flow Facilities					
					State Arterials				Class I	
	Freeways	Core Freeways	Highways		Class I		Class II		Bicycle	Pedestrian
ROADWAY CHARACTERISTICS										
Area type (u,lu)	lu	lu	u	u	u	u	u	u	u	u
Number of through lanes (both dir.)	4-10	4-12	2	4-6	2	4-8	2	4-8	4	4
Posted speed (mph)	70	65	50	50	45	50	30	30	45	45
Free flow speed (mph)	75	70	55	55	50	55	35	35	50	50
Auxiliary Lanes (n,y)	n	n								
Median (n, nr, r)			n	r	n	r	n	r	r	r
Terrain (l,r)	l	l	l	l	l	l	l	l	l	l
% no passing zone			80							
Exclusive left turn lane impact (n, y)			[n]	y	y	y	y	y	y	y
Exclusive right turn lanes (n, y)					n	n	n	n	n	n
Facility length (mi)	4	4	5	5	2	2	1.9	1.8	2	2
Number of basic segments	4	4								
TRAFFIC CHARACTERISTICS										
Planning analysis hour factor (K)	0.090	0.085	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Directional distribution factor (D)	0.547	0.547	0.550	0.550	0.550	0.560	0.565	0.560	0.565	0.565
Peak hour factor (PHF)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)			1,700	2,100	1,950	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	2.5	2.0
Local adjustment factor	0.91	0.91	0.97	0.98						
% left turns					12	12	12	12	12	12
% right turns					12	12	12	12	12	12
CONTROL CHARACTERISTICS										
Number of signals					4	4	10	10	4	6
Arrival type (1-6)					3	3	4	4	4	4
Signal type (a, c, p)					c	c	c	c	c	c
Cycle length (C)					120	150	120	120	120	120
Effective green ratio (g/C)					0.44	0.45	0.44	0.44	0.44	0.44
MULTIMODAL CHARACTERISTICS										
Paved shoulder/bicycle lane (n, y)									n, 50%, y	n
Outside lane width (n, t, w)									t	t
Pavement condition (d, t, u)									t	
On-street parking (n, y)										
Sidewalk (n, y)										n, 50%, y
Sidewalk/roadway separation(a, t, w)										t
Sidewalk protective barrier (n, y)										n

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highways		Arterials		Bicycle	Ped	Bus
	Density	Two-Lane %ffs	Multilane Density	Class I ats	Class II ats	Score	Score	Buses/hr.
B	≤ 17	> 83.3	≤ 17	> 31 mph	> 22 mph	≤ 2.75	≤ 2.75	≤ 6
C	≤ 24	> 75.0	≤ 24	> 23 mph	> 17 mph	≤ 3.50	≤ 3.50	≤ 4
D	≤ 31	> 66.7	≤ 31	> 18 mph	> 13 mph	≤ 4.25	≤ 4.25	< 3
E	≤ 39	> 58.3	≤ 35	> 15 mph	> 10 mph	≤ 5.00	≤ 5.00	< 2

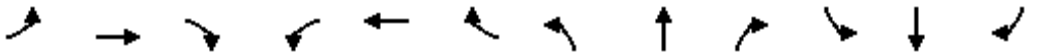
% ffs = Percent free flow speed ats = Average travel speed



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	1140	73	157	844	108	139	414	174	82	125	17
Future Volume (veh/h)	37	1140	73	157	844	108	139	414	174	82	125	17
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1796	1856	1796	1870	1826	1856	1870	1870	1870	1722	1870	1870
Adj Flow Rate, veh/h	40	1239	79	171	917	117	151	450	189	89	136	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	3	7	2	5	3	2	2	2	12	2	2
Cap, veh/h	245	1344	580	216	1428	647	431	473	400	183	419	355
Arrive On Green	0.04	0.38	0.38	0.07	0.41	0.41	0.08	0.25	0.25	0.06	0.22	0.22
Sat Flow, veh/h	1711	3526	1522	1781	3469	1572	1781	1870	1585	1640	1870	1585
Grp Volume(v), veh/h	40	1239	79	171	917	117	151	450	189	89	136	18
Grp Sat Flow(s),veh/h/ln	1711	1763	1522	1781	1735	1572	1781	1870	1585	1640	1870	1585
Q Serve(g_s), s	1.3	30.1	3.0	5.3	19.0	4.2	5.8	21.3	9.1	3.7	5.5	0.8
Cycle Q Clear(g_c), s	1.3	30.1	3.0	5.3	19.0	4.2	5.8	21.3	9.1	3.7	5.5	0.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	245	1344	580	216	1428	647	431	473	400	183	419	355
V/C Ratio(X)	0.16	0.92	0.14	0.79	0.64	0.18	0.35	0.95	0.47	0.49	0.32	0.05
Avail Cap(c_a), veh/h	282	1350	583	216	1428	647	440	473	400	183	419	355
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.3	26.5	18.1	21.5	21.1	16.8	23.7	33.0	28.5	26.8	29.2	27.4
Incr Delay (d2), s/veh	0.3	10.6	0.1	17.8	1.0	0.1	0.5	29.6	0.9	2.0	0.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	13.5	1.0	3.0	7.3	1.5	2.4	13.1	3.4	1.5	2.4	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.6	37.1	18.2	39.3	22.1	16.9	24.2	62.6	29.4	28.8	29.6	27.4
LnGrp LOS	B	D	B	D	C	B	C	E	C	C	C	C
Approach Vol, veh/h		1358			1205			790			243	
Approach Delay, s/veh		35.4			24.1			47.3			29.2	
Approach LOS		D			C			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.4	39.8	13.1	25.6	8.7	42.5	10.5	28.2
Change Period (Y+Rc), s	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Max Green Setting (Gmax), s	5.9	34.4	8.0	19.7	5.1	35.2	5.0	22.7
Max Q Clear Time (g_c+I1), s	7.3	32.1	7.8	7.5	3.3	21.0	5.7	23.3
Green Ext Time (p_c), s	0.0	2.1	0.0	0.4	0.0	10.5	0.0	0.0

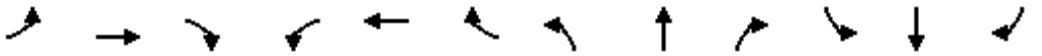
Intersection Summary	
HCM 6th Ctrl Delay	33.8
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	141	1321	58	101	877	103	42	192	237	210	141	73
Future Volume (veh/h)	141	1321	58	101	877	103	42	192	237	210	141	73
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1870	1870	1811	1870	1870	1870	1870	1870	1870	1826
Adj Flow Rate, veh/h	153	1436	63	110	953	112	46	209	258	228	153	79
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	2	2	6	2	2	2	2	2	2	5
Cap, veh/h	316	1578	710	200	1487	685	311	348	295	271	393	326
Arrive On Green	0.07	0.45	0.45	0.05	0.43	0.43	0.04	0.19	0.19	0.06	0.21	0.21
Sat Flow, veh/h	1767	3526	1585	1781	3441	1585	1781	1870	1585	1781	1870	1547
Grp Volume(v), veh/h	153	1436	63	110	953	112	46	209	258	228	153	79
Grp Sat Flow(s),veh/h/ln	1767	1763	1585	1781	1721	1585	1781	1870	1585	1781	1870	1547
Q Serve(g_s), s	4.2	33.3	2.0	3.0	19.1	3.8	1.8	9.0	13.9	5.5	6.2	3.7
Cycle Q Clear(g_c), s	4.2	33.3	2.0	3.0	19.1	3.8	1.8	9.0	13.9	5.5	6.2	3.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	316	1578	710	200	1487	685	311	348	295	271	393	326
V/C Ratio(X)	0.48	0.91	0.09	0.55	0.64	0.16	0.15	0.60	0.87	0.84	0.39	0.24
Avail Cap(c_a), veh/h	326	1586	713	207	1489	686	346	383	325	271	393	326
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.9	22.6	13.9	20.0	19.6	15.2	27.2	32.7	34.7	33.3	29.8	28.9
Incr Delay (d2), s/veh	1.1	8.2	0.1	2.9	0.9	0.1	0.2	2.2	21.0	20.5	0.6	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	14.1	0.7	1.2	7.1	1.3	0.8	4.2	6.9	3.6	2.7	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.1	30.8	14.0	22.8	20.5	15.3	27.4	34.9	55.7	53.8	30.4	29.2
LnGrp LOS	B	C	B	C	C	B	C	C	E	D	C	C
Approach Vol, veh/h		1652			1175			513			460	
Approach Delay, s/veh		28.8			20.2			44.7			41.8	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.2	44.8	8.9	24.0	11.5	43.5	11.0	21.8
Change Period (Y+Rc), s	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Max Green Setting (Gmax), s	5.0	39.5	5.1	18.4	6.5	38.0	5.5	18.0
Max Q Clear Time (g_c+I1), s	5.0	35.3	3.8	8.2	6.2	21.1	7.5	15.9
Green Ext Time (p_c), s	0.0	4.0	0.0	0.6	0.0	12.5	0.0	0.5

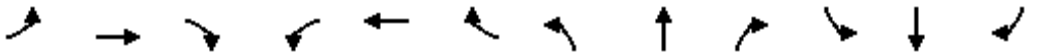
Intersection Summary	
HCM 6th Ctrl Delay	29.9
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	964	115	177	1212	70	52	230	204	155	581	102
Future Volume (veh/h)	39	964	115	177	1212	70	52	230	204	155	581	102
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1856	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	42	1048	125	192	1317	76	57	250	222	168	632	111
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	3	2	2	2	2	2
Cap, veh/h	144	1239	553	253	1419	633	150	581	493	398	660	559
Arrive On Green	0.03	0.35	0.35	0.08	0.40	0.40	0.04	0.31	0.31	0.08	0.35	0.35
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1767	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	42	1048	125	192	1317	76	57	250	222	168	632	111
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1767	1870	1585	1781	1870	1585
Q Serve(g_s), s	1.6	29.3	6.0	7.1	38.0	3.3	2.3	11.4	12.1	6.6	35.5	5.2
Cycle Q Clear(g_c), s	1.6	29.3	6.0	7.1	38.0	3.3	2.3	11.4	12.1	6.6	35.5	5.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	144	1239	553	253	1419	633	150	581	493	398	660	559
V/C Ratio(X)	0.29	0.85	0.23	0.76	0.93	0.12	0.38	0.43	0.45	0.42	0.96	0.20
Avail Cap(c_a), veh/h	168	1273	568	253	1419	633	165	601	509	405	670	568
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.6	32.3	24.7	24.6	30.8	20.4	28.4	29.4	29.7	21.7	34.0	24.2
Incr Delay (d2), s/veh	1.1	5.3	0.2	12.6	10.9	0.1	1.6	0.5	0.6	0.7	24.7	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	12.9	2.2	3.7	17.4	1.2	1.0	5.1	4.6	2.8	20.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.7	37.7	24.9	37.2	41.7	20.4	30.0	29.9	30.3	22.4	58.7	24.4
LnGrp LOS	C	D	C	D	D	C	C	C	C	C	E	C
Approach Vol, veh/h		1215			1585			529			911	
Approach Delay, s/veh		36.0			40.1			30.1			47.8	
Approach LOS		D			D			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.0	43.0	8.1	43.4	7.6	48.4	12.6	38.9
Change Period (Y+Rc), s	4.0	5.5	4.0	5.5	4.0	5.5	4.0	5.5
Max Green Setting (Gmax), s	9.0	38.5	5.0	38.5	5.0	42.5	9.0	34.5
Max Q Clear Time (g_c+I1), s	9.1	31.3	4.3	37.5	3.6	40.0	8.6	14.1
Green Ext Time (p_c), s	0.0	6.2	0.0	0.4	0.0	2.4	0.0	1.8

Intersection Summary	
HCM 6th Ctrl Delay	39.3
HCM 6th LOS	D



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	69	1037	52	147	1201	97	190	152	246	172	253	270
Future Volume (veh/h)	69	1037	52	147	1201	97	190	152	246	172	253	270
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1811	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	75	1127	57	160	1305	105	207	165	267	187	275	293
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	6	2	2	2	2	2	2	2	2	2
Cap, veh/h	211	1492	644	275	1565	698	301	426	361	350	384	325
Arrive On Green	0.05	0.42	0.42	0.07	0.44	0.44	0.09	0.23	0.23	0.07	0.21	0.21
Sat Flow, veh/h	1781	3554	1535	1781	3554	1585	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	75	1127	57	160	1305	105	207	165	267	187	275	293
Grp Sat Flow(s),veh/h/ln	1781	1777	1535	1781	1777	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	2.1	23.7	2.0	4.4	28.6	3.5	8.0	6.6	13.8	6.0	12.1	15.9
Cycle Q Clear(g_c), s	2.1	23.7	2.0	4.4	28.6	3.5	8.0	6.6	13.8	6.0	12.1	15.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	211	1492	644	275	1565	698	301	426	361	350	384	325
V/C Ratio(X)	0.36	0.76	0.09	0.58	0.83	0.15	0.69	0.39	0.74	0.53	0.72	0.90
Avail Cap(c_a), veh/h	227	1555	672	275	1595	712	301	436	369	350	393	333
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.1	21.7	15.4	17.5	21.8	14.8	26.0	28.8	31.5	27.1	32.6	34.1
Incr Delay (d2), s/veh	1.0	2.1	0.1	3.1	3.9	0.1	6.4	0.6	7.5	1.6	6.0	25.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	9.4	0.7	1.8	11.5	1.2	3.9	3.0	5.9	3.5	5.8	8.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.1	23.8	15.4	20.6	25.7	14.9	32.4	29.3	39.1	28.6	38.6	60.0
LnGrp LOS	B	C	B	C	C	B	C	C	D	C	D	E
Approach Vol, veh/h		1259			1570			639			755	
Approach Delay, s/veh		23.1			24.5			34.4			44.4	
Approach LOS		C			C			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.0	42.4	12.0	23.5	8.2	44.2	10.0	25.5
Change Period (Y+Rc), s	4.0	5.5	4.0	5.5	4.0	5.5	4.0	5.5
Max Green Setting (Gmax), s	6.0	38.5	8.0	18.5	5.0	39.5	6.0	20.5
Max Q Clear Time (g_c+I1), s	6.4	25.7	10.0	17.9	4.1	30.6	8.0	15.8
Green Ext Time (p_c), s	0.0	10.7	0.0	0.2	0.0	8.2	0.0	0.8

Intersection Summary	
HCM 6th Ctrl Delay	29.1
HCM 6th LOS	C

Intersection: 3: Morgantown Road & County Line Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	83	400	369	66	156	232	239	80	136	525	78	160
Average Queue (ft)	22	253	218	16	77	116	133	25	60	262	40	61
95th Queue (ft)	57	388	353	44	135	212	233	66	111	450	68	124
Link Distance (ft)	967	967	967	967	5238	5238	5238	5238	714	714	714	808
Upstream Blk Time (%)										0		
Queuing Penalty (veh)										0		
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 3: Morgantown Road & County Line Road

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	132	29
Average Queue (ft)	65	7
95th Queue (ft)	117	23
Link Distance (ft)	808	808
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Peterman Road/Railroad Road & County Line Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	156	375	382	40	120	303	249	66	73	200	195	342
Average Queue (ft)	64	200	210	10	52	173	129	20	26	106	88	146
95th Queue (ft)	124	351	364	28	101	270	231	46	59	179	158	300
Link Distance (ft)	5238	5238	5238	5238	778	778	778	778	807	807	807	975
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 6: Peterman Road/Railroad Road & County Line Road

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	143	60
Average Queue (ft)	62	24
95th Queue (ft)	118	53
Link Distance (ft)	975	975
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Intersection: 3: Morgantown Road & County Line Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	64	401	382	107	193	395	411	61	84	231	107	253
Average Queue (ft)	23	254	221	38	96	230	246	19	32	124	48	82
95th Queue (ft)	54	363	334	80	167	372	388	47	67	209	81	168
Link Distance (ft)	966	966	966	966	5244	5244	5244	5244	1152	1152	1152	1074
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 3: Morgantown Road & County Line Road

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	656	93
Average Queue (ft)	403	33
95th Queue (ft)	658	71
Link Distance (ft)	1074	1074
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Peterman Road/Railroad Road & County Line Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (ft)	99	346	368	86	149	365	328	59	201	169	172	168
Average Queue (ft)	38	197	212	18	71	223	191	18	100	76	81	77
95th Queue (ft)	81	333	352	58	128	319	294	43	171	136	144	139
Link Distance (ft)	5244	5244	5244	5244	779	779	779	779	1176	1176	1176	1068
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 6: Peterman Road/Railroad Road & County Line Road

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	301	111
Average Queue (ft)	145	56
95th Queue (ft)	257	91
Link Distance (ft)	1068	1068
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0