

PREPARED FOR:

CITY OF SANDY



ODOT



PREPARED BY DKS ASSOCIATES



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THIS REPORT PRESENTS THE FEASIBILITY REEVALUATION CONDUCTED FOR THE US 26 BYPASS PROJECT IDENTIFIED IN THE 2011 SANDY TRANSPORTATION SYSTEM PLAN (TSP). THE REPORT PROVIDES AN EXECUTIVE SUMMARY FOR EACH REEVALUATION PHASE: EXISTING AND FUTURE TRANSPORTATION SYSTEM PERFORMANCE, BENEFIT COST ANALYSIS, AND POLICY AND REGULATORY CONSIDERATIONS. THE DETAILED ANALYSIS FOR EACH OF THESE PHASES ARE DOCUMENTED IN THE APPENDIX MATERIALS. THE SANDY TSP IS CURRENTLY BEING UPDATED. THE TSP UPDATE PLANNING PROCESS WILL INCORPORATE THE FINDINGS AND RECOMMENDATIONS FROM THIS REEVALUATION OF THE BYPASS WHEN DEVELOPING THE MOTOR VEHICLE PROJECT LIST AND PRIORITIES.

EXISTING AND FUTURE TRANSPORTATION SYSTEM PERFORMANCE

EXISTING PERFORMANCE

The existing transportation system was evaluated along US 26 through Sandy, focused on the segment between the intersections of SE Orient Drive and Firwood Drive at Shorty's Corner. The existing transportation system performance analysis documented the current vehicle travel conditions through the City and provided a framework to compare and evaluate the effectiveness of a potential alternative route to US 26.

The existing conditions are based on October 2020 count data that was adjusted to represent the level of traffic that is typically encountered during the peak travel month. The existing motor vehicle operations analysis revealed that two intersections do not meet mobility targets during the peak hour; US 26/Orient Drive and US 26/362nd Drive. At both intersections, the eastbound though-traffic volume on US 26 is at or near the available capacity, a condition that has a significant impact on the overall operation of each intersection.

A travel pattern analysis was conducted using StreetLight data, a big-data provider that aggregates location-based information that can be analyzed to provide insight into travel behavior. The existing travel patterns in Sandy and on US 26 suggested around 30 to 40 percent of vehicles on US 26 would likely divert to a new bypass facility. The StreetLight data was also used to approximate existing travel times on US 26 through Sandy to determine potential benefits associated with a bypass project.

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¹ Sandy Transportation System Plan, DKS Associates, adopted December 2011.

FUTURE PERFORMANCE

Future improvement alternatives were previously developed as part of the 2011 Sandy Transportation System Plan (TSP)². Three of the prior TSP alternatives were carried forward and incorporated into this Sandy Bypass Feasibility Reevaluation, as described below. TSP Alternative #2 was not included in this study. The Future Transportation System Performance memo in the Appendix provides details on the alternatives and the operations analysis.

2040 No Build Alternative represented the existing system plus several roadway projects that are fully funded and/or currently in the design phase.

2040 Alternative #1 included several street connectivity projects and intersection capacity projects as shown in Figure 1, excluding the conceptual bypass alignment.

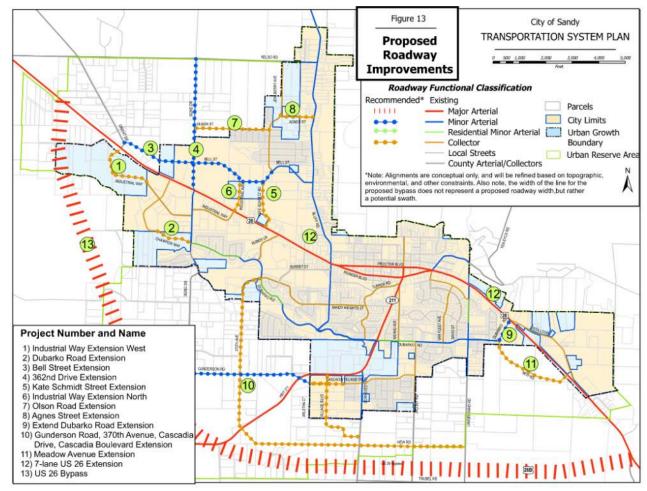


FIGURE 1: SANDY TSP MOTOR VEHICLE SYSTEM PLAN

² Sandy TSP Update, Technical Memo #2: Transportation Alternatives and Improvement Strategies, DKS Associates, February 25, 2011.



2040 Alternative #3 included all the same projects as Alternative #1 but added a bypass of the existing US 26 corridor around the south side of the City from a point west of Orient Drive to approximately Shorty's Corner.

Key findings from the future conditions alternative analysis include:

- Under the 2040 No Build Alternative, 8 study intersections (4 on US 26) would exceed mobility targets.
- With the addition of local connections and intersection improvements under 2040 Alternative #1, 6 study intersections (4 on US 26) would continue to exceed mobility targets.
- Adding the bypass under Alternative #3 would improve traffic operations, only one study intersection would continue to exceed mobility targets (US 26 and Orient Drive)
- Approximately 60% of bypass users during peak periods would represent through trips,
 40% would be local trips accessing the southern portion of Sandy.
- Approximately 1,500 vehicles an hour would use the bypass during the 2040 peak hour.
- Compared to the 2040 No Build Alternative, adding Alternative #1 improvements would reduce travel times on US 26 approximately 3 minutes 30 seconds travelling eastbound and 4 minutes travelling westbound
- Adding the Alternative #3 bypass facility to Alternative #1 improvements would reduce travel times an additional 4 minutes and 30 seconds travelling eastbound and no change travelling westbound on existing US 26.
- Under Alternative #3, the bypass facility would have shorter travel times through the study area compared to existing US 26, saving 1 minute travelling eastbound and 2 minutes 30 seconds travelling westbound.

BENEFIT COST ANALYSIS

A benefit cost analysis was conducted to provide a planning-level assessment of the potential benefits and costs associated with the bypass facility using performance measures related to the construction cost, value of travel time, safety, local businesses, and regulatory requirements. The following sections summarize the findings.

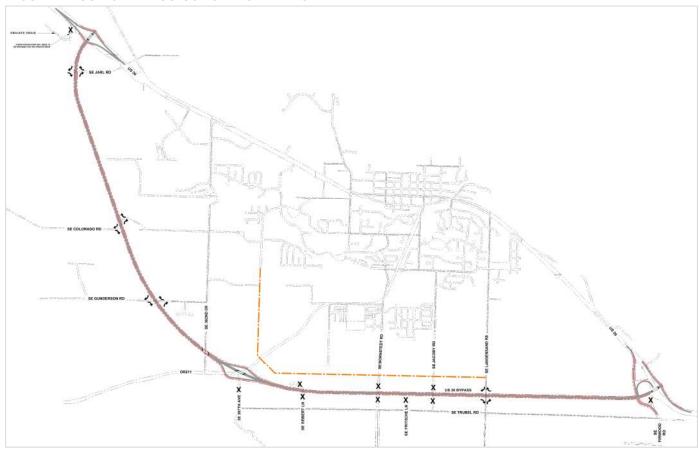
PREFERRED CONCEPTUAL ALIGNMENT

A conceptual alignment and planning-level cost estimate was developed for the bypass. The US 26 bypass conceptual alignment developed for the 2011 Sandy TSP was refined based on updated future traffic operations and more detailed design considerations for topography, environmental constraints, and freeway design standards.

The conceptual alignment for the bypass is shown in Figure 2 and Appendix Section 1. The bypass features and design parameters are summarized below.

- The facility would be located south of the Sandy Urban Growth Boundary and approximately 5.8 miles long.
- The west end of the bypass would connect to US 26 approximately 2,400 feet west of Orient Drive. The new intersection on US 26 would be an interchange configuration.
- The east end of the bypass would connect to US 26 at Firwood Road (Shorty's Corner). The existing intersection would be converted to an interchange configuration.
- The new bypass intersection with OR 211 would be an interchange configuration.
- The bypass facility would provide a grade separated overcrossing at 362nd Drive.
- The facility would provide a 120-foot-wide right-of-way to accommodate four travel lanes (two each direction), raised median, shoulder area, lighting, trees and public utility easement.





The primary purpose of the bypass is to serve regional traffic demand that currently travels on US 26 through Sandy. The interchanges at each end of the bypass and OR 211 would provide the primary access to the bypass. The rest of the facility would be limited to right-in/right-out access at key intersections to reduce conflicts and provide reliable free-flow traffic operations. The remaining streets that intersect the bypass conceptual alignment would be closed and an alternative street network would be provided.

A cost estimate was prepared based on a 10% design concept for the bypass shown in Figure 1. The total cost estimate accounts for construction, utility and slope easements, right-of-way acquisition and professional services to administer design and construction management. The cost estimate is approximately \$365 to \$390 million in current year 2021 dollars. The detailed cost estimate is shown in Appendix Section 2. The cost estimate when adjusted for inflation to represent year 2040 is approximately \$980 million to \$1 billion.

VALUE OF TIME IN TRAVEL

Comparing No Build and Alternative #3, the hourly time savings benefit during the 2040 peak hour is approximately \$3,700. If this benefit is realized for one hour every weekday, the annual benefit is estimated at \$1 million per year. If the benefit is realized for 6 hours every weekday, the annual benefit is estimate at \$6,000,000 per year. If this time savings benefit can be sustained for 20 years at an interest rate of 5%, the net present value of the benefit is approximately \$74.8 million.

Based on the travel time savings between Alternative #1 and Alternative #3 shown in Table 2, the hourly benefit during the 2040 peak hour is approximately \$1,900. If this benefit is realized for one hour every weekday, the annual benefit is estimated at \$500,000 per year. If the benefit is realized for 6 hours every weekday, the annual benefit is estimate at \$3,000,000 per year. If this time savings benefit can be sustained for 20 years at an interest rate of 5%, the net present value of the benefit is approximately \$37.4 million.

SAFETY ANALYSIS

A safety analysis was conducted for US 26 between the bypass end points. The most recent five years of available collision data, 2014 to 2018, was reviewed to document the severity of collisions and calculate the crash rate. The collision data compiled for the Sandy TSP Update is shown in Figure 3 and includes the focused US 26 safety data used for this analysis.

In total, the US 26 corridor experienced 338 crashes over the five-year study period, including four fatal crashes and five serious injury crashes. All four fatal crashes involved a driver under the influence of alcohol or drugs. The study corridor experienced a total of 213 crashes that were non-intersection related. Key findings include:

- The segment along US 26 between Ruben Lane and Bluff Road reported the highest number of crashes and the highest crash rate compared to the other segments.
- The top three collision types reported for segments were rear-end (56%), turning (16%), and sideswipe (13%).
- The top three contributing circumstances were reported failure to avoid (32%), failure to yield (16%), and following too close (14%).

Sandy Transportation System Plan Collisions '14-'18 Fatal Serious Injury Minor Injury Possible Injury 2018 SPIS Sites Streets City Limits 0.25 0.5 1 Miles Source: Oregon Department of Transportation, Data Resource Center (Oregon Metro), City of Sandy

FIGURE 3: SANDY SAFETY ASSESSMENT - 2014 TO 2018

It is estimated the construction of the bypass facility would moderately improve safety on US 26 between Orient Drive and Firwood Road. Based on the literature review, it is likely that the number of crashes on the existing US 26 through Sandy would be reduced if proper safety measures are implemented for the bypass construction. In particular, appropriate wayfinding signage and speed limit setting for both the main road and the new bypass would need to be planned thoughtfully for both local residents and regional travelers.

Overall, construction of the bypass facility is expected to reduce the level of traffic traveling on the existing US 26 and avoid vulnerable travelers (i.e. pedestrians and bicyclists) by rerouting traffic away from the commercial and downtown areas. Regional traffic travelling on the bypass facility would experience fewer conflict points compared to travelling on the existing US 26 through Sandy.

BENEFITS OR IMPACTS TO LOCAL BUSINESSES

Accounting for a city's unique characteristics and commercial competition outside the city is the only way to truly assess how a particular economy may be impacted by a new bypass. The City of Sandy is a mixed economic environment with local and big-box businesses. Many are auto-oriented and cater to highway pass-through traffic such as gas stations, convenience stores, drive-through coffee shops and fast food/high turnover restaurants. A major segment of retail customers are recreational visitors travelling through Sandy to Mt. Hood and Central Oregon. These unique customers support specialized local businesses such as outdoor equipment stores.

Some of these businesses serving pass through traffic may see an impact if their services cannot be easily replaced. For example, customers will need to determine if the travel time savings from taking the bypass outweighs the convenience of shopping in Sandy. Customers may choose to shop near their home before they leave or at their destination instead. Other existing auto-oriented businesses, such as gas stations, would likely be impacted by traffic diverted away from town and on to a bypass route. Customers may choose to stop for gas outside Sandy to save time travelling on the bypass. There are several gas stations to the east and west of Sandy within a few miles. The existing gas station at Firwood Road (Shorty's Corner) would be conveniently located on the east end of the bypass. Note that Sandy has a local gas tax that generates revenue to fund various transportation needs including facility maintenance. The diversion of vehicles to the bypass would likely reduce local gas tax revenue.

It is challenging to forecast the potential impact of the bypass to local businesses along US 26. With the forecasted local growth over the next 20 years, the associated local demand for goods and services could compensate for some of the business loss due to the bypass. However, the projected growth is based on the existing transportation system. With the bypass in place, the forecasted business growth along US 26 may decrease resulting in lower local demand for goods and services and an increased impact to future businesses. An analysis of employment data from 2018³ (the most recent year available) showed that approximately 5,000 Sandy residents work outside of the city, 3,000 workers commute into the city, and 600 residents work within the city. Of the 3,600 jobs within Sandy, most are classified as retail trade (25%) followed by accommodation and food services (15%) and educational services (12%). Of these, retail and food services may be the most vulnerable to impacts from a bypass.

The majority of the bypass alignment is outside the urban growth boundary and would travel through areas with rural zoning and land uses. Urban development would be prohibited, eliminating the possibility for new commercial development along the bypass that could compete with existing businesses on US 26. The biggest commercial competition is found in the Portland Metro area, approximately seven miles west of Sandy, which can provide almost all the retail and service businesses highway drivers could need.

³ https://onthemap.ces.census.gov/



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The bypass is forecasted to serve 1,500 vehicles peak hour in the 2040 peak hour. A portion of these vehicles are potential Sandy business customers that choose the travel time savings of the bypass over the convenience of shopping at a business on US 26. To counter that impact, lower traffic volumes on the highway may make downtown highway-fronting businesses more attractive for certain types of businesses.

US 26 JURISDICTIONAL TRANSFER TO THE CITY

A new bypass facility would be constructed and operated by ODOT. With the bypass in place, ODOT would transfer the jurisdiction of the existing section of US 26 being bypassed to the City. The ongoing maintenance and operation of the facility would be a cost burden for the City. This segment of US 26 is approximately 5 miles long with four to five travel lanes, street lighting, and numerous traffic signals. The average annual cost to maintain a comparable urban highway is \$20,000 to \$30,000 per mile. Over the next 20 years with inflation, the maintenance cost for the City is estimated to be \$5 to \$8 million.

The City taking jurisdiction of US 26 also brings opportunities to make local changes to the facility. Future traffic demand on the existing US 26 will decrease significantly with 1,500 vehicles during the peak hour diverting to the bypass. This demand reduction would potentially allow the reconstruction of the existing five-lane sections (outside the downtown couplet) to three-lanes and provide additional design features such as landscaping, wider sidewalks, protected bicycle lanes, median treatments, and diagonal parking with the extra roadway width. This would result in benefits to overall safety and livability and encourage more walking, biking, and transit activity. Reconstruction of US 26 would be a major capital project with potential modifications to traffic signals, drainage, utilities, street lighting, pavement markings and signage. Based on planning level cost estimates for comparable corridor reconstruction projects, the cost estimate could range from \$20 to \$40 million for improvements. When adjusted for inflation over the next 20 years, the corridor reconstruction cost estimate could range from \$55 to \$105 million. The conversion of US 26 to a three-lane facility could also significantly increase travel times through Sandy to the point it would be slower than Alternative #1. The safety and livability benefits should be balanced with the travel time impacts.

POLICY AND REGULATORY REQUIREMENTS

A detailed evaluation of the policy and regulatory considerations associated with a potential bypass was conducted for this analysis, as provided in the Appendix, Section 4 and summarized below.

The construction of a US 26 bypass around the city of Sandy represents a significant investment in public infrastructure with the potential to impact transportation, urban and rural lands, Goal 5 resources, and the local and regional economy. Demonstration of compliance with several related policies and regulations will need to be addressed if this alternative is pursued and further developed.

A preferred bypass alternative would be documented in a facility plan, ultimately adopted by the Oregon Transportation Commission (OTC) and ODOT, thereby amending the Oregon Highway Plan (OHP). Planning for new bypasses is governed by OHP Policy 1G: Major Improvements and Policy 1H: Bypasses. Policy 1G states that existing facilities should be maintained and enhanced to improve performance and safety before adding capacity. The construction of a new facility such as a bypass is categorized under the lowest level of priority under this policy. The planning process must demonstrate that alternatives that do not include a bypass cannot adequately support safety, growth management, and other livability and economic objectives.

Sandy and Clackamas County will need to work collaboratively on developing any necessary amendments to local plans (such as the comprehensive plan, TSPs, local land use, and subdivision codes) to ensure consistency with the facility plan for the proposed bypass. While both the state and the local governments adopt the facility plan, or elements thereof, the adoption processes are different and the roles and responsibilities for the different levels of government are not the same.

Both Sandy and Clackamas County would amend their respective TSPs to incorporate elements of the facility plan. Local approval may require the adoption of new transportation-related policies, consistent with the findings and supportive of the recommendations of the facility plan. New ordinances or amendments to existing ordinances, resolutions, and Inter-Governmental Agreements (IGA) may be necessary to ensure that the access management, the land use management, and the coordination elements of the facility plan are achieved. The approval process would include Planning Commission/City Council hearings with the City of Sandy and Planning Commission/County Commission hearings with Clackamas County.

The preferred bypass alignment would most likely impact County land designated for EFU or Forest use and the County would need to support adoption with goal exception findings.⁴ Following successful local adoption by the City and County, the facility plan could be presented to the OTC for its review and approval.

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⁴ Note that the adoption action is an amendment to the TSP, the transportation element of the local Comprehensive Plan. The comprehensive plan amendment becomes acknowledged after the 21-day appeal period and no appeals have been filed (see https://www.oregonlaws.org/ors/197.625.)

SCHEDULE AND FUNDING CONSIDERATIONS

Construction in 2040 is the soonest the bypass could reasonably be built due to the magnitude of the project. The general process for building a major infrastructure project is shown below. The primary challenges for the bypass project are related to regulations, acquiring right of way and funding that would likely extend the length of the process beyond 2040.



Major infrastructure projects use a wide variety of revenue and funding from federal, state, local, and private sources. Each phase of the project would likely be funded by multiple sources as they become available. ODOT receives about half a billion dollars from the Federal Highway Administration each year for construction projects on the state's roads, including the interstate, as well as planning and engineering. The State Highway Fund, collected from local fees and taxes, can be used for both construction projects and the day-to-day maintenance and operations of the state's roads.

The Statewide Transportation Improvement Program (STIP) is ODOT's capital improvement program for state and federally-funded projects. ODOT and the OTC allocate STIP funding to projects through a competitive process in coordination with a wide range of stakeholders and the public. The bypass project could be a candidate for the STIP Enhance program that funds projects to enhance or expand the transportation system. Area Commissions on Transportation recommend high-priority investments from state and local transportation plans in many of the Enhance programs. In addition, the Oregon legislature can pass a house bill to create new revenue sources and expand the state's investment in transportation system improvements.

The Dundee Bypass is a recent example of a major infrastructure project in Oregon. Phase 1 of the project constructed a four-mile facility which opened in 2018 and cost \$252 million. The \$22.4 million funding for Phase 2 design came from House Bill 2017 passed by the Oregon Legislature. Construction of Phase 2 is estimated at \$200 million but the source has not been identified.

TSP UPDATE PROCESS

The Sandy TSP is currently being updated and will consider the findings from this bypass reevaluation with the development of the revised motor vehicle projects and priorities. The TSP update will also assess the need for alternative mobility targets for US 26 at locations where meeting the existing ODOT mobility targets is infeasible or impractical based on specific criteria. If needed, alternative mobility targets will be developed as a TSP solution to address mobility and local growth objectives over the next 20 years. The bypass project is a potential long-term and unfunded TSP solution to address mobility and local growth objectives beyond 2040.

SUMMARY

To support the reevaluation of the US 26 bypass project, a planning-level assessment of the potential benefits and costs of the bypass was conducted with various measures of performance. The key findings are summarized in Table 1. These findings will contribute to TSP discussions and future decisions on pursuing the bypass concept.

TABLE 1: POTENTIAL COST AND BENEFIT SUMMARY OF BYPASS FACILITY

Measure	Cost/Impact	Benefit	Consideration
Project Planning and Construction Cost	Bypass would cost \$980 million to \$1 billion (in 2040 dollars) for construction, right-of-way acquisition, easements, design and construction management		The cost estimates are for planning purposes only and could change significantly due to the high level of uncertainty regarding the construction year, NEPA process and final design and alignment.
2040 Future Traffic Demand		Bypass is estimated to serve 1,500 vehicles during future peak hour. Existing US 26 is estimated to serve 2,300 vehicles during future peak hour.	Forecasting future demand estimated 40% of the total US 26 traffic would divert to the bypass facility.
2040 Future Travel Time		Adding the bypass to other Alternative #1 projects would save an additional 4 minutes and 30 seconds travelling eastbound and no savings travelling westbound on existing US 26. Under Alternative #3, the bypass would have shorter travel times compared to existing US 26, saving 1 minute travelling eastbound and 2 minutes 30 seconds travelling westbound.	Other roadway capacity projects are likely to be built by 2040 that would improve US 26 traffic flow and reduce the estimated time savings (5.5 minutes eastbound and 2.5 minutes westbound).
Travel Time Value		Save \$6 million per year, \$75 million over 20 years	Cost saving estimate is highly variable depending on future traffic patterns and duration of congested conditions.

Measure	Cost/Impact	Benefit	Consideration
Safety		Overall reduction in crashes on existing US 26 expected with lower volumes and fewer conflicts with pedestrians and cyclists downtown.	
Local Businesses	Diverts potential customers from highway-oriented businesses on US 26. Local gas tax revenue would likely be lower.	Reducing traffic volumes in the downtown area could increase walking and biking activity and make fronting businesses more attractive.	Current zoning and land use patterns encourage commercial development along the highway. A bypass outside the UGB would not allow for adjacent commercial development. If the bypass was inside the UGB, new adjacent commercial development may compete with businesses on US 26.
Jurisdictional Transfer to City	City would be responsible for US 26 maintenance after construction of the bypass, estimated to cost \$5 to 8 million over 20 years. Potential reconstruction of US 26 with reduced vehicle lanes and multimodal improvements could increase congestion and travel times through Sandy.	Potential reconstruction of US 26 with reduced vehicle lanes and multimodal improvements, estimated to cost \$55 to \$105 million	City would need to find new ongoing funding for maintenance. The cost for reconstruction is highly variable due to uncertainty regarding the final design and year of construction.
Policy and Regulation Requirements	Demonstration of compliance with numerous related policies, regulations and ordinances will need to be addressed to gain project approval.		Amendments to the Oregon Highway Plan require adoption by the OTC and ODOT. A robust NEPA planning process will be needed to address potential impacts to Goal 5 resources and designated forest use lands.

APPENDIX

CONTENTS

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SECTION 2. FUTURE TRANSPORTATION SYSTEM PERFORMANCE MEMO

SECTION 3. BENEFIT COST ANALYSIS MEMO

SECTION 4. POLICY AND REGULATORY CONSIDERATION MEMO



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SECTION 1. EXISTING TRANSPORTATION SYSTEM PERFORMANCE MEMO



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EXISTING TRANSPORTATION SYSTEM PERFORMANCE

DATE: April 19, 2020

TO: Project Management Team

FROM: Reah Flisakowski, Kevin Chewuk, Dock Rosenthal | DKS Associates

SUBJECT: Sandy Bypass Feasibility Reevaluation P# 20020-007

This memorandum summarizes the existing transportation conditions along US 26 through the City of Sandy, Oregon. This assessment generally includes the US 26 segment between the intersections with SE Orient Drive and Firwood Drive at Shorty's Corner. Analyzing the existing transportation system performance documents the current vehicle travel conditions through the City and provides a framework to compare and evaluate the effectiveness of a potential alternative route to US 26 as identified in the 2011 City of Sandy Transportation System Plan. A documentation of existing pedestrian, bicycle and transit conditions will be provided as part of the on-going update of the City's Transportation System Plan.

MOTOR VEHICLE CONDITIONS

Current operating conditions for vehicles along US 26 through the City were assessed using data on existing vehicle travel behavior and volumes.¹ The data includes information on where vehicle trips are coming from through the City, how much delay these trips experience and how long it takes them to make their trip. The following sections summarize this analysis.

TRAVEL PATTERN ANALYSIS

The travel pattern analysis was completed using StreetLight data. StreetLight data is a big data provider that aggregates a variety of location-based information and can provide insight into travel behavior. The StreetLight data was used to answer the following questions.

- What are the travel routes between highways (US 26 and OR 211) and various areas of the City?
- What is the typical travel time along US 26 through the City?

The zone structure shown in Figure 1 was used to evaluate these questions.

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¹ Traffic counts were collected on October 22, 2020.

StreetLight Anaysis Zone Structure * Proposed Bypass Intersections Preliminary Bypass Alignment External Gateways Internal Zones North South West Streets **US 26 W** City Limits NORTH WEST OR 211 **US 26 E** 0 0.250.5 1 Miles

FIGURE 1: STREETLIGHT ZONE STRUCTURE

- The North zone covers the portion of Sandy that is not expected to use a future bypass due to the proposed route south of the City.
- The South and West zones cover areas that could potentially benefit from access to a future bypass.
- The three highway segment zones, shown as black lines in the map, capture the trips entering and exiting the study area. For example, the US 26 W zone represents all trips coming from or going to places west of that segment. All trips between these zones are expected to use a future bypass.

TRAVEL ROUTES

Table 1 shows a breakdown of the proportion of total p.m. peak period trips (4 p.m. to 6 p.m.) that travel between the zones. As shown, most trips in the p.m. peak come from the west, enter Sandy via US 26 and end at some location in the North analysis zone. Similarly, most trips are coming from or going to US 26 W or the North analysis zone indicating that these areas are attractive locations for drivers. The zones that generate the most trips are US 26 W and the North zone, with 34 percent and 24 percent respectively. These zones also generate the most trip destinations, with the North zone more attractive with 30 percent of the destinations, while US 26 W attracts 21 percent.

Some other key highlights include:

- Internal trips (between the North, South and West zones) = 23%
- External trips (between US 26 W, US 26 E and OR 211)² = 18%
- Trips entering or exiting Sandy = 59%
- Highest activity: between US 26 W and the North zone = 22%

TABLE 1: PROPORTION OF TOTAL PM PEAK TRIPS BETWEEN ZONES

	US 26 W	US 26 E	OR 211	NORTH	SOUTH	WEST	Origin Total
US 26 W	0%	6%	2%	14%	6%	6%	34%
US 26 E	6%	0%	1%	2%	0%	1%	10%
OR 211	1%	1%	0 %	4%	2%	1%	9%
NORTH	8%	4%	3%	0 %	5%	4%	24%
SOUTH	3%	0%	1%	5%	0 %	1%	10%
WEST	3%	1%	2%	5%	2%	0%	13%
Destination Total	21%	12%	9%	30%	15%	13%	

The shaded cells in the table above represent the trips expected to use a future bypass.³

- The trips between the South zone and US 26 W, in either direction.
- Trips between the West zone and US 26 E, in either direction.

² The sensitivity of this result was tested by looking at the proportion of external trips for an average 24-hour period, for a typical daily volume, including weekend days. This resulted in a small increase to 21 percent.

³ Other origin-destination pairs in Table 1 are expected to remain on US 26 or use other local streets due the access restrictions assumed in the current configuration of the bypass. It is assumed that most drivers will avoid out-of-direction travel for local trips.

• Trips between the external highway zones (i.e., US 26 W, US 26 E and OR 211) are also expected to divert to the potential future bypass.

Based on these assumptions, a diversion proportion can be estimated at around 28 percent of the total p.m. peak period trips, which roughly correlates to 2,800 trips.

MOTOR VEHICLE OPERATIONS

Intersection turning movement counts were collected in October 2020. The ODOT traffic volume patterns report that monitors the impact of COVID-19 indicated that traffic volumes on US 26 were within five percent of 2019 volumes for the week counts were collected indicating that the collected counts were within a reasonable range and were appropriate to use for the subject analysis.

The methodology from the ODOT Analysis Procedures Manual was applied to determine the 30th highest annual hour volume (30 HV) for the study intersections. The 30 HV is commonly used for design purposes and represents the level of congestion that is typically encountered during the peak travel month.

To determine when the 30th highest annual hour volume occurs, data is examined from Automatic Traffic Recorder (ATR) stations that record highway traffic volumes year-round. If no on-site ATR is present, one with similar characteristics can be identified using ODOT's ATR Characteristics Table. If these do not produce a similar ATR with average annual daily traffic volumes (AADT) within 10% of study area volumes, the seasonal trend method should be used. The seasonal trend method averages seasonal trend groupings from the ATR Characteristics Table. For the study area, a nearby ATR (#26-033 US 26 near SE Powell Valley Road) was utilized to develop a calculated seasonal factor of 1.066. This factor was applied to the existing count data.

Jurisdictional Mobility Standards

The mobility standards for intersections vary according to the agency of jurisdiction for each intersection. Five of the study intersections are under City jurisdiction (362nd Drive/Industrial Way – North and South, Bluff Road/Bell Street, OR 211/Bornstedt, and OR 211/Dubarko) while the remaining 11 intersections are under ODOT jurisdiction. Current ODOT mobility targets require a volume to capacity ratio between 0.80 and 0.90 or less to be maintained at study intersections (see Table 2) and the City of Sandy operating standards require that a level of service "D" or better be maintained for any signalized intersection and unsignalized intersections with stop control on the minor approach⁴.

⁴City of Sandy Transportation System Plan (2011)

Existing Intersection Operations

Motor vehicle conditions were evaluated during the 2020 p.m. peak hour at the 16 study intersections (shown in Table 2). The evaluation utilized the Highway Capacity Manual (HCM) 6th Edition methodology. As shown, two intersections exceed current mobility targets, including the intersections of US 26 with Orient Drive and 362nd Drive. The US 26 intersection at Orient Drive serves high eastbound through traffic volumes and high southbound left traffic volumes that typically extend their green phases to the maximum length. These two movements are not served simultaneously so they require additional green time from the cycle that is not available resulting in the HCM analysis exceeding the mobility target. The US 26 intersection at 362nd Drive serves a high eastbound through volume that is approaching the available capacity of the existing timing and a high northbound left volume. Similar to the operations at US 26 and Orient Drive, these two movements require additional green time that is already allocated to other movements.

TABLE 2: EXISTING INTERSECTION OPERATIONS (2020)

STUDY INTERSECTION	CONTROL TYPE	JURISDICTION	MOBILITY TARGET	LEVEL OF SERVICE	DELAY (SECONDS)	V/C RATIO
US 26/ORIENT DRIVE	Signal	ODOT	0.80	С	33	0.90
US 26/362 ND DRIVE	Signal	ODOT	0.80	С	28	0.83
US 26/INDUSTRIAL WAY	Signala	ODOT	0.80	С	28	0.72
362 ND DRIVE/ INDUSTRIAL WAY (NORTH)	TWSC ^b	City of Sandy	D	A [C]	8 [18]	0.24
362 ND DRIVE/ INDUSTRIAL WAY (SOUTH)	AWSC	City of Sandy	D	D	32	0.70
US 26/RUBEN LANE	Signala	ODOT	0.80	С	27	0.73
US 26/BLUFF ROAD	Signal	ODOT	0.85	D	36	0.79
BLUFF ROAD/BELL STREET	TWSC	City of Sandy	D	A [B]	8 [15]	0.08
PIONEER BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	29	0.68
PROCTOR BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	33	0.71
OR 211/ DUBARKO RD	TWSC	City of Sandy	D	A [D]	8 [29]	0.29
OR 211/BORNSTEDT ROD	TWSC	City of Sandy	D	A [C]	9 [17]	0.36
US 26/TEN EYCK ROAD	Signal	ODOT	0.85	С	31	0.58

STUDY INTERSECTION	CONTROL TYPE	JURISDICTION	MOBILITY TARGET	LEVEL OF SERVICE	DELAY (SECONDS)	V/C RATIO
US 26/LANGENSAND ROAD	TWSC	ODOT	0.80	B [F]	13 [63]	0.30
US 26/VISTA LOOP DRIVE W	TWSC	ODOT	0.80	В [С]	10 [19]	0.09
US 26/VISTA LOOP DRIVE E	TWSC	ODOT	0.80	A [E]	10 [37]	0.05

a. This signal reported using HCM 2000 due to non-standard characteristics.

CORRIDOR TRAVEL TIME

Using the StreetLight data and zone structure as depicted in Figure 1, an estimate of travel time along the US 26 corridor through Sandy was estimated for a typical weekday (Tuesday through Thursday) in the p.m. peak period (4 p.m. to 6 p.m.). This travel time estimate provides a baseline to compare benefits associated with a potential alternative highway route to the south of the City. Overall, the estimated total travel time (including intersection delay and segment travel time) is:

- Westbound total travel time: 9 minutes 54 seconds
- Eastbound total travel time: 9 minutes 36 seconds

Corridor delay was also estimated to establish a baseline to compare against the future alternatives. The intersection delay, including the impact of queuing, was estimated at:

- Westbound intersection delay: 2 minutes 48 seconds
- Eastbound intersection delay: 3 minutes 10 seconds

This total intersection delay estimate, subtracted from the StreetLight travel time estimate, provided a road segment travel time estimate and average speed. This information provides a reasonableness check of the StreetLight data and a baseline travel time that can be used to estimate future conditions. For comparison, a vehicle traveling at the posted speed along the length of the study corridor, with no intersection delay, would average approximately 45 miles per hour (mph). As shown below, the StreetLight free-flow speeds for eastbound and westbound directions deviate only slightly from the 45-mph speed estimate.

- Westbound segment travel time: 7 minutes 6 seconds, 43 miles per hour
- Eastbound segment travel time: 6 minutes 26 seconds, 47 miles per hour

b. Two-way Stop Controlled (TWSC) measures are reported as worst major [worst minor] approach for LOS and Delay and as worst movement for V/C.

SUMMARY

The existing motor vehicle operations analysis revealed that two intersections in Sandy, US 26 and Orient Drive and US 26 and 362nd Drive do not meet mobility targets. At both intersections, the eastbound though volume is at or near the available capacity which has a significant impact on the overall operation of each intersection.

The StreetLight origin-destination (OD) analysis showed that most of the activity coming from the US 26 W zone, west of the City of Sandy, is destined for the North analysis zone, the area generally north of US 26 which is not expected to use a future bypass. However, these trips may benefit from the Bell Street extension to 362nd Drive that is currently in the design phase. With this improvement in place some trips that are destined for the North zone would be able to exit the US 26 corridor at the intersection with 362nd instead of continuing to Bluff Road.

The OD pairs that are expected to use the bypass, including the highway through trips and trips to and from zones near the proposed bypass connections comprise 28% of the total traffic during the p.m. peak period.

The findings above will contribute to the content and analysis in subsequent memoranda including the Benefit Cost Analysis Memorandum and the Sandy Bypass Feasibility Reevaluation Report.

APPENDIX

CONTENTS

SECTION 1. EXISTING CONDITION HCM REPORTS



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SECTION	1. EXISTI	NG CONDI	TION HCM	REPORTS	

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	^	7	ሻ	^	7		4			4	
Traffic Volume (veh/h)	15	1790	5	5	1200	185	5	5	5	230	5	10
Future Volume (veh/h)	15	1790	5	5	1200	185	5	5	5	230	5	10
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	4770	No	4770	4744	No	4744	4000	No	4000	4770	No	4770
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	16	1946	5	5	1304	0	5	5	5	250	5	11
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	4	4	4	14	14	14	2	2	2
Cap, veh/h	78	1940	865	77	1910	0.00	13 0.03	13	13	295 0.19	6 0.19	13 0.19
Arrive On Green	0.05 1688	0.58 3367	0.58 1502	0.05 1661	0.58 3313	0.00 1478	496	0.03 496	0.03 496	1579	32	69
Sat Flow, veh/h												
Grp Volume(v), veh/h	16	1946	5 4500	5	1304	1470	15	0	0	266	0	0
Grp Sat Flow(s), veh/h/ln	1688	1683	1502	1661	1657 26.7	1478	1489	0.0	0	1680	0	0.0
Q Serve(g_s), s	0.9	56.0 56.0	0.1 0.1	0.3	26.7	0.0	1.0 1.0	0.0	0.0	14.9 14.9	0.0	0.0
Cycle Q Clear(g_c), s	1.00	30.0	1.00	1.00	20.7	1.00	0.33	0.0	0.0	0.94	0.0	0.04
Prop In Lane Lane Grp Cap(c), veh/h	78	1940	865	77	1910	1.00	38	0	0.33	314	0	0.04
V/C Ratio(X)	0.20	1.00	0.01	0.07	0.68		0.39	0.00	0.00	0.85	0.00	0.00
Avail Cap(c_a), veh/h	191	1940	865	188	1910		169	0.00	0.00	363	0.00	0.00
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	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	44.6	20.6	8.8	44.3	14.4	0.0	46.4	0.0	0.0	38.2	0.00	0.00
Incr Delay (d2), s/veh	0.8	21.1	0.0	0.2	1.3	0.0	2.4	0.0	0.0	15.1	0.0	0.0
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	0.4	22.7	0.0	0.1	8.3	0.0	0.4	0.0	0.0	7.4	0.0	0.0
Unsig. Movement Delay, s/veh			0.0	U. 1	0.0	0.0	U. 1	0.0	0.0	•••	0.0	0.0
LnGrp Delay(d),s/veh	45.4	41.7	8.8	44.5	15.7	0.0	48.8	0.0	0.0	53.2	0.0	0.0
LnGrp LOS	D	F	A	D	В	0.0	D	A	A	D	A	A
Approach Vol, veh/h		1967			1309	Α		15			266	
Approach Delay, s/veh		41.7			15.8	• •		48.8			53.2	
Approach LOS		D			В			D			D	
						^						
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.5	60.0		22.2	8.5	60.0		6.5				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	10.5	53.0		20.0	10.5	53.0		10.5				
Max Q Clear Time (g_c+l1), s	2.9	28.7		16.9	2.3	58.0		3.0				
Green Ext Time (p_c), s	0.0	13.6		0.3	0.0	0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			33.0									
HCM 6th LOS			С									

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBT	EE	BR WB	L WBT	NBL	NBR
Lane Configurations	^			ነ ተተ	ሻሻ	7
Traffic Volume (veh/h)	1415		40 26		320	305
Future Volume (veh/h)	1415		40 26		320	305
Initial Q (Qb), veh	0) 0	0	0
Ped-Bike Adj(A_pbT)	U		00 1.0		1.00	1.00
	1.00		00 1.0		1.00	1.00
Parking Bus, Adj			00 1.0			1.00
Work Zone On Approac			70 474	No	No	4700
Adj Sat Flow, veh/h/ln	1772				1786	1786
Adj Flow Rate, veh/h	1505		62 28		340	324
Peak Hour Factor	0.94		94 0.9	4 0.94	0.94	0.94
Percent Heavy Veh, %	2	<u>-</u>	2	4 4	1	1
Cap, veh/h	1727	7	70 42	3 2688	431	578
Arrive On Green	0.51	0.	51 0.2	5 0.81	0.13	0.13
Sat Flow, veh/h	3455				3300	1514
Grp Volume(v), veh/h	1505		62 28		340	324
Grp Sat Flow(s), veh/h/h					1650	1514
	54.3		.4 21.		13.8	0.0
Q Serve(g_s), s						
Cycle Q Clear(g_c), s	54.3		1.4 21.		13.8	0.0
Prop In Lane			00 1.0		1.00	1.00
Lane Grp Cap(c), veh/h			70 42		431	578
V/C Ratio(X)	0.87	0.4	47 0.6	7 0.44	0.79	0.56
Avail Cap(c_a), veh/h	1732	2 7	73 42	3 2688	717	709
HCM Platoon Ratio	1.00	1.	00 1.0	1.00	1.00	1.00
Upstream Filter(I)	1.00		00 0.7		1.00	1.00
Uniform Delay (d), s/ve			.6 46.		58.1	33.5
Incr Delay (d2), s/veh	6.4		2.1 2.		2.0	0.5
Initial Q Delay(d3),s/vel			0.0 0.		0.0	0.0
%ile BackOfQ(50%),vel			7.4 8.	7 3.1	5.8	8.6
Unsig. Movement Delay						
LnGrp Delay(d),s/veh	36.0	23	3.6 48.		60.1	34.1
LnGrp LOS	D)	C I) A	E	С
Approach Vol, veh/h	1867	7		1468	664	
Approach Delay, s/veh	33.6	;		12.8	47.4	
Approach LOS	С			В	D	
••						
Timer - Assigned Phs	1		2			6
Phs Duration (G+Y+Rc), \$ 1.2	2 74	l.8			116.0
Change Period (Y+Rc),	s 6.0) ,	[*] 6			6.0
Max Green Setting (Gm			69			98.0
Max Q Clear Time (g_c			5.3			16.5
Green Ext Time (p_c),	, .		2.5			67.6
" '	5 U.Z	. 12	0			07.0
Intersection Summary						
HCM 6th Ctrl Delay			28.	2		
HCM 6th LOS				<u>-</u>		
Notes						

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Edition methodology expects strict NEMA phasing.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	∱ β		7	^	7		4		7	र्स	7
Traffic Volume (vph)	50	1615	5	25	1245	35	40	20	70	160	10	65
Future Volume (vph)	50	1615	5	25	1245	35	40	20	70	160	10	65
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1627		1624	1638	1508
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	1676	3316		1644	3358	1471		1627		1624	1638	1508
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	51	1648	5	26	1270	36	41	20	71	163	10	66
RTOR Reduction (vph)	0	0	0	0	0	16	0	29	0	0	0	59
Lane Group Flow (vph)	51	1653	0	26	1270	20	0	103	0	86	87	7
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases						6						4
Actuated Green, G (s)	18.7	96.2		5.0	82.5	82.5		13.7		15.7	15.7	15.7
Effective Green, g (s)	19.2	97.6		5.0	83.9	83.9		13.7		15.7	15.7	15.7
Actuated g/C Ratio	0.13	0.66		0.03	0.57	0.57		0.09		0.11	0.11	0.11
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	217	2186		55	1903	833		150		172	173	159
v/s Ratio Prot	0.03	c0.50		0.02	c0.38			c0.06		0.05	c0.05	
v/s Ratio Perm						0.01						0.00
v/c Ratio	0.24	0.76		0.47	0.67	0.02		0.69		0.50	0.50	0.04
Uniform Delay, d1	57.8	17.1		70.2	22.3	14.1		65.1		62.4	62.5	59.4
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	2.5		3.7	1.9	0.1		12.3		1.3	1.3	0.1
Delay (s)	58.1	19.6		73.9	24.2	14.1		77.3		63.8	63.8	59.5
Level of Service	Е	В		Е	С	В		Е		Е	Е	Е
Approach Delay (s)		20.8			24.9			77.3			62.6	
Approach LOS		С			С			Е			E	
Intersection Summary												
HCM 2000 Control Delay			27.5	H	CM 2000	Level of S	Service		С			
HCM 2000 Volume to Capac	city ratio		0.72									
Actuated Cycle Length (s)			148.0	Sı	um of lost	t time (s)			16.0			
Intersection Capacity Utilizat	tion		68.6%			of Service			С			
Analysis Period (min)			15									

c Critical Lane Group

HCM 6th Edition methodology does not support turning movements with shared & exclusive lanes.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	^	7	ሻ	^↑	7		र्स	7	ሻ	र्स	7
Traffic Volume (vph)	110	1630	110	40	1230	65	50	20	35	165	25	80
Future Volume (vph)	110	1630	110	40	1230	65	50	20	35	165	25	80
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.97	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1466	1644	3358	1431		1687	1461	1624	1649	1507
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.97	1.00	0.95	0.96	1.00
Satd. Flow (perm)	1676	3318	1466	1644	3358	1431		1687	1461	1624	1649	1507
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	111	1646	111	40	1242	66	51	20	35	167	25	81
RTOR Reduction (vph)	0	0	28	0	0	25	0	0	32	0	0	74
Lane Group Flow (vph)	111	1646	83	40	1242	41	0	71	3	95	97	7
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2			6		8	8			4
Actuated Green, G (s)	12.6	92.1	92.1	9.7	89.2	89.2		13.7	13.7	13.1	13.1	13.1
Effective Green, g (s)	12.6	93.5	93.5	9.7	90.6	90.6		13.7	13.7	13.1	13.1	13.1
Actuated g/C Ratio	0.09	0.64	0.64	0.07	0.62	0.62		0.09	0.09	0.09	0.09	0.09
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	144	2124	938	109	2083	888		158	137	145	147	135
v/s Ratio Prot	0.07	c0.50		0.02	c0.37			c0.04		0.06	c0.06	
v/s Ratio Perm			0.06			0.03			0.00			0.00
v/c Ratio	0.77	0.77	0.09	0.37	0.60	0.05		0.45	0.02	0.66	0.66	0.05
Uniform Delay, d1	65.3	18.7	10.0	65.2	16.7	10.8		62.6	60.1	64.3	64.3	60.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.9	2.8	0.2	1.2	1.3	0.1		1.2	0.0	8.6	8.7	0.1
Delay (s)	86.2	21.6	10.2	66.4	18.0	10.9		63.8	60.1	72.9	73.0	60.9
Level of Service	F	С	В	Е	В	В		Е	Е	Е	E	E
Approach Delay (s)		24.7			19.0			62.6			69.4	
Approach LOS		С			В			Е			E	
Intersection Summary												
HCM 2000 Control Delay			27.1	H	CM 2000	Level of S	Service		С			
HCM 2000 Volume to Capac	city ratio		0.73									
Actuated Cycle Length (s)			146.0		um of lost				16.0			
Intersection Capacity Utilizat	ion		74.0%	IC	U Level	of Service			D			
Analysis Period (min)			15									

c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ች	^	7	- 1	^	7	ች	f)		*	f.		
Traffic Volume (veh/h)	120	1570	150	65	1155	150	95	40	60	155	45	115	
Future Volume (veh/h)	120	1570	150	65	1155	150	95	40	60	155	45	115	
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		0.97	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 Approac		No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786	
Adj Flow Rate, veh/h	122	1602	153	66	1179	153	97	41	61	158	46	117	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1	
Cap, veh/h	357	2036	907	83	1285	640	119	71	106	182	66	169	
Arrive On Green	0.21	0.60	0.60	0.05	0.44	0.44	0.07	0.11	0.12	0.11	0.15	0.15	
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	637	948	1701	445	1132	
Grp Volume(v), veh/h	122	1602	153	66	1179	153	97	0	102	158	0	163	
Grp Sat Flow(s), veh/h/li		1683	1499	1647	1470	1464	1701	0	1586	1701	0	1577	
Q Serve(g_s), s	7.8	45.6	5.7	5.0	47.9	5.8	7.1	0.0	7.7	11.6	0.0	12.4	
Cycle Q Clear(g_c), s	7.8	45.6	5.7	5.0	47.9	5.8	7.1	0.0	7.7	11.6	0.0	12.4	
Prop In Lane	1.00	40.0	1.00	1.00	₹1.5	1.00	1.00	0.0	0.60	1.00	0.0	0.72	
Lane Grp Cap(c), veh/h		2036	907	83	1285	640	119	0	178	182	0	235	
V/C Ratio(X)	0.34	0.79	0.17	0.80	0.92	0.24	0.81	0.00	0.57	0.87	0.00	0.69	
Avail Cap(c_a), veh/h	357	2036	907	143	1297	646	188	0.00	375	188	0.00	373	
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)	0.59	0.59	0.59	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/vel		18.9	11.0	59.7	33.6	11.0	58.2	0.0	53.4	55.8	0.0	51.1	
Incr Delay (d2), s/veh	0.2	1.9	0.2	10.1	11.8	0.9	9.7	0.0	1.8	31.2	0.0	2.3	
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	
%ile BackOfQ(50%),vel		16.8	2.0	2.4	19.0	3.0	3.4	0.0	3.2	6.6	0.0	5.1	
Unsig. Movement Delay					. 5.0	3.0	J. 1	3.0	J	3.0	3.0	J , 1	
LnGrp Delay(d),s/veh	42.7	20.8	11.3	69.8	45.4	11.8	67.9	0.0	55.1	87.0	0.0	53.4	
LnGrp LOS	D	C	В	E	D	В	E	A	E	F	A	D	
Approach Vol, veh/h	_	1877		_	1398		_	199	_	•	321	_	
Approach Delay, s/veh		21.5			42.9			61.4			69.9		
Approach LOS		C C			72.3 D			E			00.5 E		
	1		2	1		6	7						
Timer - Assigned Phs	1 40 4	2	3	4	5	6	7	8					
Phs Duration (G+Y+Rc)		80.8	12.9	22.9	31.7	59.5	17.6	18.2					
Change Period (Y+Rc),		4.8	4.0	4.5	4.8	* 4	4.0	4.5					
Max Green Setting (Gm		55.2	14.0	29.5	11.0	* 56	14.0	29.5					
Max Q Clear Time (g_c		47.6	9.1	14.4	9.8	49.9	13.6	9.7					
Green Ext Time (p_c), s	s 0.0	7.3	0.0	0.5	0.0	5.7	0.0	0.3					
Intersection Summary													
HCM 6th Ctrl Delay			35.5										
HCM 6th LOS			D										
Notos													

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection							
Int Delay, s/veh	2.1						
		EDD	NDI	NDT	CDT	CDD	
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations		7	75	4	4	-	
Traffic Vol, veh/h	5	55	75	210	250	5	
Future Vol, veh/h	5	55	75	210	250	5	
Conflicting Peds, #/hr	1	1	_ 2	_ 0	_ 0	_ 2	
Sign Control	Stop	Stop	Free	Free	Free	Free	
RT Channelized	-	None	-	None	-	None	
Storage Length	180	0	150	-	-	-	
Veh in Median Storage		-	-	0	0	-	
Grade, %	0	-	-	0	0	-	
Peak Hour Factor	88	88	88	88	88	88	
Heavy Vehicles, %	4	4	1	1	3	3	
Mvmt Flow	6	63	85	239	284	6	
Major/Minor	Minor2	-	Major1	N	Major2		
Conflicting Flow All	699	290	292	0	- viajoiz	0	
	289						
Stage 1		-	-	-	-	-	
Stage 2	410	-	-	-	-	-	
Critical Hdwy	6.44	6.24	4.11	-	-	-	
Critical Hdwy Stg 1	5.44	-	-	-	-	-	
Critical Hdwy Stg 2	5.44	-	-	-	-	-	
Follow-up Hdwy	3.536	3.336	2.209	-	-	-	
Pot Cap-1 Maneuver	403	744	1275	-	-	-	
Stage 1	756	-	-	-	-	-	
Stage 2	666	-	-	-	-	-	
Platoon blocked, %				-	-	-	
Mov Cap-1 Maneuver	374	742	1273	_	-	-	
Mov Cap-2 Maneuver	374	-	-	-	-	-	
Stage 1	704	-	-	-	-	-	
Stage 2	665	-	-	-	-	-	
Annraach	EB		ND		CD		
Approach			NB		SB		
HCM Control Delay, s	10.7		2.1		0		
HCM LOS	В						
Minor Lane/Major Mvm	nt	NBL	NBT	EBLn1 E	EBLn2	SBT	
Capacity (veh/h)		1273	-		742	-	
HCM Lane V/C Ratio		0.067		0.015		_	
HCM Control Delay (s)		8	0	14.8	10.3	_	
HCM Lane LOS		A	A	14.0 B	В	_	
HCM 95th %tile Q(veh	١	0.2	-	0	0.3	_	
)	0.2	_	U	0.5	_	

Intersection Int Delay, s/veh 1.6
Movement
Lane Configurations
Traffic Vol, veh/h Future Vol Storage Length Future Vol Free
Future Vol, veh/h Conflicting Peds, #/hr Conflicting Peds, #/hr Sign Control Stop Stop Free Free Free Free Free Free RT Channelized - None Storage Length 0 125 - Veh in Median Storage, # 0 - 0 - 0 Grade, % 0 - 0 - 0 - 0 Peak Hour Factor Heavy Vehicles, % 4 4 1 1 3 3 3 Mvmt Flow Major/Minor Minor Minor1 Major1 Major2 Conflicting Flow All Stage 1 Stage 2 554
Conflicting Peds, #/hr 0 2 0 0 0 Sign Control Stop Stop Free Rree Rree None - 0 - 0 0 4 0 0 - 0 0 4 0 0 4 4 1 1 3 3 3 1 2 500 0 4 3 4 3
Sign Control Stop Stop Free Free Free Free Free Free Free Free Free RT Channelized - None - O - O - O - O - O - O - O - O - O - O - O - O - O - O - None - None
RT Channelized - None - None - None Storage Length 0 - - 125 - Veh in Median Storage, # 0 - 0 - 0 0 Grade, % 0 - 0 - - 0 0 Peak Hour Factor 94
Storage Length 0 - - 125 - Veh in Median Storage, # 0 - 0 - 0 Grade, % 0 - 0 - - 0 Peak Hour Factor 94
Veh in Median Storage, # 0 - 0 - - 0 Grade, % 0 - 0 - - 0 Peak Hour Factor 94 94 94 94 94 94 Heavy Vehicles, % 4 4 1 1 3 3 Mvmt Flow 43 43 436 37 27 500 Major/Minor Minor1 Major1 Major2 Conflicting Flow All 1009 457 0 0 473 0 Stage 1 455 - - - - - - Stage 2 554 - - - - - - Critical Hdwy 6.44 6.24 - 4.13 -
Grade, % 0 - 0 - - 0 Peak Hour Factor 94
Peak Hour Factor 94 96 96 Stage 1 435 57 - - - - - - - - - - -
Heavy Vehicles, % 4 4 1 1 3 3 Mvmt Flow 43 43 436 37 27 500 Major/Minor Minor1 Major1 Major2 Conflicting Flow All 1009 457 0 0 473 0 Stage 1 455 - - - - - - Stage 2 554 - - - - - - Critical Hdwy 6.44 6.24 - 4.13 - </td
Mvmt Flow 43 43 436 37 27 500 Major/Minor Minor1 Major1 Major2 Conflicting Flow All 1009 457 0 0 473 0 Stage 1 455 -
Major/Minor Minor1 Major1 Major2 Conflicting Flow All 1009 457 0 0 473 0 Stage 1 455 -
Conflicting Flow All 1009 457 0 0 473 0 Stage 1 455 -
Conflicting Flow All 1009 457 0 0 473 0 Stage 1 455 - - - - - Stage 2 554 - - - - - Critical Hdwy 6.44 6.24 - - 4.13 - Critical Hdwy Stg 1 5.44 - - - - - Critical Hdwy Stg 2 5.44 - - - - - Follow-up Hdwy 3.536 3.336 - - 2.227 - Pot Cap-1 Maneuver 264 599 - - 1084 - Stage 1 635 - - - - - Mov Cap-1 Maneuver 257 598 - - 1084 - Mov Cap-2 Maneuver 257 - - - - - Stage 1 635 - - - - - <tr< td=""></tr<>
Conflicting Flow All 1009 457 0 0 473 0 Stage 1 455 - - - - - Stage 2 554 - - - - - Critical Hdwy 6.44 6.24 - - 4.13 - Critical Hdwy Stg 1 5.44 - - - - - Critical Hdwy Stg 2 5.44 - - - - - Follow-up Hdwy 3.536 3.336 - - 2.227 - Pot Cap-1 Maneuver 264 599 - - 1084 - Stage 1 635 - - - - - Mov Cap-1 Maneuver 257 598 - - 1084 - Mov Cap-2 Maneuver 257 - - - - - Stage 1 635 - - - - - <tr< td=""></tr<>
Stage 1 455 -
Stage 2 554 - - - - Critical Hdwy 6.44 6.24 - 4.13 - Critical Hdwy Stg 1 5.44 - - - - Critical Hdwy Stg 2 5.44 - - - - Follow-up Hdwy 3.536 3.336 - 2.2227 - Pot Cap-1 Maneuver 264 599 - 1084 - Stage 1 635 - - - - Stage 2 572 - - - - Platoon blocked, % - - - - - Mov Cap-1 Maneuver 257 598 - 1084 - Mov Cap-2 Maneuver 257 - - - - Stage 1 635 - - - - Stage 2 558 - - - - Approach WB NB SB HCM Control Delay, s 18.1 0 0.4
Critical Hdwy 6.44 6.24 - - 4.13 - Critical Hdwy Stg 1 5.44 - - - - - Critical Hdwy Stg 2 5.44 - - - - - - Follow-up Hdwy 3.536 3.336 - - 2.227 - Pot Cap-1 Maneuver 264 599 - 1084 - Stage 1 635 - - - - Stage 2 572 - - - - Platoon blocked, % - - - - - Mov Cap-1 Maneuver 257 598 - 1084 - Mov Cap-2 Maneuver 257 - - - - Stage 1 635 - - - - Stage 2 558 - - - - Approach WB NB SB HCM Control Delay, s 18.1 0 0.4
Critical Hdwy Stg 1 5.44 - - - - Critical Hdwy Stg 2 5.44 - - - - Follow-up Hdwy 3.536 3.336 - - 2.227 - Pot Cap-1 Maneuver 264 599 - - 1084 - Stage 1 635 - - - - - Stage 2 572 - - - - - Platoon blocked, % - - - - - Mov Cap-1 Maneuver 257 598 - 1084 - Mov Cap-2 Maneuver 257 - - - - Stage 1 635 - - - - - Stage 2 558 - - - - - Approach WB NB SB HCM Control Delay, s 18.1 0 0.4
Critical Hdwy Stg 2 5.44 Follow-up Hdwy 3.536 3.336 - 2.227 - Pot Cap-1 Maneuver 264 599 - 1084 - Stage 1 635 Stage 2 572
Follow-up Hdwy 3.536 3.336 - 2.227 - Pot Cap-1 Maneuver 264 599 - 1084 - Stage 1 635 Stage 2 572 Platoon blocked, % Mov Cap-1 Maneuver 257 598 - 1084 - Mov Cap-2 Maneuver 257 Stage 1 635 Stage 2 558 Approach WB NB SB HCM Control Delay, s 18.1 0 0.4
Pot Cap-1 Maneuver 264 599 - - 1084 - Stage 1 635 - - - - - Stage 2 572 - - - - - Platoon blocked, % - - - - - - Mov Cap-1 Maneuver 257 598 - - 1084 - Mov Cap-2 Maneuver 257 - - - - - Stage 1 635 - - - - - - Stage 2 558 - - - - - - Approach WB NB SB HCM Control Delay, s 18.1 0 0.4
Stage 1 635 -
Stage 2 572 - - - - Platoon blocked, % - - - - - Mov Cap-1 Maneuver 257 598 - - 1084 - Mov Cap-2 Maneuver 257 - </td
Platoon blocked, %
Platoon blocked, % - - - - Mov Cap-1 Maneuver 257 598 - - 1084 - Mov Cap-2 Maneuver 257 -
Mov Cap-1 Maneuver 257 598 - - 1084 - Mov Cap-2 Maneuver 257 - - - - - Stage 1 635 - - - - - - Stage 2 558 - - - - - - Approach WB NB SB HCM Control Delay, s 18.1 0 0.4
Mov Cap-2 Maneuver 257 - - - - - Stage 1 635 - - - - - Stage 2 558 - - - - - Approach WB NB SB HCM Control Delay, s 18.1 0 0.4
Stage 1 635 -
Stage 2 558 -
Approach WB NB SB HCM Control Delay, s 18.1 0 0.4
HCM Control Delay, s 18.1 0 0.4
HCM Control Delay, s 18.1 0 0.4
HCM LOS C
Minor Lone/Major Mumt NDT NDDWDL - 4 CDL CDT
Minor Lane/Major Mvmt NBT NBRWBLn1 SBL SBT
Capacity (veh/h) 359 1084 -
HCM Lane V/C Ratio 0.237 0.025 -
HCM Control Delay (s) 18.1 8.4 -
HCM Lane LOS C A -
HCM 95th %tile Q(veh) 0.9 0.1 -

Intersection						
Intersection Delay, s/veh	24.4					
Intersection LOS	C					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	¥.	LDIN	NDL	NDT	<u>361</u>	אופט
Traffic Vol, veh/h	130	160	90	315	480	30
Future Vol, veh/h	130	160	90	315	480	30
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	0.01	0	1	1	1	1
Mymt Flow	138	170	96	335	511	32
Number of Lanes	1	0	0	1	1	0
Approach	EB		NB		SB	
Opposing Approach			SB		NB	
Opposing Lanes	0		1		1	
Conflicting Approach Left	SB		EB		•	
Conflicting Lanes Left	1		1		0	
Conflicting Approach Right	NB				EB	
Conflicting Lanes Right	1		0		1	
HCM Control Delay	16.1		21.3		31.5	
HCM LOS	С		С		D	
I IOW LOO	U		U		U	
TIOM EOU	O .		O .		D	
Lane		NBLn1	EBLn1	SBLn1		
		NBLn1 22%		SBLn1		
Lane			EBLn1			
Lane Vol Left, %		22%	EBLn1 45%	0%		
Lane Vol Left, % Vol Thru, %		22% 78%	EBLn1 45% 0% 55% Stop	0% 94% 6% Stop	D	
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane		22% 78% 0% Stop 405	EBLn1 45% 0% 55% Stop 290	0% 94% 6% Stop 510		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol		22% 78% 0% Stop 405 90	EBLn1 45% 0% 55% Stop 290 130	0% 94% 6% Stop 510		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol		22% 78% 0% Stop 405 90 315	EBLn1 45% 0% 55% Stop 290 130 0	0% 94% 6% Stop 510 0	B	
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol		22% 78% 0% Stop 405 90 315	EBLn1 45% 0% 55% Stop 290 130 0 160	0% 94% 6% Stop 510 0 480		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate		22% 78% 0% Stop 405 90 315 0	EBLn1 45% 0% 55% Stop 290 130 0 160 309	0% 94% 6% Stop 510 0 480 30 543		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp		22% 78% 0% Stop 405 90 315 0 431	EBLn1 45% 0% 55% Stop 290 130 0 160 309	0% 94% 6% Stop 510 0 480 30 543		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X)		22% 78% 0% Stop 405 90 315 0 431 1 0.696	EBLn1 45% 0% 55% Stop 290 130 0 160 309 1 0.529	0% 94% 6% Stop 510 0 480 30 543 1 0.842		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd)		22% 78% 0% Stop 405 90 315 0 431 1 0.696 5.813	EBLn1 45% 0% 55% Stop 290 130 0 160 309 1 0.529 6.168	0% 94% 6% Stop 510 0 480 30 543 1 0.842 5.584		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N		22% 78% 0% Stop 405 90 315 0 431 1 0.696 5.813 Yes	EBLn1 45% 0% 55% Stop 290 130 0 160 309 1 0.529 6.168 Yes	0% 94% 6% Stop 510 0 480 30 543 1 0.842 5.584 Yes		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap		22% 78% 0% Stop 405 90 315 0 431 1 0.696 5.813 Yes 616	EBLn1 45% 0% 55% Stop 290 130 0 160 309 1 0.529 6.168 Yes 580	0% 94% 6% Stop 510 0 480 30 543 1 0.842 5.584 Yes 646		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time		22% 78% 0% Stop 405 90 315 0 431 1 0.696 5.813 Yes 616 3.897	EBLn1 45% 0% 55% Stop 290 130 0 160 309 1 0.529 6.168 Yes 580 4.256	0% 94% 6% Stop 510 0 480 30 543 1 0.842 5.584 Yes 646 3.661		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio		22% 78% 0% Stop 405 90 315 0 431 1 0.696 5.813 Yes 616 3.897 0.7	EBLn1 45% 0% 55% Stop 290 130 0 160 309 1 0.529 6.168 Yes 580 4.256 0.533	0% 94% 6% Stop 510 0 480 30 543 1 0.842 5.584 Yes 646 3.661 0.841		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio HCM Control Delay		22% 78% 0% Stop 405 90 315 0 431 1 0.696 5.813 Yes 616 3.897 0.7 21.3	EBLn1 45% 0% 55% Stop 290 130 0 160 309 1 0.529 6.168 Yes 580 4.256 0.533 16.1	0% 94% 6% Stop 510 0 480 30 543 1 0.842 5.584 Yes 646 3.661 0.841 31.5		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio		22% 78% 0% Stop 405 90 315 0 431 1 0.696 5.813 Yes 616 3.897 0.7	EBLn1 45% 0% 55% Stop 290 130 0 160 309 1 0.529 6.168 Yes 580 4.256 0.533	0% 94% 6% Stop 510 0 480 30 543 1 0.842 5.584 Yes 646 3.661 0.841		

Intersection						
Int Delay, s/veh	0.1					
		CET	NI\A/T	NIVACE	CVAIL	CVVD
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations	7	^	↑ }	_	Y	•
Traffic Vol, veh/h	3	1055	850	5	5	0
Future Vol, veh/h	3	1055	850	5	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage,	,# -	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	1122	904	5	5	0
	/lajor1		Major2		Minor2	
Conflicting Flow All	909	0	-	0	1474	455
Stage 1	-	-	-	-	907	-
Stage 2	-	-	-	-	567	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	745	-	_	_	117	552
Stage 1	_	_	_	_	354	_
Stage 2	_	_	_	_	531	_
Platoon blocked, %		_	_	_	001	
Mov Cap-1 Maneuver	745	_	_	_	117	552
Mov Cap-1 Maneuver	- 143	_		<u> </u>	117	-
		-	_		353	
Stage 1	-	-	-	-		-
	_	-	-	-	531	-
Stage 2						
Stage 2						
Approach	SE		NW		SW	
Approach						
Approach HCM Control Delay, s	SE 0		NW 0		37.2	
Approach						
Approach HCM Control Delay, s HCM LOS	0		0		37.2 E	
Approach HCM Control Delay, s	0	NWT		SEL	37.2 E	SWLn1
Approach HCM Control Delay, s HCM LOS Minor Lane/Major Mvmt Capacity (veh/h)	0	NWT -	0 NWR	745	37.2 E SETS	117
Approach HCM Control Delay, s HCM LOS Minor Lane/Major Mvmt	0	NWT -	0 NWR		37.2 E SETS	
Approach HCM Control Delay, s HCM LOS Minor Lane/Major Mvmt Capacity (veh/h) HCM Lane V/C Ratio	0	-	0 NWR	745	37.2 E SETS	117 0.045
Approach HCM Control Delay, s HCM LOS Minor Lane/Major Mvmt Capacity (veh/h)	0	-	0 NWR -	745 0.004	37.2 E SETS	117 0.045

	۶	→	•	•	←	•	1	†	<i>></i>	/	+	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					ፋው			र्स			₽	
Traffic Volume (veh/h)	0	0	0	155	995	15	270	45	0	0	35	25
Future Volume (veh/h)	0	0	0	155	995	15	270	45	0	0	35	25
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00	4.00	0.99	0.99	4.00	1.00	1.00	4.00	0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				4700	No	4700	4770	No	•	•	No	4770
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772
Adj Flow Rate, veh/h				168	1082	16	293	49	0	0	38	27
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				5 224	5 1520	5 23	2 354	2 49	0	0	2 262	100
Cap, veh/h Arrive On Green				0.52	0.52	0.52	0.27	0.27	0.00	0.00	0.27	186 0.27
Sat Flow, veh/h				434	2949	45	1076	180	0.00	0.00	960	682
				661					0	0	900	65
Grp Volume(v), veh/h				1708	0	605 1721	342 1256	0	0	0	0	1642
Grp Sat Flow(s),veh/h/ln				33.6	0.0	28.9	26.6	0.0	0.0	0.0	0.0	3.3
Q Serve(g_s), s Cycle Q Clear(g_c), s				33.6	0.0	28.9	29.9	0.0	0.0	0.0	0.0	3.3
Prop In Lane				0.25	0.0	0.03	0.86	0.0	0.00	0.00	0.0	0.42
Lane Grp Cap(c), veh/h				880	0	887	403	0	0.00	0.00	0	448
V/C Ratio(X)				0.75	0.00	0.68	0.85	0.00	0.00	0.00	0.00	0.15
Avail Cap(c_a), veh/h				1118	0.00	1126	403	0.00	0.00	0.00	0.00	448
HCM Platoon Ratio				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	0.91	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				21.1	0.0	19.9	41.6	0.0	0.0	0.0	0.0	30.3
Incr Delay (d2), s/veh				5.9	0.0	4.2	17.9	0.0	0.0	0.0	0.0	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
%ile BackOfQ(50%),veh/ln				14.5	0.0	12.4	11.2	0.0	0.0	0.0	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				26.9	0.0	24.2	59.5	0.0	0.0	0.0	0.0	30.4
LnGrp LOS				С	Α	С	Е	Α	Α	Α	Α	С
Approach Vol, veh/h					1266			342			65	
Approach Delay, s/veh					25.6			59.5			30.4	
Approach LOS					С			Е			С	
Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				34.0		60.7		34.0				
Change Period (Y+Rc), s				4.0		4.0		4.0				
Max Green Setting (Gmax), s				30.0		72.0		30.0				
Max Q Clear Time (g_c+l1), s				5.3		35.6		31.9				
Green Ext Time (p_c), s				0.2		21.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			32.7									
HCM 6th LOS			С									

	ᄼ	→	•	•	←	•	•	†	/	>	↓	4	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		41	7					†	7		↑		
Traffic Volume (veh/h)	75	1310	365	0	0	0	0	240	125	25	185	0	
Future Volume (veh/h)	75	1310	365	0	0	0	0	240	125	25	185	0	
Initial Q (Qb), veh	0	0	0		•		0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00	•	0.99	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	
Work Zone On Approac		No	1.00				1.00	No	1.00	1.00	No	1.00	
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0	
Adj Flow Rate, veh/h	79	1379	0				0	253	132	26	195	0	
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2				0.55	2	2	5	5	0.55	
Cap, veh/h	97	1777					0	580	484	33	663	0	
Arrive On Green	0.54	0.54	0.00				0.00	0.33	0.33	0.01	0.13	0.00	
Sat Flow, veh/h	178	3268	1502				0.00	1772	1480	1647	1730	0.00	
										26		0	
Grp Volume(v), veh/h	781	677	1502				0	253	132		195		
Grp Sat Flow(s), veh/h/l		1683	1502				0	1772	1480	1647	1730	0	
Q Serve(g_s), s	39.9	33.8	0.0				0.0	12.3	7.2	1.7	11.2	0.0	
Cycle Q Clear(g_c), s	39.9	33.8	0.0				0.0	12.3	7.2	1.7	11.2	0.0	
Prop In Lane	0.10	045	1.00				0.00	500	1.00	1.00	000	0.00	
Lane Grp Cap(c), veh/h		915					0	580	484	33	663	0	
V/C Ratio(X)	0.81	0.74					0.00	0.44	0.27	0.79	0.29	0.00	
Avail Cap(c_a), veh/h	959	915					0	580	484	150	786	0	
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00	
Upstream Filter(I)	1.00	1.00	0.00				0.00	1.00	1.00	1.00	1.00	0.00	
Uniform Delay (d), s/ve		19.2	0.0				0.0	29.0	27.3	54.4	34.5	0.0	
Incr Delay (d2), s/veh	7.6	5.4	0.0				0.0	2.4	1.4	22.2	0.1	0.0	
Initial Q Delay(d3),s/vel		0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),ve		14.1	0.0				0.0	5.5	2.7	0.9	5.3	0.0	
Unsig. Movement Delay	y, s/veh												
LnGrp Delay(d),s/veh	28.1	24.5	0.0				0.0	31.4	28.7	76.6	34.7	0.0	
LnGrp LOS	С	С					Α	С	С	Е	С	Α	
Approach Vol, veh/h		1458	Α					385			221		
Approach Delay, s/veh		26.4						30.5			39.6		
Approach LOS		С						С			D		
Timer - Assigned Phs		2		4			7	8					
Phs Duration (G+Y+Rc), s	63.8		46.2			6.2	40.0					
Change Period (Y+Rc)		4.0		4.0			4.0	4.8					
Max Green Setting (Gn		52.0		50.0			10.0	35.2					
Max Q Clear Time (g_c		41.9		13.2			3.7	14.3					
Green Ext Time (p_c),		8.6		0.5			0.0	1.1					
Intersection Summary		0.0		0.0			0.0						
			20.6										
HCM 6th Ctrl Delay			28.6										
HCM 6th LOS			С										
Notes													

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	*	^	7	ሻ	^	7		4			4		
Traffic Volume (veh/h)	160	1095	125	5	815	20	95	25	10	45	20	120	
Future Volume (veh/h)	160	1095	125	5	815	20	95	25	10	45	20	120	
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 Approac	h	No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758	
Adj Flow Rate, veh/h	168	1153	132	5	858	21	100	26	11	47	21	126	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3	
Cap, veh/h	607	1607	716	399	1176	524	177	43	14	92	42	173	
Arrive On Green	0.36	0.48	0.48	0.25	0.36	0.36	0.16	0.17	0.15	0.16	0.17	0.15	
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	717	254	85	305	252	1032	
Grp Volume(v), veh/h	168	1153	132	5	858	21	137	0	0	194	0	0	
Grp Sat Flow(s), veh/h/lr	11688	1683	1500	1621	1617	1442	1056	0	0	1589	0	0	
Q Serve(g_s), s	7.8	29.9	5.5	0.3	25.3	1.0	2.2	0.0	0.0	0.0	0.0	0.0	
Cycle Q Clear(g_c), s	7.8	29.9	5.5	0.3	25.3	1.0	14.8	0.0	0.0	12.7	0.0	0.0	
Prop In Lane	1.00		1.00	1.00		1.00	0.73		0.08	0.24		0.65	
Lane Grp Cap(c), veh/h	607	1607	716	399	1176	524	229	0	0	300	0	0	
V/C Ratio(X)	0.28	0.72	0.18	0.01	0.73	0.04	0.60	0.00	0.00	0.65	0.00	0.00	
Avail Cap(c_a), veh/h	607	2020	900	399	1793	800	261	0	0	335	0	0	
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	0.00	0.00	1.00	0.00	0.00	
Uniform Delay (d), s/veh		22.8	16.5	31.4	30.3	22.6	44.7	0.0	0.0	43.9	0.0	0.0	
Incr Delay (d2), s/veh	0.1	2.8	0.6	0.0	4.0	0.1	2.3	0.0	0.0	3.2	0.0	0.0	
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		12.3	2.0	0.1	10.1	0.4	3.8	0.0	0.0	5.3	0.0	0.0	
Unsig. Movement Delay													
LnGrp Delay(d),s/veh	25.2	25.6	17.0	31.4	34.3	22.7	47.0	0.0	0.0	47.1	0.0	0.0	
LnGrp LOS	С	С	В	С	С	С	D	Α	Α	D	Α	Α	
Approach Vol, veh/h		1453			884			137			194		
Approach Delay, s/veh		24.8			34.0			47.0			47.1		
Approach LOS		C			С			D			D		
	4			1		c							
Timer - Assigned Phs	24.4	2		4	5	6		8					
Phs Duration (G+Y+Rc)		56.5		22.4	43.6	44.0		22.4					
Change Period (Y+Rc),		4.0		5.5	4.5	4.0		5.5					
Max Green Setting (Gm		66.0		19.5	15.5	61.0		19.5					
Max Q Clear Time (g_c-		31.9		14.7	9.8	27.3		16.8					
Green Ext Time (p_c), s	0.0	20.6		0.2	0.2	12.7		0.1					
Intersection Summary													
HCM 6th Ctrl Delay			30.6										
HCM 6th LOS			С										

Intersection						
Int Delay, s/veh	0.5					
		EDT	MOT	WIDD	CDI	CDD
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	ነ	^	↑ ↑	^	¥	00
Traffic Vol, veh/h	50	1050	850	0	5	20
Future Vol, veh/h	50	1050	850	0	5	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-		-	None
Storage Length	300	-	-	-	0	-
Veh in Median Storage		0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	6	6	0	0
Mvmt Flow	53	1105	895	0	5	21
Major/Minor N	/lajor1	N	Major2	N	Minor2	
Conflicting Flow All	895	0	-	0	1554	448
Stage 1	-	-	_	-	895	-
Stage 2	_	_	_	_	659	_
Critical Hdwy	4.16	_	_	_	6.8	6.9
Critical Hdwy Stg 1	T. 10	_	_	_	5.8	- 0.5
Critical Hdwy Stg 2	_	_	_	_	5.8	_
Follow-up Hdwy	2.23	_	_	_	3.5	3.3
Pot Cap-1 Maneuver	748	_		_	106	564
Stage 1	140	_	_	_	364	- 504
Stage 2	_		-	_	482	-
Platoon blocked, %	-	_	-	_	402	_
Mov Cap-1 Maneuver	748	-	-		98	564
		_	_		98	504
Mov Cap-2 Maneuver	-	-	-	-		
Stage 1	-	-	-	-	338	-
Stage 2	-	-	-	-	482	-
Approach	EB		WB		SB	
HCM Control Delay, s	0.5		0		18.7	
HCM LOS					С	
Mineral and Main M		EDI	CDT.	WDZ	MDD	ODL 4
Minor Lane/Major Mvm	ι	EBL	EBT	WBT	WBR :	
Capacity (veh/h)		748	-	-	-	
HCM Lane V/C Ratio		0.07	-	-		0.091
HCM Control Delay (s)		10.2	-	-	-	
HCM Lane LOS		В	-	-	-	С
HCM 95th %tile Q(veh)		0.2	-	-	-	0.3

Intersection												
Int Delay, s/veh	4.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ች	1		ች	f)			44			र्स	7
Traffic Vol, veh/h	10	45	60	30	45	25	50	260	50	15	365	15
Future Vol, veh/h	10	45	60	30	45	25	50	260	50	15	365	15
Conflicting Peds, #/hr	1	0	0	0	0	1	4	0	1	1	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	125	-	-	-	-	-	-	-	325
Veh in Median Storage,	, # -	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	2	2	2	2	2	2	3	3	3
Mvmt Flow	11	49	65	33	49	27	54	283	54	16	397	16
Major/Minor N	/linor2			Minor1			Major1			Major2		
Conflicting Flow All	890	879	401	913	868	312	417	0	0	338	0	0
Stage 1	433	433	-	419	419	-	-	-	-	-	-	-
Stage 2	457	446	-	494	449	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	266	288	653	254	290	728	1142	-	-	1216	-	-
Stage 1	605	585	-	612	590	-	-	-	-	-	-	-
Stage 2	587	577	-	557	572	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	207	265	651	185	267	727	1138	-	-	1215	-	-
Mov Cap-2 Maneuver	207	265	-	185	267	-	-	-	-	-	-	-
Stage 1	567	573	-	575	555	-	-	-	-	-	-	-
Stage 2	484	542	-	451	560	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	18			21.5			1.2			0.3		
HCM LOS	С			С								
Minor Lane/Major Mvmt	t	NBL	NBT	NBR	EBLn1	EBLn2\	VBLn1\	WBLn2	SBL	SBT	SBR	
Capacity (veh/h)		1138	-	-	207	401	185	345	1215	-	_	
HCM Lane V/C Ratio		0.048	-	-		0.285			0.013	-	-	
HCM Control Delay (s)		8.3	0	-	23.4	17.5	28.6	18.4	8	0	-	
HCM Lane LOS		Α	Α	-	С	С	D	С	Α	Α	-	
HCM 95th %tile Q(veh)		0.1	-	-	0.2	1.2	0.6	0.8	0	-	-	

Intersection						
Int Delay, s/veh	4.9					
		ED.5	14/5	1A/DT	NE	NES
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	Þ		ች	<u></u>	À	
Traffic Vol, veh/h	240	60	210	235	35	115
Future Vol, veh/h	240	60	210	235	35	115
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	0	-
Veh in Median Storage,		-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	1	1	1	1
Mvmt Flow	267	67	233	261	39	128
Major/Minor M	lajor1	ı	Major2		Minor1	
	0	0	334	0	1028	301
Conflicting Flow All			334			
Stage 1	-	-	-	-	301	-
Stage 2	-	-	-	-	727	- 04
Critical Hdwy	-	-	4.11	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-		2.209	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	1231	-	260	741
Stage 1	-	-	-	-	753	-
Stage 2	-	-	-	-	480	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1231	-	211	741
Mov Cap-2 Maneuver	-	-	-	-	211	-
Stage 1	-	-	-	-	753	-
Stage 2	-	-	-	-	389	-
Annroach	ED		\\/D		NB	
Approach	EB		WB			
HCM Control Delay, s	0		4.1		16.9	
HCM LOS					С	
Minor Lane/Major Mvmt		NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)		467	_		1231	_
HCM Lane V/C Ratio		0.357	_	_	0.19	_
HCM Control Delay (s)		16.9	_	_	8.6	_
HCM Lane LOS		C	_	_	A	_
HCM 95th %tile Q(veh)		1.6	_	_	0.7	_
TOW JOHN JUNE Q(VEII)		1.0			0.1	

Intersection						
Int Delay, s/veh	1					
	•					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	^	7		^	7	7
Traffic Vol, veh/h	1085	85	20	845	25	20
Future Vol, veh/h	1085	85	20	845	25	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	300	-	0	0
Veh in Median Storage	, # 0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	1154	90	21	899	27	21
WWW.CT IOW	1101	00		000	_,	
	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1244	0	1646	577
Stage 1	-	-	-	-	1154	-
Stage 2	-	-	-	-	492	-
Critical Hdwy	-	-	4.22	-	6.8	6.9
Critical Hdwy Stg 1	_	_	-	-	5.8	-
Critical Hdwy Stg 2	-	-	_	-	5.8	-
Follow-up Hdwy	_	_	2.26	_	3.5	3.3
Pot Cap-1 Maneuver	_	_	534	_	92	465
Stage 1	_	_	- 00	_	267	-
Stage 2	_	_	_	_	586	_
Platoon blocked, %	_			_	500	
Mov Cap-1 Maneuver	_	_	534		88	465
Mov Cap-1 Maneuver				-	88	405
	-	-	-			
Stage 1	-	-	-	-	267	-
Stage 2	-	-	-	-	563	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.3		40.7	
HCM LOS			0.0		E	
					_	
Minor Lane/Major Mvm	it 1	VBLn1	VBLn2	EBT	EBR	WBL
Capacity (veh/h)		88	465	-	-	534
HCM Lane V/C Ratio		0.302	0.046	-	-	0.04
HCM Control Delay (s)		62.7	13.1	-	-	12
HCM Lane LOS		F	В	-	-	В
HCM 95th %tile Q(veh)		1.1	0.1	-	-	0.1

SECTION 2. FUTURE TRANSPORTATION SYSTEM PERFORMANCE MEMO

FUTURE TRANSPORTATION SYSTEM PERFORMANCE

DATE: June 28, 2021

TO: Project Management Team

FROM: Reah Flisakowski, Dock Rosenthal | DKS Associates

SUBJECT: Sandy Bypass Feasibility Reevaluation P# 20020-007

This memorandum summarizes the future transportation system performance along US 26 through the City of Sandy, Oregon. This assessment generally includes the US 26 segment between the intersections with SE Orient Drive and Firwood Drive at Shorty's Corner. Analyzing the future transportation system performance documents, the expected year 2040 vehicle travel conditions through the City and provides an evaluation of a potential alternative route to US 26 as identified in the 2011 City of Sandy Transportation System Plan. A documentation of future pedestrian, bicycle and transit conditions will be provided as part of the on-going update of the City's Transportation System Plan (TSP).

MOTOR VEHICLE CONDITIONS

Future year 2040 operating conditions for vehicles were assessed using data and findings developed for the existing conditions analysis¹ and available growth pattern data for the study area and US 26. The following sections summarize this analysis.

MOTOR VEHICLE ALTERNATIVES

Future improvement alternatives were previously developed and evaluated as part of the 2011 Sandy TSP² to enhance connectivity, provide access to developing lands, and address congestion in the US 26 corridor. The objective for each improvement alternative ranged from relying mainly on management and enhancement of the existing transportation system to large investments in new facilities to increase corridor capacity.

Three of the prior TSP alternatives were carried forward and incorporated into this Sandy Bypass Feasibility Reevaluation, as described in the following sections. Note the prior TSP Alternative #2 – US 26 Widening was not included in this analysis.

¹ Existing Transportation System Performance memo, DKS Associates, April 19, 2021.

² Sandy TSP Update, Technical Memo #2: Transportation Alternatives and Improvement Strategies, DKS Associates, February 25, 2011.

2040 NO BUILD ALTERNATIVE

A No Build Alternative would typically be based on the existing system and not include future improvements. However, there are several roadway projects that are fully funded and/or currently in the design phase. It was determined these projects should be included in the No Build Alternative due to the high level of certainty that they will be part of the future system. These projects are listed below. A figure showing the project locations by project ID is provided in the appendix.

- Dubarko Road connection to Champion Way (#2)
- Extend Bell Street to 362nd Avenue (portion of #3)
- Extend 362nd Avenue to Bell Street (portion of #4)
- Extend Dubarko Road to US 26 opposite Vista Loop Drive West (#9)
- Signalized control at the intersection of OR 211 and Dubarko Road and US 26 and Vista Loop Drive (west)/Dubarko extension

2040 ALTERNATIVE #1 - LOCAL SYSTEM ENHANCEMENTS AND MINOR HIGHWAY IMPROVEMENTS

The emphasis of this alternative was to improve overall street connectivity, provide access to lands that would develop in the future, and improve operations on US 26 by enhancing the supporting City street network so that local trips would have less need to travel on US 26.

The future improvement projects included in the 2040 Alternative #1 are listed below. They include roadway and intersection capacity projects. A figure showing the project locations by project ID is provided in the appendix.

Roadway Improvements

- Industrial Way extension to Jarl Road/ US 26 (#1)
- Dubarko Road connection to Champion Way (#2)
- Extend Bell Street to Orient Drive (#3)
- Extend 362nd Drive to Kelso Road (#4)
- Extend Kate Schmidt Street from US 26 to the proposed Bell Street extension (#5)
- Extend Industrial Way north of US 26 to Bell Street Extension (#6)
- Extend Olson Road from 362nd Drive to Jewelberry Avenue (#7)
- Extend Agnes Street to Jewelberry Avenue (#8)
- Extend Dubarko Road to US 26 opposite Vista Loop Drive West (#9)
- Gunderson Road, Sandy Heights St./370th Avenue, Colorado Road, Arletha Court (#10)
- Construct a new road from Dubarko Road to US 26 opposite Vista Loop Drive East (#11)

Intersection Improvements

- US 26/ 362nd Drive Construct a second westbound left turn lane, receiving lane for second westbound left turn lane, northbound through lane, new southbound leg with through, right turn and left turn lane
- US 26/ Industrial Way Change southbound approach to dual left turn lanes and a shared through/right lane, construct a northbound left turn lane
- US 26/Ruben Lane Change southbound approach to dual left turn lanes and a shared through/right lane, change northbound approach to left turn lane, and shared through/right lane
- OR 211/ Proctor Boulevard (US 26) Construct a northbound left turn lane (restriping only)
- US 26/ Ten Eyck Road/Wolf Drive Construct a northbound and southbound left turn lane
- US 26/ Vista Loop Drive West Realign Vista Loop Drive to be perpendicular to US 26
- OR 211/ Dubarko Road Construct a traffic signal, northbound right turn lane, southbound left turn lane, northbound left turn lane
- OR 211/ Bornstedt Road Prohibit left turn movements out
- OR 211/ Arletha Court Realign intersection to create a four-legged intersection with the Gunderson Road extension
- 362nd Drive/ Industrial Way (West) Construct an eastbound left turn lane with 50 feet of storage
- 362nd Drive/ Dubarko Road Construct a single-lane roundabout

2040 ALTERNATIVE #3 - LOCAL SYSTEM ENHANCEMENTS AND US 26 BYPASS

Alternative #3 included all the same projects as Alternative #1 but added a bypass of the existing US 26 corridor around the south side of the City from a point west of Orient Drive to approximately Shorty's Corner. A figure showing the high-level conceptual alignment of the bypass (#13) is provided in the appendix.

For the purpose of this analysis, the bypass concept was assumed to have the following design characteristics:

- Four-lane facility (two lanes in each direction)
- 45 mph posted speed and 50 mph design speed
- Limited access facility
 - o interchange at the east and west end connections with US 26
 - o at-grade intersection at OR 211 controlled by a traffic signal or roundabout
 - $\circ \quad \text{remaining key street intersections limited to right-in/right-out} \\$

The bypass conceptual alignment and design characteristics will be further refined during the next phase of the analysis, the Bypass Benefit Cost Analysis.

FUTURE FORECASTING

Traffic forecasts for each of the future 2040 alternatives were developed using a combination of available data and prior modeling analysis and findings. The forecasts relied on recent year 2020 intersection counts³, year 2029 analysis from the 2011 Sandy TSP and ODOT Volume Tables. The forecasts were developed for the TSP study intersections and focused on the peak hour. Future volumes can be found in the operation reports in the appendix.

Future 2040 No Build Alternative forecasts were based on the 2020 count data and growth rates available from the 2029 forecasts. The addition of the Alternative #1 improvements would result in moderate changes to local travel patterns with better connectivity and intersection capacity. The 2040 No Build Alternative forecasts were refined to represent the 2040 Alternative #1 using growth rates available from the 2029 forecasts.

The addition of the bypass would result in significant changes to regional travel patterns. Future 2040 Alternative #3 forecasts were developed using the Alternative #1 volumes, growth rates available from the 2029 forecasts and current travel pattern data.

A travel pattern analysis was completed using StreetLight data which provided information on where vehicle trips are coming from through the City, how much delay these trips experience and how long it takes them to make their trip. The data showed the proposed bypass would attract up to 28% of the total US 26 traffic during the peak hour. For a conservative analysis and for alignment with the 2011 Sandy TSP findings, the forecasting assumed 40% of the total US 26 traffic would divert to the bypass.

The 2040 Alternative #1 volumes were adjusted to account for use of the US 26 bypass to develop 2040 Alternative #3 volumes. US 26 is forecasted to serve approximately 3,800 vehicles during the peak hour under the 2040 No Build Alternative. Under the 2040 Alternative #3, US 26 is forecasted to serve approximately 2,300 vehicles and the bypass is forecasted to serve approximately 1,500 vehicles during the peak hour.

JURISDICTIONAL MOBILITY STANDARDS

The mobility standards for intersections vary according to the agency of jurisdiction for each intersection. Five of the study intersections are under City jurisdiction (362nd Drive/Industrial Way – North and South, Bluff Road/Bell Street, OR 211/Bornstedt, and OR 211/Dubarko) while the remaining 11 intersections are under ODOT jurisdiction. Current ODOT mobility targets require a volume to capacity ratio between 0.80 and 0.90 or less to be maintained at study intersections (see Table 2) and the City of Sandy operating standards require that a level of service "D" or better

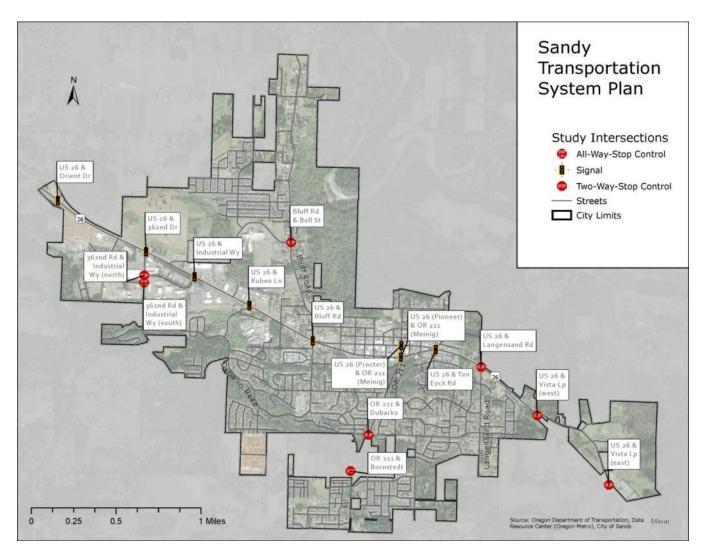
³ Traffic counts were collected on October 22, 2020.

be maintained for any signalized intersection and unsignalized intersections with stop control on the minor approach⁴.

FUTURE INTERSECTION OPERATIONS

Motor vehicle conditions were evaluated for the 2040 peak hour at the 16 study intersections under each of the future improvement alternatives. The evaluation utilized the Highway Capacity Manual (HCM) 6^{th} Edition methodology. The detailed intersection operation reports are shown in the appendix.

FIGURE 1: STUDY INTERSECTIONS WITH EXISTING CONTROL



⁴ City of Sandy Transportation System Plan, DKS Associates, 2011.

2040 No Build

As shown in Table 1, eight intersections are forecasted to exceed mobility targets.

- **US 26 and Orient Drive** The eastbound through movement at this intersection requires more capacity but is limited by the split phasing for Orient Drive/Jarl Road which serves a high southbound left turn volume with only a single approach lane.
- **US 26 and 362nd Drive** More capacity is needed for the eastbound and westbound left and through movements at this intersection but green time for those movements is limited by the split phasing of the northbound and southbound approaches.
- **US 26 and Industrial Way** The eastbound through movement and northbound approach are both over capacity at this intersection. The split phasing of the northbound and southbound approaches also limits the green time available to the US 26 movements.
- **362**nd **Drive and Industrial Way (north)** High northbound and southbound volumes result in limited gaps for the Industrial Way approach at this two-way-stop-controlled intersection.
- **362**nd **Drive and Industrial Way (south)** High traffic volumes at all approaches result in long delays for all movements at this all-way-stop-controlled intersection.
- **US 26 and Ruben Lane** The eastbound through movement and southbound approach are both over capacity at this intersection. The split phasing of the northbound and southbound approaches also limits the green time available to the US 26 movements.
- **US 26 and Bluff Road** The eastbound left and through, westbound left and through, and northbound left movements are all over capacity at this intersection.
- **OR 211 and Bornstedt Road** High eastbound and westbound volumes result in limited gaps for the Bornstedt Road approach at this two-way-stop-controlled intersection.

TABLE 1: 2040 NO BUILD INTERSECTION OPERATIONS (PEAK HOUR)

STUDY INTERSECTION	CONTROL TYPE	JURISDICTION	MOBILITY TARGET	LEVEL OF SERVICE	DELAY (SECONDS)	V/C RATIO
US 26/ORIENT DRIVE	Signal	ODOT	0.80	F	134	1.19
US 26/362 ND DRIVE	Signal	ODOT	0.80	F	121	1.16
US 26/INDUSTRIAL WAY	Signala	ODOT	0.80	Е	74	1.10
362 ND DRIVE/ INDUSTRIAL WAY (NORTH)	TWSC ^b	City of Sandy	D	В [F]	11 [117]	0.49 [0.94]
362 ND DRIVE/ INDUSTRIAL WAY (SOUTH)	AWSC	City of Sandy	D	F	214	1.43
US 26/RUBEN LANE	Signala	ODOT	0.80	С	35	0.97
US 26/BLUFF ROAD	Signal	ODOT	0.85	F	112	1.12
BLUFF ROAD/BELL STREET	TWSC	City of Sandy	D	A [C]	9 [23]	0.29 [0.09]
PIONEER BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	30	0.81
PROCTOR BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	32	0.84
OR 211/ DUBARKO ROAD	Signal	City of Sandy	D	С	21	0.81
OR 211/BORNSTEDT ROAD	TWSC	City of Sandy	D	A [F]	10 [240]	0.35 [1.32]
US 26/TEN EYCK ROAD	Signal	ODOT	0.85	С	29	0.80
US 26/LANGENSAND ROAD	TWSC	ODOT	0.80	C [F]	16 [>300]	0.48 [0.91]
US 26/VISTA LOOP DRIVE W	Signal	ODOT	0.80	С	25	0.66
US 26/VISTA LOOP DRIVE E	TWSC	ODOT	0.80	B [F]	12 [117]	0.48 [0.25]

a. This signal reported using HCM 2000 due to non-standard characteristics.

b. Two-way Stop Controlled (TWSC) measures are reported as worst major [worst minor] approach for LOS and Delay and as worst movement for V/C.

2040 Alternative #1

The improvements included in Alternative 1 were analyzed to assess operation benefits at the study intersections resulting from new system network and added capacity. Two intersections that did not meet mobility targets will do so with the improvements in Alternative #1.

- The intersection of US 26 and Industrial Way meets mobility targets with a reduction in demand at the eastbound, westbound and northbound approaches.
- The intersection of OR 211 and Bornstedt Road meets mobility targets with the prohibition of the northbound left turn movement.

Operations under Alternative #1 conditions are show in Table 2. With the new local network connections north of US 26, particularly the Bell Street extension to Orient Drive, through volumes along US 26 are reduced in Alternative #1 which results in improvements to the operation of intersections along the highway.

Six intersections still fail to meet mobility targets under Alternative #1.

- **US 26 and Orient Drive** There is a higher eastbound left traffic volume and lower eastbound through volume relative to the No Build condition however this reduction does not improve conditions enough for this intersection to meet mobility targets.
- **US 26 and 362nd Drive** Lower traffic volumes for the eastbound and westbound approaches improve conditions at this intersection but it still fails to meet mobility targets.
- **362nd Drive and Industrial Way (north)** With an additional southbound through lane that widens this intersection and increased traffic volumes, conditions remain LOS F for the Industrial Way approach.
- **362nd Drive and Industrial Way (south)** The eastbound left turn lane improves conditions for that approach, but higher northbound and southbound volumes degrade conditions for the major approaches.
- **US 26 and Ruben Lane** Lower traffic volumes for the eastbound and westbound approaches improve conditions at this intersection but it still fails to meet mobility targets.
- **US 26 and Bluff Road** Lower traffic volumes for the eastbound left and through and westbound through movements improve conditions at this intersection but it still fails to meet mobility targets.

TABLE 2: 2040 ALTERNATIVE #1 INTERSECTION OPERATIONS (PEAK HOUR)

STUDY INTERSECTION	CONTROL TYPE	JURISDICTION	MOBILITY TARGET	LEVEL OF SERVICE	DELAY (SECONDS)	V/C RATIO
US 26/ORIENT DRIVE	Signal	ODOT	0.80	F	134	1.11
US 26/362 ND DRIVE	Signal	ODOT	0.80	D	41	1.00
US 26/INDUSTRIAL WAY	Signala	ODOT	0.80	D	18	0.79
362 ND DRIVE/ INDUSTRIAL WAY (NORTH)	TWSC ^b	City of Sandy	D	A [F]	10 [107]	0.46 [1.04]
362 ND DRIVE/ INDUSTRIAL WAY (SOUTH)	AWSC	City of Sandy	D	F	>300	1.52
US 26/RUBEN LANE	Signala	ODOT	0.80	D	48	0.84
US 26/BLUFF ROAD	Signal	ODOT	0.85	Е	73	0.86
BLUFF ROAD/BELL STREET	TWSC	City of Sandy	D	A [C]	8 [16]	0.24 [0.10]
PIONEER BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	32	0.80
PROCTOR BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	27	0.72
OR 211/ DUBARKO RD	Signal	City of Sandy	D	В	16	0.68
OR 211/BORNSTEDT ROD	TWSC	City of Sandy	D	B [B]	11 [15]	0.5 [0.04]
US 26/TEN EYCK ROAD	Signal	ODOT	0.85	С	28	0.73
US 26/LANGENSAND ROAD	TWSC	ODOT	0.80	C [F]	18 [>300]	0.51 [1.21]
US 26/VISTA LOOP DRIVE W	Signal	ODOT	0.80	В	17	0.61
US 26/VISTA LOOP DRIVE E	TWSC	ODOT	0.80	B [F]	12 [121]	0.48 [0.26]

a. This signal reported using HCM 2000 due to non-standard characteristics.

b. Two-way Stop Controlled (TWSC) measures are reported as worst major [worst minor] approach for LOS and Delay and as worst movement for V/C.

Alternative #3

The improvements included in Alternative 1, combined with the bypass of the existing US 26 corridor, were analyzed to assess operation benefits at the study intersections. Because the impacts on the City street network will vary significantly with the locations and types of access allowed to the bypass, only the US 26 corridor intersections were evaluated to see how much the bypass could relieve congestion.

As shown in Table 3, with the addition of a US 26 bypass only the intersection of US 26 and Orient Drive would exceed mobility targets. The eastbound through and southbound left movements at this intersection continue to compete for available green time in the cycle even with the addition of the bypass.

TABLE 3: 2040 ALTERNATIVE #3 INTERSECTION OPERATIONS (PEAK HOUR)

STUDY INTERSECTION	CONTROL TYPE	JURISDICTION	MOBILITY TARGET	LEVEL OF SERVICE	DELAY (SECONDS)	V/C RATIO
US 26/ORIENT DRIVE	Signal	ODOT	0.80	С	32	0.83
US 26/362 ND DRIVE	Signal	ODOT	0.80	С	34	0.76
US 26/INDUSTRIAL WAY	Signala	ODOT	0.80	С	22	0.56
US 26/RUBEN LANE	Signala	ODOT	0.80	С	31	0.65
US 26/BLUFF ROAD	Signal	ODOT	0.85	D	42	0.64
PIONEER BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	27	0.59
PROCTOR BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	29	0.67
US 26/TEN EYCK ROAD	Signal	ODOT	0.85	С	26	0.54
US 26/LANGENSAND ROAD	TWSC	ODOT	0.80	B [D]	10 [33]	0.25 [0.17]
US 26/VISTA LOOP DRIVE W	Signal	ODOT	0.80	Α	4	0.48
US 26/VISTA LOOP DRIVE E	TWSC	ODOT	0.80	A [F]	10 [62]	0.28 [0.14]

a. This signal reported using HCM 2000 due to non-standard characteristics.

b. Two-way Stop Controlled (TWSC) measures are reported as worst major [worst minor] approach for LOS and Delay and as worst movement for V/C.

MOTOR VEHICLE TRAVEL TIME ESTIMATES

The US 26 bypass is expected to serve a moderate future volume and improve traffic flow on US 26 through Sandy. It was estimated that approximately 1,500 vehicles per hour would use the bypass during the year 2040 peak hour. Approximately 60% of the bypass users during the peak hour would be through traffic with no origin or destination in Sandy, while the other 40% would be comprised of local trips accessing the southern end of Sandy.

As an additional measure for evaluating the effectiveness of each alternative, travel times along US 26 through the study area were estimated. Table 4 shows the travel time estimates for each alternative. Improvements in travel times among the alternatives are generally consistent with the improvements shown for intersection operations, with the provision of a bypass in Alternative #3 resulting in moderate reductions in through travel time.

TABLE 4: ESTIMATED US 26 CORRIDOR TRAVEL TIMES (PEAK HOUR)

ALTERNATIVE		TRAVEL TIME EASTBOUND (MM:SS)	TRAVEL TIME WESTBOUND (MM:SS)
2020 EXISTING		09:36	09:54
2040 NO BUILD		16:49	14:26
2040 ALTERNATIVE #1		13:18	10:15
2040 ALTERNATIVE #2	US 26 FACILITY	08:54	10:19
2040 ALTERNATIVE #3	BYPASS FACILITY	07:56	07:56

BYPASS FACILITY CROSS-SECTION CONSIDERATION

The expected 2040 peak hour volumes using the bypass suggest the facility could adequately accommodate demands with a narrower cross-section providing 2 lanes (one in each direction). The highest 2040 volume on the bypass is not expected to exceed 1,000 vehicles in either direction. If the bypass concept was reduced to a 2- lane facility, the connection with OR 211 may require a full interchange instead of an at-grade intersection with traffic signal or roundabout control. The analysis and findings in this future conditions memo would not change since free-flow operations are expected on the bypass with either 2 or 4 lanes and the same future volumes would be served. Both cross-sections options will be considered and further refined during the next phase of the analysis, the Bypass Benefit Cost Analysis.

SUMMARY

The future conditions findings from this analysis will contribute to the content and analysis in subsequent memoranda including the Benefit Cost Analysis Memorandum and the Sandy Bypass Feasibility Reevaluation Report.

Key findings from the future conditions alternative analysis include:

- Under the 2040 No Build Alternative, 8 study intersections (4 on US 26) would exceed mobility targets.
- The addition of local connections and intersection improvements under 2040 Alternative #1,
 6 study intersections (4 on US 26) would continue to exceed mobility targets.
- Adding the bypass under Alternative #3 would improve traffic operations, only one study intersection would continue to exceed mobility targets (US 26 and Orient Drive)
- Approximately 1,500 vehicles an hour would use the bypass during the 2040 peak hour.
- Approximately 60% of bypass users during peak periods would represent through trips,
 40% would be local trips accessing the southern end of Sandy.
- Compared to the 2040 No Build Alternative, the addition of local connections and intersection improvements under 2040 Alternative #1 would decrease travel times on US 26 approximately 3 minutes 30 seconds eastbound and 4 minutes westbound
- Compared to the 2040 No Build Alternative, the addition of the bypass under 2040
 Alternative #3 would decrease travel times on US 26 approximately 8 minutes eastbound and 4 minutes westbound
- Under Alternative #3, the bypass would save travel time through the study area compared to US 26 (1 minute eastbound and 2 minutes 30 seconds westbound)

APPENDIX

CONTENTS

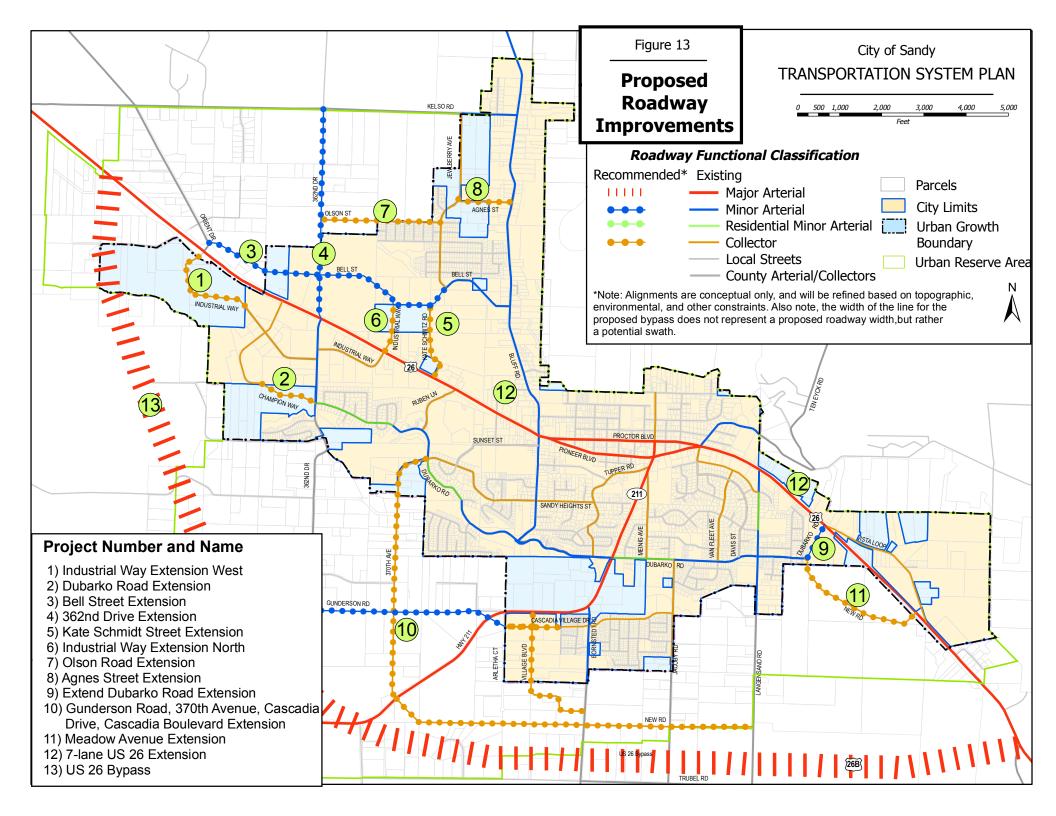
SECTION 1. FUTURE ROADWAY

SECTION 2. FUTURE CONDITION HCM REPORTS



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SECTION 1. FUTURE ROADWAY



SECTION	2.	FUTURE	CONDIT	ION	нсм	REPORTS	

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		^	7	ሻ	^	7		4			4	
Traffic Volume (veh/h)	60	2520	5	10	1750	225	10	50	10	260	10	20
Future Volume (veh/h)	60	2520	5	10	1750	225	10	50	10	260	10	20
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	4	No	4==0		No		1000	No	1000	4==0	No	4==0
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	63	2653	5	11	1842	0	11	53	11	274	11	21
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	81	1907	850	65	1847	0.00	14	69	14	288	12	22
Arrive On Green	0.05	0.57	0.57	0.04	0.56	0.00	0.07	0.06	0.07	0.19	0.19	0.19
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	227	1096	227	1501	60	115
Grp Volume(v), veh/h	63	2653	5	11	1842	0	75	0	0	306	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1551	0	0	1676	0	0
Q Serve(g_s), s	4.2	65.0	0.2	0.7	63.6	0.0	5.5	0.0	0.0	20.7	0.0	0.0
Cycle Q Clear(g_c), s	4.2	65.0	0.2	0.7	63.6	0.0	5.5	0.0	0.0	20.7	0.0	0.0
Prop In Lane	1.00	4007	1.00	1.00	40.47	1.00	0.15	•	0.15	0.90	^	0.07
Lane Grp Cap(c), veh/h	81	1907	850	65	1847		98	0	0	321	0	0
V/C Ratio(X)	0.78	1.39	0.01	0.17	1.00		0.76	0.00	0.00	0.95	0.00	0.00
Avail Cap(c_a), veh/h	81	1907	850	80	1847	4.00	101	0	0	321	0	0
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 25.3	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	54.0 35.6	24.9 179.5	10.8	53.3 0.7	20.2	0.0	52.8 24.9	0.0	0.0	45.9 37.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh %ile BackOfQ(50%),veh/ln	2.5	69.1	0.0	0.0	26.1	0.0	2.8	0.0	0.0	12.0	0.0	0.0
Unsig. Movement Delay, s/veh		09.1	0.1	0.3	20.1	0.0	2.0	0.0	0.0	12.0	0.0	0.0
LnGrp Delay(d),s/veh	89.7	204.4	10.8	54.1	45.5	0.0	77.7	0.0	0.0	83.5	0.0	0.0
LnGrp LOS	09.1 F	204.4 F	В	D D	43.3 D	0.0	F	Α	Α	03.5 F	Α	Α
Approach Vol, veh/h	ı ı	2721	D	ט	1853	А	<u> </u>	75		l l	306	
Approach Delay, s/veh		201.3			45.6	A		77.7			83.5	
Approach LOS		201.3 F			45.0 D			77.7 E			65.5 F	
Approach LOS		Г			D						Г	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	68.0		26.0	8.5	69.0		11.3				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	5.0	61.0		21.0	5.0	61.0		7.0				
Max Q Clear Time (g_c+l1), s	6.2	65.6		22.7	2.7	67.0		7.5				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			133.9									
HCM 6th LOS			F									

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	*	^	7		^	7	ሻሻ	†	7	ች	†	7	
Traffic Volume (veh/h)	300	1600	420	265	1525	340	335	150	325	150	175	170	
Future Volume (veh/h)	300	1600	420	265	1525	340	335	150	325	150	175	170	
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 Approac		No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772	
Adj Flow Rate, veh/h	316	1684	442	279	1605	358	353	158	342	158	184	179	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2	
Cap, veh/h	198	1243	884	258	1397	820	761	402	343	236	248	210	
Arrive On Green	0.08	0.37	0.36	0.16	0.56	0.54	0.23	0.23	0.23	0.14	0.14	0.14	
Sat Flow, veh/h	1688	3367	1502	1661	3313	1502	3300	1772	1512	1688	1772	1502	
Grp Volume(v), veh/h	316	1684	442	279	1605	358	353	158	342	158	184	179	
		1683	1502	1661	1605	1502	1650	1772	342 1512	1688	1772	1502	
Grp Sat Flow(s),veh/h/l													
Q Serve(g_s), s	11.0	48.0	22.3	15.8	54.8	15.9	12.0	9.8	29.4	11.6	13.0	15.1	
Cycle Q Clear(g_c), s	11.0	48.0	22.3	15.8	54.8	15.9	12.0	9.8	29.4	11.6	13.0	15.1	
Prop In Lane	1.00	4040	1.00	1.00	4007	1.00	1.00	400	1.00	1.00	0.40	1.00	
Lane Grp Cap(c), veh/h		1243	884	258	1397	820	761	402	343	236	248	210	
V/C Ratio(X)	1.59	1.35	0.50	1.08	1.15	0.44	0.46	0.39	1.00	0.67	0.74	0.85	
Avail Cap(c_a), veh/h	198	1243	884	258	1397	820	761	402	343	376	395	335	
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	0.20	0.20	0.20	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/ve		41.0	15.6	52.8	28.5	13.2	43.1	42.7	50.2	53.1	53.7	54.6	
Incr Delay (d2), s/veh			2.0	50.9	68.8	0.3	0.3	0.4	47.8	2.4	3.3	9.5	
nitial Q Delay(d3),s/ve		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%),ve		47.0	12.5	11.3	30.1	6.0	4.9	4.3	15.5	5.1	6.0	6.2	
Unsig. Movement Dela													
LnGrp Delay(d),s/veh			17.6	103.7	97.4	13.5	43.3	43.0	98.0	55.5	56.9	64.1	
_nGrp LOS	F	F	В	F	F	В	D	D	F	Е	Е	E	
Approach Vol, veh/h		2442			2242			853			521		
Approach Delay, s/veh		187.6			84.8			65.2			59.0		
Approach LOS		F			F			Е			Е		
Γimer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Ro	3), 281.8	52.0		22.2	15.0	58.8		34.0					
Change Period (Y+Rc)		* 6		4.0	4.0	6.0		4.5					
Max Green Setting (Gn	•	* 46		29.0	11.0	42.0		29.5					
Max Q Clear Time (g. c		50.0		17.1	13.0	56.8		31.4					
Green Ext Time (p_c),	, .	0.0		1.0	0.0	0.0		0.0					
Intersection Summary								J. 5					
			121.2										
HCM 6th Ctrl Delay HCM 6th LOS			121.2 F										
I IOW OUI LOS			Г										

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	*	∱ }		ሻ	^	7		4		*	ર્ન	7
Traffic Volume (vph)	65	1945	5	25	1795	50	170	35	250	230	15	170
Future Volume (vph)	65	1945	5	25	1795	50	170	35	250	230	15	170
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1620		1624	1638	1508
Flt Permitted	0.06	1.00		0.06	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	100	3316		101	3358	1471		1620		1624	1638	1508
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	66	1985	5	26	1832	51	173	36	255	235	15	173
RTOR Reduction (vph)	0	0	0	0	0	23	0	33	0	0	0	112
Lane Group Flow (vph)	66	1990	0	26	1832	28	0	431	0	125	125	61
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						4
Actuated Green, G (s)	74.3	70.3		71.1	68.7	68.7		22.6		17.3	17.3	17.3
Effective Green, g (s)	75.3	71.7		71.1	70.1	70.1		22.6		17.3	17.3	17.3
Actuated g/C Ratio	0.58	0.55		0.55	0.54	0.54		0.17		0.13	0.13	0.13
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	112	1828		83	1810	793		281		216	217	200
v/s Ratio Prot	c0.02	c0.60		0.01	0.55			c0.27		c0.08	0.08	
v/s Ratio Perm	0.32			0.16		0.02						0.04
v/c Ratio	0.59	1.09		0.31	1.01	0.03		1.53		0.58	0.58	0.31
Uniform Delay, d1	56.5	29.1		59.7	30.0	14.1		53.7		52.9	52.9	50.9
Progression Factor	0.43	0.45		0.79	0.67	2.57		1.00		1.00	1.00	1.00
Incremental Delay, d2	2.8	45.0		0.8	19.5	0.0		257.3		2.8	2.7	0.5
Delay (s)	27.4	58.1		47.8	39.4	36.2		311.0		55.7	55.6	51.4
Level of Service	С	Е		D	D	D		F		Е	Е	D
Approach Delay (s)		57.1			39.5			311.0			53.9	
Approach LOS		Е			D			F			D	
Intersection Summary												
•			74.0		<u> </u>	l accal af (
HCM 2000 Control Delay			74.2	Н	CIVI 2000	Level of S	service		Е			
HCM 2000 Volume to Cap	acity ratio		1.10		um afla	t time a /->			10.0			
Actuated Cycle Length (s)			130.0		um of los	. ,			16.0			
Intersection Capacity Utiliz	ation		102.9%	IC	U Level	of Service			G			
Analysis Period (min)			15									

Analysis Period (min) c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ች	^	7	*	^	7		ર્ન	7	*	4	7
Traffic Volume (vph)	175	2045	195	45	1650	100	120	35	40	270	35	135
Future Volume (vph)	175	2045	195	45	1650	100	120	35	40	270	35	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1467	1644	3358	1432		1682	1461	1624	1646	1506
Flt Permitted	0.07	1.00	1.00	0.06	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (perm)	132	3318	1467	96	3358	1432		1682	1461	1624	1646	1506
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	177	2066	197	45	1667	101	121	35	40	273	35	136
RTOR Reduction (vph)	0	0	40	0	0	36	0	0	34	0	0	126
Lane Group Flow (vph)	177	2066	157	45	1667	65	0	156	6	153	155	10
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6		8	8			4
Actuated Green, G (s)	81.5	80.1	80.1	75.5	75.5	75.5		19.3	19.3	10.0	10.0	10.0
Effective Green, g (s)	81.5	81.5	81.5	75.5	76.9	76.9		19.3	19.3	10.0	10.0	10.0
Actuated g/C Ratio	0.63	0.63	0.63	0.58	0.59	0.59		0.15	0.15	0.08	0.08	0.08
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	175	2080	919	93	1986	847		249	216	124	126	115
v/s Ratio Prot	0.06	c0.62		0.01	c0.50			c0.09		c0.09	0.09	
v/s Ratio Perm	c0.57		0.11	0.27		0.05			0.00			0.01
v/c Ratio	1.01	0.99	0.17	0.48	0.84	0.08		0.63	0.03	1.23	1.23	0.09
Uniform Delay, d1	42.5	24.0	10.1	30.2	21.5	11.4		52.0	47.3	60.0	60.0	55.8
Progression Factor	0.66	0.41	0.29	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	23.3	4.6	0.0	2.3	4.5	0.2		3.9	0.0	156.7	154.7	0.2
Delay (s)	51.1	14.5	2.9	32.5	26.0	11.5		55.9	47.4	216.7	214.7	56.0
Level of Service	D	В	Α	С	С	В		Е	D	F	F	Е
Approach Delay (s)		16.2			25.4			54.2			166.8	
Approach LOS		В			С			D			F	
Intersection Summary												
HCM 2000 Control Delay			34.8	Н	CM 2000	Level of S	Service		С			
HCM 2000 Volume to Capa	acity ratio		0.97									
Actuated Cycle Length (s)			130.0	S	um of los	t time (s)			16.0			
Intersection Capacity Utiliz	ation		90.4%			of Service			Е			
Analysis Period (min)			15									
0 111 11 0												

c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ች	^	7	ች	^	7		f)		*	ĵ.		
Traffic Volume (veh/h)	285	1910	155	95	1430	245	145	55	120	155	45	255	
Future Volume (veh/h)	285	1910	155	95	1430	245	145	55	120	155	45	255	
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	•	0.98	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 Approa		No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786	
Adj Flow Rate, veh/h	291	1949	158	97	1459	250	148	56	122	158	46	260	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1	
Cap, veh/h	247	1681	748	75	1150	572	139	78	170	250	53	299	
Arrive On Green	0.15	0.50	0.50	0.05	0.39	0.39	0.08	0.16	0.16	0.15	0.23	0.23	
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	493	1075	1701	232	1313	
Grp Volume(v), veh/h	291	1949	158	97	1459	250	148	0	178	158	0	306	
Grp Sat Flow(s),veh/h/l		1683	1499	1647	1470	1464	1701	0	1569	1701	0	1546	
Q Serve(g_s), s	16.1	54.9	6.5	5.0	43.0	13.8	9.0	0.0	11.8	9.6	0.0	20.9	
Cycle Q Clear(g_c), s	16.1	54.9	6.5	5.0	43.0	13.8	9.0	0.0	11.8	9.6	0.0	20.9	
Prop In Lane	1.00	54.9	1.00	1.00	43.0	1.00	1.00	0.0	0.69	1.00	0.0	0.85	
Lane Grp Cap(c), veh/l		1681	748	75	1150	572	139	0	248	250	0	352	
V/C Ratio(X)	1.18	1.16	0.21	1.30	1.27	0.44	1.06	0.00	0.72	0.63	0.00	0.87	
Avail Cap(c_a), veh/h	247	1681	748	75	1150	572	139	0.00	428	250	0.00	422	
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)	0.13	0.13	0.13	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	
• • • • • • • • • • • • • • • • • • • •		27.5	15.4	52.5	33.5	24.6	50.5	0.00	43.8	44.1	0.00	40.7	
Uniform Delay (d), s/ve Incr Delay (d2), s/veh	85.1	72.7	0.1	202.2	128.1	2.4	94.2	0.0	2.4	44.1	0.0	14.3	
• ():		0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	
Initial Q Delay(d3),s/ve			2.2	6.3	0.0	5.2	0.0		4.8	4.4	0.0	9.4	
%ile BackOfQ(50%),ve		37.1	2.2	0.3	35.5	J.Z	7.5	0.0	4.0	4.4	0.0	9.4	
Unsig. Movement Dela	•		15 5	254.7	161.6	27.0	144.7	0.0	46.2	48.5	0.0	54.9	
LnGrp Delay(d),s/veh		100.2			161.6	27.0		0.0					
LnGrp LOS	F	F	<u>B</u>	F	F 4000	<u>C</u>	F	A 200	D	D	A 404	D	
Approach Vol, veh/h		2398			1806			326			464		
Approach Delay, s/veh		98.5			148.0			90.9			52.7		
Approach LOS		F			F			F			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8					
Phs Duration (G+Y+Ro	s), s9.0	58.9	13.0	29.1	20.9	47.0	20.7	21.4					
Change Period (Y+Rc)		4.8	4.0	4.5	4.8	* 4	4.5	* 4.5					
Max Green Setting (Gr		49.2	9.0	29.5	12.0	* 43	9.0	* 30					
Max Q Clear Time (g_c		56.9	11.0	22.9	18.1	45.0	11.6	13.8					
Green Ext Time (p_c),		0.0	0.0	0.7	0.0	0.0	0.0	0.6					
Intersection Summary													
HCM 6th Ctrl Delay			111.7										
HCM 6th LOS			F										
110101 001 000			'										

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	1.5					
	EBL	EDD	NDI	NDT	CDT	CDD
Movement		EBR	NBL	NBT	SBT	SBR
Lane Configurations	ጟ	7	100	<u>ન</u>	♣	_
Traffic Vol, veh/h	5	55	100	465	405	5
Future Vol, veh/h	5	55	100	465	405	5
Conflicting Peds, #/hr	1	1	_ 2	_ 0	_ 0	_ 2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	180	0	150	-	-	-
Veh in Median Storage		-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	1	1	3	3
Mvmt Flow	5	58	105	489	426	5
Major/Minor	Minor		Major1		Majara	
	Minor2		Major1		Major2	
Conflicting Flow All	1131	432	433	0	-	0
Stage 1	431	-	-	-	-	-
Stage 2	700	-	-	-	-	-
Critical Hdwy	6.44	6.24	4.11	-	-	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	2.209	-	-	-
Pot Cap-1 Maneuver	223	619	1132	-	-	-
Stage 1	651	-	-	-	-	-
Stage 2	489	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	201	617	1130	-	-	-
Mov Cap-2 Maneuver	201	-	_	_	-	-
Stage 1	589	_	_	_	_	_
Stage 2	488	_	_	_	_	_
	,00					
Approach	EB		NB		SB	
HCM Control Delay, s	12.4		1.5		0	
HCM LOS	В					
Minor Lane/Major Mvn	nt	NBL	NRT	EBLn1 l	FRI n2	SBT
	IL .					
Capacity (veh/h)		1130	-		617	-
HCM Lane V/C Ratio		0.093		0.026		-
HCM Control Delay (s		8.5	0	23.4	11.4	-
HCM Lane LOS	,	A	Α	С	В	-
HCM 95th %tile Q(veh)	0.3	-	0.1	0.3	-

Intersection						
Int Delay, s/veh	10.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	₩.	וטוי	1\ B1	וטוז	JDL Š	<u> </u>
Traffic Vol, veh/h	55	80	575	210	190	530
Future Vol, veh/h	55	80	575	210	190	530
Conflicting Peds, #/hr	0	2	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	Stop -	None	-		-	None
Storage Length	0	-	_	-	125	-
Veh in Median Storage		<u>-</u>	0		125	0
Grade, %	e, # 0 0	<u>-</u>	0	-	<u>-</u>	0
Peak Hour Factor	95	95	95	95		95
					95	
Heavy Vehicles, %	4	4	1	1	3	3
Mvmt Flow	58	84	605	221	200	558
Major/Minor I	Minor1	N	Major1	N	Major2	
Conflicting Flow All	1674	718	0	0	826	0
Stage 1	716	-	-	-	-	-
Stage 2	958	_	_	_	_	_
Critical Hdwy	6.44	6.24	_	_	4.13	_
Critical Hdwy Stg 1	5.44	-	_	_	-	<u>-</u>
Critical Hdwy Stg 2	5.44	_	_	_	_	_
Follow-up Hdwy	3.536		_	_	2.227	_
Pot Cap-1 Maneuver	104	426	_	-	800	_
Stage 1	481	420	_	_	000	_
Stage 2	369		-	-	-	-
	309	-	_	-	_	_
Platoon blocked, %	70	405	-	-	000	-
Mov Cap-1 Maneuver	78	425	-	-	800	-
Mov Cap-2 Maneuver	78	-	-	-	-	-
Stage 1	481	-	-	-	-	-
Stage 2	277	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s			0		2.9	
HCM LOS	F		U		2.3	
TICIVI LOS	'					
Minor Lane/Major Mvm	nt	NBT	NBRV	VBLn1	SBL	SBT
Capacity (veh/h)			-	151	800	-
HCM Lane V/C Ratio		_	-	0.941	0.25	-
HCM Control Delay (s)		-		116.9	11	-
HCM Lane LOS		-	-	F	В	_
HCM 95th %tile Q(veh))	-	_	6.8	1	-

Intersection						
Intersection Delay, s/veh	133.5					
Intersection LOS	F					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	¥/	LDIT	NDL	4	<u> </u>	ODIT
Traffic Vol, veh/h	180	230	125	605	555	30
Future Vol, veh/h	180	230	125	605	555	30
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	189	242	132	637	584	32
Number of Lanes	1	0	0	1	1	0
Approach	EB		NB		SB	
Opposing Approach			SB		NB	
Opposing Lanes	0		1		1	
Conflicting Approach Left	SB		EB			
Conflicting Lanes Left	1		1		0	
Conflicting Approach Right	NB				EB	
Conflicting Lanes Right	1		0		1	
HCM Control Delay	35.2		214.3		101.6	
HCM LOS	Е		F		F	
I IOWI LOG			Г		Г	
TION LOS	_				Г	
Lane		NBLn1	EBLn1	SBLn1		
		NBLn1 17%		SBLn1		
Lane			EBLn1			
Lane Vol Left, %		17%	EBLn1 44%	0%		
Lane Vol Left, % Vol Thru, %		17% 83%	EBLn1 44% 0%	0% 95%		
Lane Vol Left, % Vol Thru, % Vol Right, %		17% 83% 0%	EBLn1 44% 0% 56%	0% 95% 5%		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control		17% 83% 0% Stop 730 125	EBLn1 44% 0% 56% Stop 410 180	0% 95% 5% Stop	r	
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol		17% 83% 0% Stop 730 125 605	EBLn1 44% 0% 56% Stop 410 180 0	0% 95% 5% Stop 585 0 555		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol		17% 83% 0% Stop 730 125 605	EBLn1 44% 0% 56% Stop 410 180 0 230	0% 95% 5% Stop 585 0 555 30		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol		17% 83% 0% Stop 730 125 605	EBLn1 44% 0% 56% Stop 410 180 0	0% 95% 5% Stop 585 0 555		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp		17% 83% 0% Stop 730 125 605 0 768	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1	0% 95% 5% Stop 585 0 555 30 616		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X)		17% 83% 0% Stop 730 125 605 0 768 1	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809	0% 95% 5% Stop 585 0 555 30 616 1		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd)		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495	0% 95% 5% Stop 585 0 555 30 616		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes	0% 95% 5% Stop 585 0 555 30 616 1 1.116 7.139 Yes		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes 538	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes 488	0% 95% 5% Stop 585 0 555 30 616 1 1.116 7.139 Yes 511		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes 538 4.863	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes 488 5.495	0% 95% 5% Stop 585 0 555 30 616 1.116 7.139 Yes 511 5.139		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes 538 4.863 1.428	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes 488 5.495 0.885	0% 95% 5% Stop 585 0 555 30 616 1.116 7.139 Yes 511 5.139 1.205		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio HCM Control Delay		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes 538 4.863 1.428 214.3	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes 488 5.495 0.885 35.2	0% 95% 5% Stop 585 0 555 30 616 1 1.116 7.139 Yes 511 5.139 1.205		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes 538 4.863 1.428	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes 488 5.495 0.885	0% 95% 5% Stop 585 0 555 30 616 1.116 7.139 Yes 511 5.139 1.205		

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					4î∌			र्स			f)		
Traffic Volume (veh/h)	0	0	0	175	1375	15	270	45	0	0	65	40	
Future Volume (veh/h)	0	0	0	175	1375	15	270	45	0	0	65	40	
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)				1.00		0.99	1.00		1.00	1.00		0.99	
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approac	ch				No			No			No		
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772	
Adj Flow Rate, veh/h				184	1447	16	284	47	0	0	68	42	
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2	
Cap, veh/h				205	1702	20	422	60	0	0	362	224	
Arrive On Green				0.56	0.56	0.56	0.35	0.35	0.00	0.00	0.35	0.35	
Sat Flow, veh/h				366	3034	35	1018	169	0	0	1022	631	
Grp Volume(v), veh/h				861	0	786	331	0	0	0	0	110	
Grp Sat Flow(s), veh/h/l	n			1712	0	1723	1187	0	0	0	0	1653	
Q Serve(g_s), s				48.9	0.0	40.5	24.4	0.0	0.0	0.0	0.0	5.1	
Cycle Q Clear(g_c), s				48.9	0.0	40.5	29.4	0.0	0.0	0.0	0.0	5.1	
Prop In Lane				0.21		0.02	0.86		0.00	0.00		0.38	
Lane Grp Cap(c), veh/h	1			960	0	967	482	0	0	0	0	586	
V/C Ratio(X)				0.90	0.00	0.81	0.69	0.00	0.00	0.00	0.00	0.19	
Avail Cap(c_a), veh/h				980	0	987	482	0	0	0	0	586	
HCM Platoon Ratio				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	0.79	0.00	0.00	0.00	0.00	1.00	
Uniform Delay (d), s/vel	h			21.3	0.0	19.5	34.7	0.0	0.0	0.0	0.0	24.5	
Incr Delay (d2), s/veh				12.8	0.0	7.5	6.2	0.0	0.0	0.0	0.0	0.1	
Initial Q Delay(d3),s/vel	h			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),ve	h/ln			22.0	0.0	17.5	8.9	0.0	0.0	0.0	0.0	2.0	
Unsig. Movement Delay													
LnGrp Delay(d),s/veh				34.1	0.0	26.9	40.9	0.0	0.0	0.0	0.0	24.7	
LnGrp LOS				С	Α	С	D	Α	Α	Α	Α	С	
Approach Vol, veh/h					1647			331			110		
Approach Delay, s/veh					30.7			40.9			24.7		
Approach LOS					С			D			С		
Timer - Assigned Phs				4		6		8					
Phs Duration (G+Y+Rc). s			43.0		65.7		43.0					
Change Period (Y+Rc),	, .			4.0		4.0		4.0					
Max Green Setting (Gm				39.0		63.0		39.0					
Max Q Clear Time (g_c				7.1		50.9		31.4					
Green Ext Time (p_c), s	, .			0.3		10.8		0.9					
Intersection Summary													
			32.0										
HCM 6th Ctrl Delay HCM 6th LOS			32.0 C										

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		414	7						7		↑		
Traffic Volume (veh/h)	75	1535	555	0	0	0	0	240	245	40	210	0	
Future Volume (veh/h)	75	1535	555	0	0	0	0	240	245	40	210	0	
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	Ū	1.00				1.00	•	0.98	1.00	Ū	1.00	
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approac		No						No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0	
Adj Flow Rate, veh/h	79	1616	0				0	253	258	42	221	0	
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2				0.00	2	2	5	5	0.00	
Cap, veh/h	97	2082					0	403	334	52	498	0	
Arrive On Green	0.63	0.63	0.00				0.00	0.23	0.23	0.01	0.10	0.00	
Sat Flow, veh/h	153	3294	1502				0.00	1772	1470	1647	1730	0.00	
Grp Volume(v), veh/h	908	787	0				0	253	258	42	221	0	
Grp Sat Flow(s), veh/h/l		1683	1502				0	1772	1470	1647	1730	0	
Q Serve(g_s), s	42.9	35.5	0.0				0.0	14.2	18.1	2.8	13.3	0.0	
, T. /			0.0					14.2	18.1	2.8			
Cycle Q Clear(g_c), s	42.9	35.5					0.0	14.2			13.3	0.0	
Prop In Lane	0.09	1064	1.00				0.00	100	1.00	1.00	400	0.00	
Lane Grp Cap(c), veh/h		1064					0	403	334	52	498	0	
V/C Ratio(X)	0.81	0.74					0.00	0.63	0.77	0.81	0.44	0.00	
Avail Cap(c_a), veh/h	1115	1064	4.00				0	403	334	75	535	0	
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00	
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.97	0.97	0.99	0.99	0.00	
Uniform Delay (d), s/ve		14.0	0.0				0.0	38.3	39.8	54.1	41.5	0.0	
Incr Delay (d2), s/veh	6.6	4.6	0.0				0.0	7.0	15.4	26.3	0.4	0.0	
Initial Q Delay(d3),s/vel		0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),ve		14.0	0.0				0.0	6.8	7.8	1.6	6.2	0.0	
Unsig. Movement Delay								4= 0	^	00.4	47.0		
LnGrp Delay(d),s/veh	21.9	18.6	0.0				0.0	45.3	55.2	80.4	41.8	0.0	
LnGrp LOS	С	В					Α	D	E	F	D	Α	
Approach Vol, veh/h		1695	Α					511			263		
Approach Delay, s/veh		20.4						50.3			48.0		
Approach LOS		С						D			D		
Timer - Assigned Phs		2		4			7	8					
Phs Duration (G+Y+Rc), s	73.5		36.5			7.5	29.0					
Change Period (Y+Rc),		4.0		* 4.8			4.0	4.8					
Max Green Setting (Gr		68.0		* 34			5.0	24.2					
Max Q Clear Time (g_c				15.3			4.8	20.1					
Green Ext Time (p_c),		19.7		0.5			0.0	0.7					
Intersection Summary													
•			20.5										
HCM 6th LCC			29.5										
HCM 6th LOS			С										
Notes													

Notes

^{*} HCM 6th computational engine requires equal clearance times for the phases crossing the barrier. Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	*	^	7	- 1	^	7		4			4		
Traffic Volume (veh/h)	170	1450	125	10	1180	25	100	25	10	175	20	120	
Future Volume (veh/h)	170	1450	125	10	1180	25	100	25	10	175	20	120	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	J	1.00	1.00		1.00	1.00	U	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 Approac		No	1.00	1.00	No	1.00	1.00	No	1.00	1.00	No	1.00	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758	
Adj Flow Rate, veh/h	179	1526	132	11	1242	26	105	26	11	184	21	126	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	7	7	7	0.50	0.50	0.50	3	3	3	
Cap, veh/h	343	2075	925	24	1398	623	272	64	23	258	24	142	
Arrive On Green	0.20	0.62	0.62	0.01	0.43	0.43	0.25	0.26	0.24	0.25	0.26	0.24	
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	842	250	92	812	96	558	
	179	1526	132	11	1242	26	142	0	0	331	0	0	
Grp Volume(v), veh/h			1500	1621		1442	1185	0	0	1465		0	
Grp Sat Flow(s),veh/h/lr		1683 35.0	4.1	0.7	1617 39.0		0.0	0.0	0.0	12.7	0.0	0.0	
Q Serve(g_s), s	10.4					1.1							
Cycle Q Clear(g_c), s	10.4	35.0	4.1	0.7	39.0	1.1	11.3	0.0	0.0	24.0	0.0	0.0	
Prop In Lane	1.00	2075	1.00	1.00	1200	1.00	0.74	۸	0.08	0.56	٥	0.38	
Lane Grp Cap(c), veh/h		2075	925	24	1398	623	354	0	0	418	0	0	
V/C Ratio(X)	0.52	0.74	0.14	0.45	0.89	0.04	0.40	0.00	0.00	0.79	0.00	0.00	
Avail Cap(c_a), veh/h	343	2075	925	66	1446	645	413	0	0	481	0	0	
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	0.00	0.00	1.00	0.00	0.00	
Uniform Delay (d), s/vel		14.8	8.9	53.7	28.8	18.1	34.8	0.0	0.0	39.8	0.0	0.0	
ncr Delay (d2), s/veh	1.0	2.4	0.3	7.9	8.8	0.1	0.5	0.0	0.0	7.2	0.0	0.0	
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	
%ile BackOfQ(50%),vel		13.4	1.4	0.3	15.8	0.4	3.3	0.0	0.0	9.5	0.0	0.0	
Unsig. Movement Delay			0.0	04.7	07.5	40.0	05.0	0.0	0.0	47.4	0.0	0.0	
LnGrp Delay(d),s/veh	40.0	17.2	9.2	61.7	37.5	18.2	35.3	0.0	0.0	47.1	0.0	0.0	
LnGrp LOS	D	В	Α	<u>E</u>	D	В	D	A	Α	D	A	Α	
Approach Vol, veh/h		1837			1279			142			331		
Approach Delay, s/veh		18.8			37.4			35.3			47.1		
Approach LOS		В			D			D			D		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc)), s5 6	72.3		32.1	26.4	51.5		32.1					
Change Period (Y+Rc),		* 4.5		5.5	4.5	4.0		5.5					
Max Green Setting (Gm		* 61		31.3	15.5	49.2		31.3					
Max Q Clear Time (g_c		37.0		26.0	12.4	41.0		13.3					
Green Ext Time (p_c), s		19.6		0.5	0.1	6.6		0.4					
ntersection Summary	3.0	. 3.0		J.0	J .,	3.0		J.,					
HCM 6th Ctrl Delay			28.7										
HCM 6th LOS			C										
Notes													

^{*} HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection							
Int Delay, s/veh	3.4						
Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	^	7	ነ ነ	^	ሻ	7	
	1535	90	30	1230	25	70	
,	1535	90	30	1230	25	70	
Conflicting Peds, #/hr	0	0	0	0	0	0	
	Free	Free	Free	Free	Stop	Stop	
RT Channelized		None	-	None	-	None	
Storage Length	_	100	300	-	0	0	
Veh in Median Storage,		-	-	0	0	-	
Grade, %	0	_	_	0	0	_	
Peak Hour Factor	95	95	95	95	95	95	
Heavy Vehicles, %	2	2	6	6	0	0	
	1616	95	32	1295	26	74	
IVIVIII(I IOW	1010	30	JZ	1233	20	74	
Major/Minor Ma	ajor1	N	Major2	N	Minor1		
Conflicting Flow All	0	0	1711	0	2328	808	۰
Stage 1	-	-	-	-	1616	-	
Stage 2	-	-	-	-	712	-	
Critical Hdwy	-	-	4.22	-	6.8	6.9	
Critical Hdwy Stg 1	_	_	-	-	5.8	-	
Critical Hdwy Stg 2	-	_	-	_	5.8	_	
Follow-up Hdwy	-	-	2.26	_	3.5	3.3	
Pot Cap-1 Maneuver	-	_	350	_	32	328	
Stage 1	-	-	_	_	151	-	
Stage 2	_	_	_	_	453	_	
Platoon blocked, %	_	_		_			
Mov Cap-1 Maneuver	_	_	350	_	29	328	
Mov Cap-2 Maneuver	_	_	-	_	29	-	
Stage 1	_	_	_	-	151	_	
Stage 2	_	_	_	_	412	_	
Olage 2					712		
Approach	EB		WB		NB		
HCM Control Delay, s	0		0.4		102.1		
HCM LOS					F		
Minor Long/Major Mumt	N.	IDI n4 N	JDI 20	EDT	EBR	WBL	
Minor Lane/Major Mvmt	IN	IBLn11		EBT			
Capacity (veh/h)		29	328	-	-	350	
HCM Lane V/C Ratio		0.907		-	-	0.09	
HUNG Control Dolay (c)		33/1/	19.1	-	-	16.3	
HCM Control Delay (s)	\$	334.4				^	
HCM Lane LOS HCM 95th %tile Q(veh)	\$	F 3	C 0.8	-	-	C 0.3	

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	^↑	7	ሻ	∱ ∱			4			4	
Traffic Volume (veh/h)	170	1435	0	100	1140	0	5	5	100	5	0	120
Future Volume (veh/h)	170	1435	0	100	1140	0	5	5	100	5	0	120
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	1758	1758	1723	1723	1716	1716	1723	1723	1723	1800	1723	1800
Adj Flow Rate, veh/h	179	1511	0	105	1200	0	5	5	105	5	0	126
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	2	2	6	6	2	2	2	0	2	0
Cap, veh/h	547	2609	1141	436	2509	0	74	0	3	74	0	3
Arrive On Green	0.07	0.78	0.00	0.06	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	1674	3340	1460	1641	3346	0	75	75	1569	66	0	1654
Grp Volume(v), veh/h	179	1511	0	105	1200	0	115	0	0	131	0	0
Grp Sat Flow(s),veh/h/ln	1674	1670	1460	1641	1630	0	1719	0	0	1719	0	0
Q Serve(g_s), s	1.2	9.2	0.0	0.7	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.2	9.2	0.0	0.7	6.8	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Prop In Lane	1.00	0000	1.00	1.00	0500	0.00	0.04	•	0.91	0.04	•	0.96
Lane Grp Cap(c), veh/h	547	2609	1141	436	2509	0	77	0	0	77	0	0
V/C Ratio(X)	0.33	0.58	0.00	0.24	0.48	0.00	1.48	0.00	0.00	1.70	0.00	0.00
Avail Cap(c_a), veh/h	888	4942	2160	660	4566	0	855	0	0	851	0	0
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	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	1.8	2.2 0.4	0.0	2.2 0.2	2.1 0.3	0.0	25.4	0.0	0.0	25.4 323.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.2	0.0	0.0	228.6 0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh %ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	5.8	0.0	0.0	7.8	0.0	0.0
Unsig. Movement Delay, s/veh		0.2	0.0	0.0	0.1	0.0	5.0	0.0	0.0	1.0	0.0	0.0
LnGrp Delay(d),s/veh	2.1	2.7	0.0	2.4	2.4	0.0	254.0	0.0	0.0	348.6	0.0	0.0
LnGrp LOS	Α	A.7	Α	2. 4	2. 4	Α	254.0 F	Α	Α	540.0 F	Α	Α
Approach Vol, veh/h		1690			1305		ı	115		ı	131	
Approach Delay, s/veh		2.6			2.4			254.0			348.6	
Approach LOS		2.0 A			2.4 A			_			540.0 F	
								F			'	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.7	43.0		0.0	7.1	43.6		0.0				
Change Period (Y+Rc), s	4.0	6.0		4.0	4.0	6.0		4.0				
Max Green Setting (Gmax), s	14.0	69.0		23.0	10.0	73.0		23.0				
Max Q Clear Time (g_c+I1), s	3.2	8.8		0.0	2.7	11.2		0.0				
Green Ext Time (p_c), s	0.3	17.7		0.0	0.1	26.4		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			25.4									
HCM 6th LOS			С									

Intersection						
Int Delay, s/veh	0.4					
		EDT	WDT	WED	CDI	CDD
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	7	^	†	05	Y	^
Traffic Vol, veh/h	5	1535	1235	25	10	0
Future Vol, veh/h	5	1535	1235	25	10	0
Conflicting Peds, #/hr	_ 0	_ 0	_ 0	_ 0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized		None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage,	# -	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	1616	1300	26	11	0
Major/Minor M	lajor1	N	Major2	, l	Minor2	
	1326	0	-	0	2131	663
		U			1313	
Stage 1	-	-	-	-		-
Stage 2	-	-	-	-	818	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	517	-	-	-	42	404
Stage 1	-	-	-	-	216	-
Stage 2	-	-	-	-	394	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	517	-	-	-	42	404
Mov Cap-2 Maneuver	-	-	-	-	42	-
Stage 1	-	-	-	-	214	-
Stage 2	-	-	-	-	394	-
Approach	EB		WB		SB	
HCM Control Delay, s	0		0		117.3	
HCM LOS					F	
Minor Lane/Major Mvmt		EBL	EBT	WBT	WBR :	SBLn1
Capacity (veh/h)		517		-	-	42
Oupdoily (VOII/II)		0.01	_	_		0.251
		0.01				
HCM Lane V/C Ratio		12	_	_	_	11/3
HCM Lane V/C Ratio HCM Control Delay (s)		12 B	-	-		117.3
HCM Lane V/C Ratio		12 B 0	-	- -	- -	117.3 F 0.8

	•	→	•	•	←	•	4	†	~	/	ļ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	₽		ሻ	₽		ሻ	↑	7	7	↑	7
Traffic Volume (veh/h)	30	190	90	160	70	30	110	230	130	50	535	40
Future Volume (veh/h)	30	190	90	160	70	30	110	230	130	50	535	40
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	1800	1800	1800	1772	1772	1772	1772	1772	1772	1758	1758	1758
Adj Flow Rate, veh/h	32	200	95	168	74	32	116	242	137	53	563	42
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	2	2	2	2	2	2	3	3	3
Cap, veh/h	429	238	113	317	327	141	294	748	631	494	704	594
Arrive On Green	0.03	0.21	0.21	0.10	0.28	0.28	0.06	0.42	0.42	0.04	0.40	0.40
Sat Flow, veh/h	1714	1152	547	1688	1173	507	1688	1772	1495	1674	1758	1482
Grp Volume(v), veh/h	32	0	295	168	0	106	116	242	137	53	563	42
Grp Sat Flow(s),veh/h/ln	1714	0	1700	1688	0	1680	1688	1772	1495	1674	1758	1482
Q Serve(g_s), s	1.0	0.0	11.3	5.0	0.0	3.3	2.8	6.2	4.0	1.3	19.2	1.2
Cycle Q Clear(g_c), s	1.0	0.0	11.3	5.0	0.0	3.3	2.8	6.2	4.0	1.3	19.2	1.2
Prop In Lane	1.00	0	0.32	1.00	^	0.30	1.00	740	1.00	1.00	704	1.00
Lane Grp Cap(c), veh/h	429	0	351	317	0	468	294	748	631	494	704	594
V/C Ratio(X)	0.07 484	0.00	0.84 524	0.53 348	0.00	0.23 617	0.39 294	0.32 1067	0.22	0.11	0.80	0.07
Avail Cap(c_a), veh/h HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.007	900 1.00	530 1.00	1058 1.00	893 1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.4	0.00	25.9	18.3	0.00	18.9	14.3	13.2	12.5	11.8	18.0	12.6
Incr Delay (d2), s/veh	0.1	0.0	6.6	1.0	0.0	0.2	0.6	0.5	0.4	0.1	4.8	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.4	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	5.0	1.9	0.0	1.2	0.9	2.2	1.3	0.4	7.6	0.4
Unsig. Movement Delay, s/veh		0.0	5.0	1.0	0.0	1.2	0.5	۷.۷	1.0	0.4	1.0	0.4
LnGrp Delay(d),s/veh	20.5	0.0	32.5	19.3	0.0	19.1	14.9	13.7	12.9	11.8	22.8	12.7
LnGrp LOS	C	Α	C	В	Α	В	В	В	12.3 B	В	C	В
Approach Vol, veh/h		327			274			495			658	
Approach Delay, s/veh		31.4			19.2			13.8			21.3	
Approach LOS		C			В			В			C C	
							_				0	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.5	32.8	10.8	18.1	8.0	31.3	5.8	23.0				
Change Period (Y+Rc), s	4.0	4.8	4.0	4.0	4.0	4.8	4.0	4.0				
Max Green Setting (Gmax), s	4.0	40.2	8.0	21.0	4.0	40.2	4.0	25.0				
Max Q Clear Time (g_c+l1), s	3.3	8.2	7.0	13.3	4.8	21.2	3.0	5.3				
Green Ext Time (p_c), s	0.0	3.5	0.0	0.6	0.0	5.3	0.0	0.2				
Intersection Summary												
HCM 6th Ctrl Delay			20.7									
HCM 6th LOS			С									

Intersection						
Int Delay, s/veh	31					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	ĵ.		ች	↑	¥	
Traffic Vol, veh/h	400	120	230	570	105	80
Future Vol, veh/h	400	120	230	570	105	80
Conflicting Peds, #/hr	0	0	0	0	0	0
•	Free	Free	Free	Free	Stop	Stop
RT Channelized	-		-	None	_	None
Storage Length	_	_	150	_	0	-
Veh in Median Storage, #	# 0	-	_	0	0	_
Grade, %	0	_	_	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	1	1	1	1
Mymt Flow	421	126	242	600	111	84
IVIVIIIL I IOW	421	120	242	000	111	04
Major/Minor Ma	ajor1	N	Major2	ľ	Minor1	
Conflicting Flow All	0	0	547	0	1568	484
Stage 1	-	-	-	-	484	-
Stage 2	-	-	-	-	1084	-
Critical Hdwy	-	-	4.11	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	_	-	-	-	5.41	-
Follow-up Hdwy	_	_	2.209	_	3.509	3.309
Pot Cap-1 Maneuver	_	_	1027	_	123	585
Stage 1	_	_	-	_	622	-
Stage 2	_	_	_	-	326	_
Platoon blocked, %	_	_		_	020	
Mov Cap-1 Maneuver	_	_	1027	-	~ 94	585
Mov Cap-1 Maneuver	_	_	1021	_	~ 94	-
		_	-	-	622	
Stage 1	-	-	-	-	249	-
Stage 2	-	-	-	-	249	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		2.8		239.8	
HCM LOS					F	
Minor Lane/Major Mvmt	1	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)		148	-		1027	-
HCM Lane V/C Ratio		1.316	-	-	0.236	-
HCM Control Delay (s)		239.8	-	-	9.6	-
HCM Lane LOS		F	-	-	Α	-
HCM 95th %tile Q(veh)		12	-	-	0.9	-
Notes						
	.,			1 0	00	
~: Volume exceeds capa	icity	\$: De	elay exc	eeds 3	UUS	+: Com

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ		7	ሻ	^	7		4			4	
Traffic Volume (veh/h)	250	2205	15	10	1435	165	70	50	10	165	10	90
Future Volume (veh/h)	250	2205	15	10	1435	165	70	50	10	165	10	90
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	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	263	2321	16	11	1511	0	74	53	11	174	11	95
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	182	1735	774	73	1496	0.00	65	46	10	207	13	113
Arrive On Green	0.11	0.52	0.52	0.04	0.45	0.00	0.08	0.08	0.08	0.21	0.21	0.21
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	826	591	123	1008	64	550
Grp Volume(v), veh/h	263	2321	16	11	1511	0	138	0	0	280	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1540	0	0	1622	0	0
Q Serve(g_s), s	11.0	52.5	0.5	0.6	46.0	0.0	8.0	0.0	0.0	16.9	0.0	0.0
Cycle Q Clear(g_c), s	11.0	52.5	0.5	0.6	46.0	0.0	8.0	0.0	0.0	16.9	0.0	0.0
Prop In Lane	1.00	4705	1.00	1.00	4.400	1.00	0.54	•	0.08	0.62	•	0.34
Lane Grp Cap(c), veh/h	182	1735	774	73	1496		121	0	0	333	0	0
V/C Ratio(X)	1.44	1.34	0.02	0.15	1.01		1.14	0.00	0.00	0.84	0.00	0.00
Avail Cap(c_a), veh/h	182	1735	774	73	1496	4.00	121	0	0	541	0	0
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	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	45.4	24.7	12.1	46.9	27.9	0.0	46.8	0.0	0.0	38.9	0.0	0.0
Incr Delay (d2), s/veh	227.8	156.2	0.0	0.6	25.8	0.0	124.9	0.0	0.0	6.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0 7.3	0.0	0.0	0.0 7.3	0.0	0.0
%ile BackOfQ(50%),veh/ln Unsig. Movement Delay, s/veh	15.9	55.0	0.2	0.3	21.0	0.0	1.3	0.0	0.0	1.3	0.0	0.0
LnGrp Delay(d),s/veh	273.3	180.9	12.1	47.4	53.8	0.0	171.7	0.0	0.0	45.3	0.0	0.0
LnGrp LOS	213.3 F	100.9 F	12.1 B	47.4 D	55.6 F	0.0	171.7 F	0.0 A	0.0 A	45.5 D	0.0 A	0.0 A
· ·	Г	2600	В	U	1522	A	Г	138	^	<u> </u>	280	
Approach Vol, veh/h		189.2			53.7	А		171.7			45.3	
Approach LOS		109.Z			55.1 D			171.7 F			45.5 D	
Approach LOS		l l									D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.0	50.0		24.9	8.5	56.5		12.0				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	10.5	43.0		33.0	4.0	49.5		7.5				
Max Q Clear Time (g_c+l1), s		48.0		18.9	2.6	54.5		10.0				
Green Ext Time (p_c), s	0.0	0.0		1.0	0.0	0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			134.3									
HCM 6th LOS			F									

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ሻ	^	7	ሻሻ	^	7	ሻሻ	<u> </u>	7	<u> </u>	<u> </u>	7	
Traffic Volume (veh/h)	200	1355	450	225	1415	250	185	260	300	50	150	65	
Future Volume (veh/h)	200	1355	450	225	1415	250	185	260	300	50	150	65	
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 Approac		No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772	
Adj Flow Rate, veh/h	211	1426	474	237	1489	263	195	274	316	53	158	68	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2	
Cap, veh/h	261	1450	1003	463	1725	851	745	393	336	104	109	92	
Arrive On Green	0.07	0.43	0.43	0.29	1.00	1.00	0.23	0.22	0.22	0.06	0.06	0.06	
Sat Flow, veh/h	1688	3367	1502	3222	3313	1502	3300	1772	1511	1688	1772	1502	
Grp Volume(v), veh/h	211	1426	474	237	1489	263	195	274	316	53	158	68	
Grp Sat Flow(s), veh/h/h		1683	1502	1611	1657	1502	1650	1772	1511	1688	1772	1502	
Q Serve(g_s), s	9.0	54.4	19.9	8.0	0.0	0.0	6.3	18.5	26.7	4.0	8.0	5.8	
Cycle Q Clear(g_c), s	9.0	54.4	19.9	8.0	0.0	0.0	6.3	18.5	26.7	4.0	8.0	5.8	
Prop In Lane	1.00	07.7	1.00	1.00	0.0	1.00	1.00	10.0	1.00	1.00	0.0	1.00	
Lane Grp Cap(c), veh/h		1450	1003	463	1725	851	745	393	336	104	109	92	
V/C Ratio(X)	0.81	0.98	0.47	0.51	0.86	0.31	0.26	0.70	0.94	0.51	1.45	0.74	
Avail Cap(c_a), veh/h	261	1450	1003	463	1725	851	761	402	343	234	245	208	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	0.51	0.51	0.51	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/vel		36.5	10.5	42.5	0.0	0.0	41.4	46.5	49.7	59.1	61.0	60.0	
Incr Delay (d2), s/veh	16.5	20.0	1.6	0.3	3.2	0.5	0.1	4.5	33.1		223.6	8.3	
Initial Q Delay(d3),s/vel		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%),vel		24.5	11.9	2.8	0.8	0.1	2.6	8.6	13.1	1.8	10.3	2.4	
Unsig. Movement Delay					3.0	J. 1	0	3.0		1.0	. 5.0		
LnGrp Delay(d),s/veh	46.5	56.5	12.1	42.8	3.2	0.5	41.5	51.1	82.9	62.0	284.6	68.2	
LnGrp LOS	D	E	В	D	A	A	D	D	F	E	F	E	
Approach Vol, veh/h		2111			1989	- '		785	•	_	279	_	
Approach Delay, s/veh		45.5			7.6			61.5			189.6		
Approach LOS		43.3 D			Α.			61.5 E			F		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc) 24 7	60.0		12.0	13.0	71.7		33.4					
Change Period (Y+Rc),		* 6		4.0	4.0	6.0		4.5					
Max Green Setting (Gr		* 54		18.0	9.0	55.0		29.5					
Max Q Clear Time (g c		56.4		7.8	11.0	2.0		28.7					
Green Ext Time (p_c),	, ,	0.0		0.2	0.0	51.5		0.1					
u = 7:	5 0.0	0.0		U.Z	0.0	31.3		0.1					
Intersection Summary													
HCM 6th Ctrl Delay			41.1										
HCM 6th LOS			D										

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	↑ ↑		ሻ	^	7	ሻ	∱		1,1	1>	•
Traffic Volume (vph)	50	1645	10	40	1595	50	170	25	100	220	45	135
Future Volume (vph)	50	1645	10	40	1595	50	170	25	100	220	45	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0	3.0	4.0		4.0	4.0	
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.88		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1676	3315		1644	3358	1471	1693	1569		3317	1580	
Flt Permitted	0.08	1.00		0.06	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	140	3315		102	3358	1471	1693	1569		3317	1580	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	51	1679	10	41	1628	51	173	26	102	224	46	138
RTOR Reduction (vph)	0	0	0	0	0	20	0	91	0	0	71	0
Lane Group Flow (vph)	51	1689	0	41	1628	31	173	37	0	224	113	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						
Actuated Green, G (s)	82.0	78.8		82.0	78.8	78.8	13.5	13.5		17.1	17.1	
Effective Green, g (s)	83.0	80.2		82.0	80.2	80.2	14.5	13.5		17.1	17.1	
Actuated g/C Ratio	0.64	0.62		0.63	0.62	0.62	0.11	0.10		0.13	0.13	
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4	3.0	3.0		2.3	2.3	
Lane Grp Cap (vph)	133	2045		102	2071	907	188	162		436	207	
v/s Ratio Prot	c0.01	c0.51		0.01	0.48		c0.10	0.02		0.07	c0.07	
v/s Ratio Perm	0.23			0.24		0.02						
v/c Ratio	0.38	0.83		0.40	0.79	0.03	0.92	0.23		0.51	0.54	
Uniform Delay, d1	35.2	19.4		40.6	18.5	9.7	57.2	53.5		52.6	52.8	
Progression Factor	0.38	0.21		0.47	0.46	0.50	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	2.4		1.0	2.1	0.0	43.5	0.7		0.6	2.0	
Delay (s)	14.1	6.4		20.1	10.6	4.9	100.7	54.2		53.2	54.8	
Level of Service	В	Α		С	В	Α	F	D		D	D	
Approach Delay (s)		6.6			10.7			80.9			53.9	
Approach LOS		Α			В			F			D	
Intersection Summary												
•			40.0		ON 4 0000	l accel af	O a m si a a					
HCM 2000 Control Delay	!		18.3	Н	CIVI 2000	Level of	Service		В			
HCM 2000 Volume to Cap	acity ratio		0.79		uma afla	1 1 line 5 (-)			10.0			
Actuated Cycle Length (s)			130.0		um of lost				16.0			
Intersection Capacity Utiliz	ation		80.8%	IC	U Level	of Service	! 		D			
Analysis Period (min)			15									

Analysis Period (min) c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ሻ	^	7	ሻ	^	7	ሻ	f)		1/1	ĵ.		
Traffic Volume (veh/h)	125	1625	210	55	1450	95	115	80	35	210	55	165	
Future Volume (veh/h)	125	1625	210	55	1450	95	115	80	35	210	55	165	
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		0.99	1.00		0.98	
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 Approac	ch	No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1758	1758	1758	1800	1800	1800	
Adj Flow Rate, veh/h	126	1641	0	56	1465	96	116	81	35	212	56	167	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
Percent Heavy Veh, %	2	2	2	4	4	4	3	3	3	0	0	0	
Cap, veh/h	420	2226		232	1638	713	184	118	51	256	30	90	
Arrive On Green	0.41	1.00	0.00	0.03	0.48	0.48	0.11	0.10	0.10	0.08	0.08	0.08	
Sat Flow, veh/h	1688	3331	1502	1661	3383	1473	1674	1160	501	3326	393	1173	
Grp Volume(v), veh/h	126	1641	0	56	1465	96	116	0	116	212	0	223	
Grp Sat Flow(s),veh/h/li		1666	1502	1661	1692	1473	1674	0	1661	1663	0	1567	
Q Serve(g_s), s	0.0	0.0	0.0	2.5	51.2	4.7	8.6	0.0	8.8	8.2	0.0	10.0	
Cycle Q Clear(g_c), s	0.0	0.0	0.0	2.5	51.2	4.7	8.6	0.0	8.8	8.2	0.0	10.0	
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.30	1.00		0.75	
Lane Grp Cap(c), veh/h		2226		232	1638	713	184	0	169	256	0	121	
V/C Ratio(X)	0.30	0.74		0.24	0.89	0.13	0.63	0.00	0.69	0.83	0.00	1.85	
Avail Cap(c_a), veh/h	420	2226		234	1639	714	476	0	460	256	0	121	
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	0.53	0.53	0.00	0.46	0.46	0.46	1.00	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/vel		0.0	0.0	19.8	30.5	18.5	55.4	0.0	56.4	59.2	0.0	60.0	
Incr Delay (d2), s/veh	0.1	1.2	0.0	0.1	4.0	0.2	2.2	0.0	3.0	19.2	0.0	412.7	
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	
%ile BackOfQ(50%),vel		0.4	0.0	0.9	20.7	1.6	3.8	0.0	3.9	4.2	0.0	17.8	
Unsig. Movement Delay					•								
LnGrp Delay(d),s/veh	30.2	1.2	0.0	19.9	34.5	18.7	57.6	0.0	59.3	78.3	0.0	472.7	
LnGrp LOS	С	Α		В	С	В	E	A	E	E	A	F	
Approach Vol, veh/h		1767	Α		1617			232			435		
Approach Delay, s/veh		3.3			33.0			58.5			280.5		
Approach LOS		Α			С			Е			F		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc)) s7 0	90.9		14.0	31.8	66.9		17.3					
Change Period (Y+Rc),		* 5.4		4.0	* 5.4	* 5.4		4.0					
Max Green Setting (Gm		* 63		10.0	* 5	* 62		36.0					
Max Q Clear Time (g_c		2.0		12.0	2.0	53.2		10.8					
Green Ext Time (p_c), s		59.0		0.0	0.1	8.3		0.8					
	3 0.0	33.0		0.0	0.1	0.0		0.0					
Intersection Summary													
HCM 6th Ctrl Delay			48.1										
HCM 6th LOS			D										

Notes

^{*} HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ች	^	7		^	7	*	₽		*	f.		
Traffic Volume (veh/h)	80	1640	180	70	1370	295	90	5	25	265	145	85	
Future Volume (veh/h)	80	1640	180	70	1370	295	90	5	25	265	145	85	
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		0.98	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 Approac		No	1.00	1.00	No	1.00	1.00	No	1.00	1.00	No	1.00	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786	
Adj Flow Rate, veh/h	82	1673	184	71	1398	301	92	5	26	270	148	87	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1	
Cap, veh/h	127	1408	626	375	1675	834	115	30	155	216	191	112	
Arrive On Green	0.04	0.42	0.42	0.19	0.57	0.57	0.07	0.12	0.13	0.13	0.18	0.19	
							1701		1275			619	
Sat Flow, veh/h	1688	3367	1498	1647	2941	1465		245		1701	1053		
Grp Volume(v), veh/h	82	1673	184	71	1398	301	92	0	31	270	0	235	
Grp Sat Flow(s),veh/h/li		1683	1498	1647	1470	1465	1701	0	1520	1701	0	1672	
Q Serve(g_s), s	3.4	46.0	6.6	0.0	42.9	12.3	5.9	0.0	2.0	14.0	0.0	14.7	
Cycle Q Clear(g_c), s	3.4	46.0	6.6	0.0	42.9	12.3	5.9	0.0	2.0	14.0	0.0	14.7	
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.84	1.00		0.37	
Lane Grp Cap(c), veh/h		1408	626	375	1675	834	115	0	185	216	0	303	
V/C Ratio(X)	0.65	1.19	0.29	0.19	0.83	0.36	0.80	0.00	0.17	1.25	0.00	0.78	
Avail Cap(c_a), veh/h	127	1408	626	375	1675	834	186	0	414	216	0	486	
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)	0.55	0.55	0.55	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/vel	h 28.3	32.0	11.4	36.3	19.4	12.8	50.6	0.0	43.1	48.0	0.0	42.8	
Incr Delay (d2), s/veh	5.3	89.0	0.7	0.1	5.1	1.2	7.7	0.0	0.3	143.7	0.0	2.6	
Initial Q Delay(d3),s/veh	n 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%),vel	h/ln1.5	34.9	2.3	1.6	15.2	4.2	2.8	0.0	0.8	14.6	0.0	6.3	
Unsig. Movement Delay	y, s/veh	1											
LnGrp Delay(d),s/veh	33.6	121.0	12.1	36.4	24.5	14.0	58.2	0.0	43.4	191.7	0.0	45.4	
LnGrp LOS	С	F	В	D	С	В	Е	Α	D	F	Α	D	
Approach Vol, veh/h		1939			1770			123			505		
Approach Delay, s/veh		106.9			23.2			54.5			123.7		
Approach LOS		F			C			D			F		
Timer - Assigned Phs	1	2	3	4	5	6	7	8					
Phs Duration (G+Y+Rc)), 24.6	50.0	11.4	23.9	8.0	66.6	18.0	17.4					
Change Period (Y+Rc),		4.8	4.0	4.5	4.0	4.0	4.0	4.5					
Max Green Setting (Gm		45.2	12.0	31.5	4.0	46.0	14.0	29.5					
Max Q Clear Time (g_c		48.0	7.9	16.7	5.4	44.9	16.0	4.0					
Green Ext Time (p_c), s		0.0	0.0	0.7	0.0	1.1	0.0	0.1					
Intersection Summary													
HCM 6th Ctrl Delay			73.2										
HCM 6th LOS			Е										
Notes													

User approved pedestrian interval to be less than phase max green.

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	ሻ	7	Ť	4	\$	ODIN
Traffic Vol, veh/h	5	60	15	395	380	5
Future Vol, veh/h	5	60	15	395	380	5
Conflicting Peds, #/hr	1	1	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	180	0	150	-	_	-
Veh in Median Storage		_	-	0	0	_
Grade, %	0	_	_	0	0	_
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	1	1	3	3
Mvmt Flow	5	63	16	416	400	5
	Minor2		Major1		Major2	
Conflicting Flow All	854	406	407	0	-	0
Stage 1	405	-	-	-	-	-
Stage 2	449	-	-	-	-	-
Critical Hdwy	6.44	6.24	4.11	-	-	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy		3.336		-	-	-
Pot Cap-1 Maneuver	326	641	1157	-	-	-
Stage 1	669	-	-	-	-	-
Stage 2	639	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	320	639	1155	-	-	-
Mov Cap-2 Maneuver	320	-	-	-	-	-
Stage 1	658	-	-	-	-	-
Stage 2	638	-	-	-	-	-
Approach	EB		NB		SB	
	11.7		0.3		0	
HCM Control Delay, s HCM LOS	11.7 B		0.5		U	
HCWI LOS	D					
Minor Lane/Major Mvn	nt	NBL	NBT	EBLn1 E	EBLn2	SBT
Capacity (veh/h)		1155	-	320	639	-
HCM Lane V/C Ratio		0.014	-	0.016	0.099	-
HCM Control Delay (s)		8.2	0	16.4	11.3	-
HCM Lane LOS		Α	Α	С	В	-
HCM 95th %tile Q(veh)	0	-	0.1	0.3	-

Intersection						
Int Delay, s/veh	17					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	₩.	וטוי	1\D1	HOIL	JDL Š	↑ ↑
Traffic Vol, veh/h	185	85	505	245	15	670
Future Vol, veh/h	185	85	505	245	15	670
Conflicting Peds, #/hr	0	2	0	0	0	0/0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-		-	None
Storage Length	0	-	_	-	125	-
Veh in Median Storage			0	_	123	0
Grade, %	, # 0 0	<u>-</u>	0	_	_	0
Peak Hour Factor	95	95	95	95	95	95
	4	4			3	3
Heavy Vehicles, %			1	1		
Mvmt Flow	195	89	532	258	16	705
Major/Minor I	Minor1	N	Major1	ı	Major2	
Conflicting Flow All	1046	663	0	0	790	0
Stage 1	661	-	_	-	-	_
Stage 2	385	_	_	_	_	_
Critical Hdwy	6.66	6.26	_	_	4.145	_
Critical Hdwy Stg 1	5.46	-	_	_	-	<u>-</u>
Critical Hdwy Stg 2	5.86	_	_	_	_	_
Follow-up Hdwy	3.538		_		2.2285	_
Pot Cap-1 Maneuver	235	456	_	- 2	822	_
Stage 1	508	430	_	_	022	_
Stage 2	653		-	_		-
	000	-	-	-	-	-
Platoon blocked, %	004	455	-	-	000	-
Mov Cap-1 Maneuver	231	455	-	-	822	-
Mov Cap-2 Maneuver	231	-	-	-	-	-
Stage 1	508	-	-	-	-	-
Stage 2	641	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s			0		0.2	
HCM LOS	F		U		0.2	
HCIVI LOS	Г					
Minor Lane/Major Mvm	nt	NBT	NBRV	VBLn1	SBL	SBT
Capacity (veh/h)		_	_	273	822	_
HCM Lane V/C Ratio		-	_	1.041		-
HCM Control Delay (s)		_		106.6	9.5	_
HCM Lane LOS		-	-	F	Α	_
HCM 95th %tile Q(veh))	-	_	11	0.1	-

Intersection						
Intersection Delay, s/veh	221.9					
Intersection LOS	F					
Movement	EBL	EDD	NIDI	NDT	CDT	CDD
Movement		EBR *	NBL	NBT	SBT	SBR
Lane Configurations	100		GE.	4	950	7
Traffic Vol, veh/h	100	255	65	650	850	5
Future Vol, veh/h Peak Hour Factor	100	255	65	650	850	5
	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	105	268	68	684	895	5
Number of Lanes	1	1	0	1	1	1
Approach	EB		NB		SB	
Opposing Approach			SB		NB	
Opposing Lanes	0		2		1	
Conflicting Approach Left	SB		EB			
Conflicting Lanes Left	2		2		0	
Conflicting Approach Right	NB				EB	
Conflicting Lanes Right	1		0		2	
HCM Control Delay	18.1		203.4		322	
HCM LOS	С		F		F	
Lane		NBLn1	EBLn1	EBLn2	SBLn1	SBLn2
Lane Vol Left, %		NBLn1	EBLn1 100%	EBLn2	SBLn1	SBLn2
Vol Left, % Vol Thru, %		9%	100%	0%	0%	0%
Vol Left, % Vol Thru, % Vol Right, %		9% 91% 0%	100% 0% 0%	0% 0% 100%	0% 100% 0%	0% 0% 100%
Vol Left, % Vol Thru, %		9% 91%	100% 0%	0% 0%	0% 100%	0% 0%
Vol Left, % Vol Thru, % Vol Right, % Sign Control		9% 91% 0% Stop	100% 0% 0% Stop	0% 0% 100% Stop	0% 100% 0% Stop	0% 0% 100% Stop
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane		9% 91% 0% Stop 715	100% 0% 0% Stop 100	0% 0% 100% Stop 255	0% 100% 0% Stop 850	0% 0% 100% Stop 5
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol		9% 91% 0% Stop 715 65	100% 0% 0% Stop 100	0% 0% 100% Stop 255 0	0% 100% 0% Stop 850	0% 0% 100% Stop 5
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol		9% 91% 0% Stop 715 65 650	100% 0% 0% Stop 100 100 0	0% 0% 100% Stop 255 0 0	0% 100% 0% Stop 850 0 850	0% 0% 100% Stop 5 0
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate		9% 91% 0% Stop 715 65	100% 0% 0% Stop 100 100	0% 0% 100% Stop 255 0	0% 100% 0% Stop 850 0	0% 0% 100% Stop 5 0
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp		9% 91% 0% Stop 715 65 650 0 753	100% 0% 0% Stop 100 100 0 0 105	0% 0% 100% Stop 255 0 0 255 268 7	0% 100% 0% Stop 850 0 850 0 895	0% 0% 100% Stop 5 0 0 5 5
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X)		9% 91% 0% Stop 715 65 650 0 753 4	100% 0% 0% Stop 100 100 0 0 105 7	0% 0% 100% Stop 255 0 0 255 268 7 0.514	0% 100% 0% Stop 850 0 850 0 895 7	0% 0% 100% Stop 5 0 0 5 5 7
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd)		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422	100% 0% 0% Stop 100 100 0 0 105 7 0.237 9.469	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203	0% 100% 0% Stop 850 0 850 0 895 7 1.66	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes	100% 0% 0% Stop 100 100 0 105 7 0.237 9.469 Yes	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes	0% 100% 0% Stop 850 0 850 0 895 7 1.66 7.144 Yes	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes 497	100% 0% 0% Stop 100 0 0 105 7 0.237 9.469 Yes 382	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes 443	0% 100% 0% Stop 850 0 850 0 895 7 1.66 7.144 Yes 519	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes 561
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes 497 5.422	100% 0% 0% Stop 100 0 0 105 7 0.237 9.469 Yes 382 7.169	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes 443 5.903	0% 100% 0% Stop 850 0 850 7 1.66 7.144 Yes 519 4.844	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes 561 4.123
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes 497 5.422 1.515	100% 0% 0% Stop 100 0 0 105 7 0.237 9.469 Yes 382 7.169 0.275	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes 443 5.903 0.605	0% 100% 0% Stop 850 0 850 7 1.66 7.144 Yes 519 4.844 1.724	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes 561 4.123 0.009
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio HCM Control Delay		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes 497 5.422	100% 0% 0% Stop 100 100 0 105 7 0.237 9.469 Yes 382 7.169 0.275 15.1	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes 443 5.903 0.605	0% 100% 0% Stop 850 0 850 7 1.66 7.144 Yes 519 4.844 1.724 323.8	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes 561 4.123 0.009 9.2
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes 497 5.422 1.515 203.4	100% 0% 0% Stop 100 0 0 105 7 0.237 9.469 Yes 382 7.169 0.275	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes 443 5.903 0.605	0% 100% 0% Stop 850 0 850 7 1.66 7.144 Yes 519 4.844 1.724	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes 561 4.123 0.009

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					4î∌		ሻ	†			f)		
Traffic Volume (veh/h)	0	0	0	55	1390	15	250	50	0	0	100	25	
Future Volume (veh/h)	0	0	0	55	1390	15	250	50	0	0	100	25	
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)				1.00		0.99	1.00		1.00	1.00		0.99	
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	h				No			No			No		
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772	
Adj Flow Rate, veh/h				58	1463	16	263	53	0	0	105	26	
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2	
Cap, veh/h				68	1811	21	441	612	0	0	473	117	
Arrive On Green				0.55	0.55	0.55	0.58	0.58	0.00	0.00	0.35	0.35	
Sat Flow, veh/h				124	3284	38	1289	1772	0	0	1369	339	
Grp Volume(v), veh/h				805	0	732	263	53	0	0	0	131	
Grp Sat Flow(s), veh/h/ln	1			1724	0	1723	1289	1772	0	0	0	1708	
Q Serve(g_s), s				43.2	0.0	36.5	17.5	1.5	0.0	0.0	0.0	6.0	
Cycle Q Clear(g_c), s				43.2	0.0	36.5	23.5	1.5	0.0	0.0	0.0	6.0	
Prop In Lane				0.07	^	0.02	1.00	040	0.00	0.00	^	0.20	
Lane Grp Cap(c), veh/h				950	0	950	441	612	0	0	0	590	
V/C Ratio(X)				0.85	0.00	0.77	0.60	0.09	0.00	0.00	0.00	0.22	
Avail Cap(c_a), veh/h				1003	0	1002	441	612	0	0	0	590	
HCM Platoon Ratio				1.00	1.00	1.00	1.67	1.67	1.00	1.00	1.00	1.00	
Upstream Filter(I)				1.00	0.00	1.00 19.3	0.87 22.5	0.87 15.5	0.00	0.00	0.00	1.00 25.5	
Uniform Delay (d), s/veh Incr Delay (d2), s/veh	l			9.2	0.0	6.0	5.1	0.2	0.0	0.0	0.0	0.1	
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh				19.1	0.0	15.7	5.1	0.6	0.0	0.0	0.0	2.5	
Unsig. Movement Delay				13.1	0.0	10.7	J. I	0.0	0.0	0.0	0.0	2.0	
LnGrp Delay(d),s/veh	, 3/ (6)			30.0	0.0	25.3	27.6	15.8	0.0	0.0	0.0	25.7	
LnGrp LOS				C	Α	20.5 C	27.0 C	В	Α	Α	Α	C	
Approach Vol, veh/h					1537			316		- / \	131		
Approach Delay, s/veh					27.7			25.7			25.7		
Approach LOS					C			C			C		
Timer - Assigned Phs				4		6		8					
Phs Duration (G+Y+Rc)	•			42.0		64.7		42.0					
Change Period (Y+Rc),				42.0		4.0		42.0					
Max Green Setting (Gm				38.0		64.0		38.0					
Max Q Clear Time (g_c+	, .			8.0		45.2		25.5					
Green Ext Time (p_c), s				0.4		15.4		1.1					
u = r				U. T		10.7		1+1					
Intersection Summary			0= 0										
HCM 6th Ctrl Delay			27.3										
HCM 6th LOS			С										

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		41₽	7					†	7	ች	†		
Traffic Volume (veh/h)	80	1320	520	0	0	0	0	225	295	85	70	0	
Future Volume (veh/h)	80	1320	520	0	0	0	0	225	295	85	70	0	
Initial Q (Qb), veh	0	0	0_0		<u> </u>		0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	•	1.00				1.00		0.98	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	
Work Zone On Approach		No	1.00				1.00	No	1.00	1.00	No	1.00	
	1772	1772	1772				0	1772	1772	1730	1730	0	
Adj Flow Rate, veh/h	84	1389	0				0	237	311	89	74	0	
	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2				0.50	2	2	5	5	0.50	
Cap, veh/h	107	1853					0	451	375	111	620	0	
	0.57	0.57	0.00				0.00	0.25	0.25	0.02	0.12	0.00	
Sat Flow, veh/h	188	3258	1502				0.00	1772	1473	1647	1730	0.00	
	789	684	0				0	237	311	89	74	0	
Grp Volume(v), veh/h													
Grp Sat Flow(s), veh/h/ln		1683	1502				0	1772	1473	1647	1730	0.0	
(6-):	38.4	32.5	0.0				0.0	12.7	21.9	5.9	4.2		
(6_)	38.4	32.5	0.0				0.0	12.7	21.9	5.9	4.2	0.0	
	0.11	057	1.00				0.00	454	1.00	1.00	000	0.00	
Lane Grp Cap(c), veh/h		957					0	451	375	111	620	0	
` '	0.79	0.71					0.00	0.53	0.83	0.80	0.12	0.00	
	1002	957	4.00				0	451	375	165	676	0	
	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00	
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.93	0.93	0.98	0.98	0.00	
Uniform Delay (d), s/veh		17.2	0.0				0.0	35.3	38.7	53.0	33.0	0.0	
Incr Delay (d2), s/veh	6.2	4.6	0.0				0.0	4.0	17.6	11.3	0.1	0.0	
Initial Q Delay(d3),s/veh		0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh		13.3	0.0				0.0	5.8	9.5	2.9	1.8	0.0	
Unsig. Movement Delay,													
1 3 ()	24.7	21.8	0.0				0.0	39.3	56.4	64.3	33.0	0.0	
LnGrp LOS	С	С					Α	D	E	E	С	Α	
Approach Vol, veh/h		1473	Α					548			163		
Approach Delay, s/veh		23.4						49.0			50.1		
Approach LOS		С						D			D		
Timer - Assigned Phs		2		4			7	8					
Phs Duration (G+Y+Rc),	. S	66.6		43.4			11.4	32.0					
Change Period (Y+Rc),		4.0		4.0			4.0	4.8					
Max Green Setting (Gma		59.0		43.0			11.0	27.2					
Max Q Clear Time (g_c+		40.4		6.2			7.9	23.9					
Green Ext Time (p_c), s		14.8		0.2			0.0	0.7					
Intersection Summary													
HCM 6th Ctrl Delay			31.8										
HCM 6th LOS			C C										
Notes													

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		^	- 7		^	- 7		Þ			ĵ.		
Traffic Volume (veh/h)	155	1365	130	10	1175	20	90	25	10	135	20	150	
Future Volume (veh/h)	155	1365	130	10	1175	20	90	25	10	135	20	150	
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 Approac		No	4770	4700	No	4700	1000	No	4000	4750	No	4750	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758	
Adj Flow Rate, veh/h	163	1437	137	11	1237	21	95	26	11	142	21	158	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3	
Cap, veh/h	366	1887	841	192	1494	666	193	254	108	331	38	283	
Arrive On Green	0.22	0.56	0.56	0.12	0.46	0.46	0.21	0.21	0.20	0.21	0.21	0.20	
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	1259	1201	508	1399	178	1339	
Grp Volume(v), veh/h	163	1437	137	11	1237	21	95	0	37	142	0	179	
Grp Sat Flow(s),veh/h/li		1683	1500	1621	1617	1442	1259	0	1709	1399	0	1517	
Q Serve(g_s), s	9.2	36.0	4.9	0.7	36.7	0.9	8.1	0.0	1.9	10.1	0.0	11.7	
Cycle Q Clear(g_c), s	9.2	36.0	4.9	0.7	36.7	0.9	19.8	0.0	1.9	12.0	0.0	11.7	
Prop In Lane	1.00	4007	1.00	1.00	4.40.4	1.00	1.00	^	0.30	1.00	^	0.88	
Lane Grp Cap(c), veh/h		1887	841	192	1494	666	193	0	362	331	0	321	
V/C Ratio(X)	0.44	0.76	0.16	0.06	0.83	0.03	0.49	0.00	0.10	0.43	0.00	0.56	
Avail Cap(c_a), veh/h	366	2121	945	192	1640	732	203	0	376	342	0	334	
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 48.1	0.00	1.00 35.1	1.00	0.00	1.00 39.4	
Uniform Delay (d), s/vel	0.5	18.5 3.0	11.7	43.0 0.1	25.8 5.4	16.1 0.1	1.5	0.0	0.1	0.7	0.0	1.6	
Incr Delay (d2), s/veh Initial Q Delay(d3),s/veh		0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),vel		14.3	1.7	0.0	14.3	0.0	2.6	0.0	0.0	3.5	0.0	4.5	
Unsig. Movement Delay			1.7	0.5	14.5	0.5	2.0	0.0	0.0	3.5	0.0	4.5	
LnGrp Delay(d),s/veh	37.8	21.5	12.1	43.1	31.2	16.2	49.5	0.0	35.2	40.9	0.0	40.9	
LnGrp LOS	D	C C	12.1 B	73.1 D	C C	В	D	Α	D	D	Α	40.3 D	
Approach Vol, veh/h		1737			1269			132			321		
Approach Delay, s/veh		22.3			31.0			45.5			40.9		
Approach LOS		C C			C C			43.3 D			D		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc)		65.7		27.3	27.9	54.8		27.3					
Change Period (Y+Rc),		4.0		5.5	4.5	4.0		5.5					
Max Green Setting (Gm	, ,	69.3		22.7	17.5	55.8		22.7					
Max Q Clear Time (g_c		38.0		14.0	11.2	38.7		21.8					
Green Ext Time (p_c), s	8 0.0	23.7		0.7	0.2	12.2		0.0					
Intersection Summary													
HCM 6th Ctrl Delay			28.1										
HCM 6th LOS			С										

Intersection								
Int Delay, s/veh	5.3							
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations	^	7	ች	^	ሻ	7		
Traffic Vol, veh/h	1390	100	110	1220	25	85		
Future Vol, veh/h	1390	100	110	1220	25	85		
Conflicting Peds, #/hr	0	0	0	0	0	0		
Sign Control	Free	Free	Free	Free	Stop	Stop		
RT Channelized	-		-	None	-	None		
Storage Length	_	100	300	-	0	0		
Veh in Median Storage		-	-	0	0	-		
Grade, %	0	_	_	0	0	_		
Peak Hour Factor	95	95	95	95	95	95		
Heavy Vehicles, %	2	2	6	6	0	0		
Mvmt Flow	1463	105	116	1284	26	89		
WIVIIIL FIOW	1403	105	110	1204	20	09		
Major/Minor	Major1	ı	Major2	N	Minor1			
Conflicting Flow All	0	0	1568	0	2337	732		
Stage 1	-	-	1000	-	1463	132		
Stage 2	-		•	-	874	-		
Critical Hdwy	-	-	4.22	-	6.8	6.9		
	_	_	4.22	_	5.8	0.9		
Critical Hdwy Stg 1		-	-		5.8			
Critical Hdwy Stg 2	-	-	-	-		-		
Follow-up Hdwy	-	-	2.26	-	3.5	3.3		
Pot Cap-1 Maneuver	-	-	398	-	32	368		
Stage 1	-	-	-	-	183	-		
Stage 2	-	-	-	-	373	-		
Platoon blocked, %	-	-	000	-		000		
Mov Cap-1 Maneuver	-	-	398	-	~ 23	368		
Mov Cap-2 Maneuver	-	-	-	-	~ 23	-		
Stage 1	-	-	-	-	183	-		
Stage 2	-	-	-	-	264	-		
Approach	EB		WB		NB			
HCM Control Delay, s	0		1.5		122.9			
HCM LOS					F			
Minor Lane/Major Mvm	nt 1	NBLn11	NBLn2	EBT	EBR	WBL	WBT	
Capacity (veh/h)		23	368	-	-	398	-	
HCM Lane V/C Ratio		1.144	0.243	-	-	0.291	-	
HCM Control Delay (s)	\$	479.7	17.9	-	-	17.7	-	
HCM Lane LOS		F	С	-	_	С	-	
HCM 95th %tile Q(veh))	3.4	0.9	-	-	1.2	-	
Notes								
~: Volume exceeds car	nacity	\$· De	lav evo	eeds 30	10s	+. Com	putation Not Defined	*: All major volume in platoon
. Volumo oxocous ca	Judity	ψ. υ	hay one		000	· · · · · · · ·	Patation Not Donned	. 7 iii major volume in piatoon

	۶	→	•	•	—	•	1	†	/	/	+	✓
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		^	7	7	∱ ⊅			4			4	
Traffic Volume (veh/h)	130	1350	5	100	1240	0	5	5	100	5	0	100
Future Volume (veh/h)	130	1350	5	100	1240	0	5	5	100	5	0	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	4.00	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	4750	No	4770	4770	No	4740	4770	No	4770	4000	No	4000
Adj Sat Flow, veh/h/ln	1758	1758	1772	1772	1716	1716	1772	1772	1772	1800	1723	1800
Adj Flow Rate, veh/h	137	1421	5	106	1305	0.05	5	5	105	5	0.05	105
Peak Hour Factor	0.95	0.95	0.94	0.94	0.95	0.95	0.95 2	0.95 2	0.95 2	0.95	0.95	0.95
Percent Heavy Veh, %	ა 177	2488	1119	136	6 2347	6 0	82	0	4	0 82	2	0
Cap, veh/h Arrive On Green	0.11	0.75	0.75	0.08	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	1674	3340	1502	1688	3346	0.00	77	77	1614	78	0.00	1641
·	137	1421	5	1066	1305	0	115	0	0	110	0	
Grp Volume(v), veh/h Grp Sat Flow(s),veh/h/ln	1674	1670	1502	1688	1630	0	1768	0	0	1719	0	0
Q Serve(g_s), s	3.7	8.7	0.0	2.8	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.7	8.7	0.0	2.8	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane	1.00	0.7	1.00	1.00	0.0	0.00	0.04	0.0	0.91	0.05	0.0	0.95
Lane Grp Cap(c), veh/h	177	2488	1119	136	2347	0.00	86	0	0.51	86	0	0.33
V/C Ratio(X)	0.77	0.57	0.00	0.78	0.56	0.00	1.34	0.00	0.00	1.28	0.00	0.00
Avail Cap(c_a), veh/h	656	5089	2288	551	4754	0.00	969	0.00	0.00	938	0.00	0.00
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	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	20.0	2.6	1.5	20.7	3.0	0.0	23.0	0.0	0.0	23.0	0.0	0.0
Incr Delay (d2), s/veh	5.3	0.4	0.0	6.9	0.4	0.0	166.7	0.0	0.0	141.6	0.0	0.0
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	1.4	0.2	0.0	1.1	0.1	0.0	4.8	0.0	0.0	4.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.3	3.0	1.5	27.6	3.4	0.0	189.7	0.0	0.0	164.6	0.0	0.0
LnGrp LOS	С	Α	Α	С	Α	Α	F	Α	Α	F	Α	Α
Approach Vol, veh/h		1563			1411			115			110	
Approach Delay, s/veh		5.0			5.3			189.7			164.6	
Approach LOS		Α			Α			F			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.9	37.1		0.0	7.7	38.2		0.0				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	18.0	67.0		23.0	15.0	70.0		23.0				
Max Q Clear Time (g_c+l1), s	5.7	10.6		0.0	4.8	10.7		0.0				
Green Ext Time (p_c), s	0.2	20.0		0.0	0.2	23.6		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			17.2									
HCM 6th LOS			В									

Intersection													
Int Delay, s/veh	21.3												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	*	^	7	*	↑ ↑			4					
Traffic Vol, veh/h	5	1450	5	100	1335	25	5	5	100	10	0	0	
Future Vol, veh/h	5	1450	5	100	1335	25	5	5	100	10	0	0	
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	
RT Channelized	-	_	None	_	_	None	_	_	None	_	_	None	
Storage Length	150	_	100	150	_	-	_	_	-	0	_	-	
√eh in Median Storage,		0	-	_	0	_	_	0	_	_	0	_	
Grade, %	_	0	_	_	0	_	_	0	_	_	0	_	
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95	
leavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	
Nymt Flow	5	1526	5	105	1405	26	5	5	105	11	0	0	
VIVIIIL FIOW	J	1320	5	103	1405	20	3	5	105	- 11	U	U	
Major/Minor N	/lajor1		ı	Major2		N	/linor1		N	Minor2			
Conflicting Flow All	1431	0	0	1531	0	0	2449	3177	763	2404	_	_	
Stage 1	1431	-		1001	-	-	1536	1536	703	1628		-	
•	_		-	-		-	913	1641	-	776			
Stage 2		-	-	4 4 4	-	-					-	-	
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	-	-	
Critical Hdwy Stg 1	-	-	-		-	-	6.54	5.54	-	6.54	-	-	
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	-	-	
ollow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	-	-	
ot Cap-1 Maneuver	471	-	-	431	-	-	16	10	347	17	0	0	
Stage 1	-	-	-	-	-	-	121	176	-	106	0	0	
Stage 2	-	-	-	-	-	-	294	156	-	356	0	0	
Platoon blocked, %		-	-		-	-						-	
Mov Cap-1 Maneuver	471	-	-	431	-	-	13	7	347	~ 4	-	-	
Mov Cap-2 Maneuver	-	-	-	-	-	-	13	7	-	~ 4	-	-	
Stage 1	-	-	-	-	-	-	120	174	-	105	-	-	
Stage 2	-	-	-	-	-	-	222	118	-	238	-	-	
Approach	EB			WB			NB			SB			
HCM Control Delay, s	0			1.1		\$	357.9		\$ 2	2367.8			
HCM LOS						·	F		•	F			
Minor Lane/Major Mvmt	t N	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)		79	471	-	-	431	-	-	4				
HCM Lane V/C Ratio		1.466		-	_	0.244	_	_	2.632				
HCM Control Delay (s)	\$	357.9	12.7	_	_	16	_		2367.8				
HCM Lane LOS	Ψ	F	В	_	_	C	_	Ψ 2 -	F				
HCM 95th %tile Q(veh)		9.3	0	-	_	0.9	_	_	2.4				
Notes													
	a alle i	ф. D	alasz	d - 0/	20-	0 - :-	andell.	Net D	مانم د دا	*. A !!		alues s	n nlata
~: Volume exceeds cap	acity	\$: D6	elay exc	eeas 30	JUS	+: Com	putation	ו אסנ ט	etinea	": All	major v	/oiume i	in platoon

	۶	→	•	•	←	•	4	†	~	>	ļ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	f.		ሻ	1>		ሻ	↑	7	7	↑	7
Traffic Volume (veh/h)	40	30	135	240	105	30	30	300	415	10	470	15
Future Volume (veh/h)	40	30	135	240	105	30	30	300	415	10	470	15
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		0.99
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	1800	1800	1800	1772	1772	1772	1772	1772	1772	1758	1758	1758
Adj Flow Rate, veh/h	42	32	142	253	111	32	32	316	437	11	495	16
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	2	2	2	2	2	2	3	3	3
Cap, veh/h	378	43	193	436	355	102	302	728	614	337	693	584
Arrive On Green	0.03	0.15	0.15	0.15	0.27	0.27	0.03	0.41	0.41	0.01	0.39	0.39
Sat Flow, veh/h	1714	288	1277	1688	1322	381	1688	1772	1494	1674	1758	1482
Grp Volume(v), veh/h	42	0	174	253	0	143	32	316	437	11	495	16
Grp Sat Flow(s),veh/h/ln	1714	0	1565	1688	0	1703	1688	1772	1494	1674	1758	1482
Q Serve(g_s), s	1.2	0.0	6.2	6.8	0.0	3.9	0.7	7.4	14.2	0.2	13.8	0.4
Cycle Q Clear(g_c), s	1.2	0.0	6.2	6.8	0.0	3.9	0.7	7.4	14.2	0.2	13.8	0.4
Prop In Lane	1.00		0.82	1.00		0.22	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	378	0	236	436	0	458	302	728	614	337	693	584
V/C Ratio(X)	0.11	0.00	0.74	0.58	0.00	0.31	0.11	0.43	0.71	0.03	0.71	0.03
Avail Cap(c_a), veh/h	438	0	565	499	0	820	371	1158	977	434	1149	969
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.8	0.0	23.6	15.7	0.0	17.0	12.1	12.3	14.3	11.2	14.8	10.8
Incr Delay (d2), s/veh	0.1	0.0	3.3	1.0	0.0	0.3	0.1	0.9	3.3	0.0	2.9	0.0
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	0.0	2.3	2.4	0.0	1.4	0.2	2.5	4.6	0.1	5.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.9	0.0	26.9	16.7	0.0	17.3	12.2	13.1	17.5	11.2	17.8	10.8
LnGrp LOS	В	A	С	В	<u> </u>	В	В	В	В	В	В	<u>B</u>
Approach Vol, veh/h		216			396			785			522	
Approach Delay, s/veh		25.5			16.9			15.5			17.4	
Approach LOS		С			В			В			В	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	4.7	27.9	12.8	12.8	5.6	26.9	6.0	19.6				
Change Period (Y+Rc), s	4.0	4.8	4.0	4.0	4.0	4.8	4.0	4.0				
Max Green Setting (Gmax), s	4.0	37.2	11.0	21.0	4.0	37.2	4.0	28.0				
Max Q Clear Time (g_c+l1), s	2.2	16.2	8.8	8.2	2.7	15.8	3.2	5.9				
Green Ext Time (p_c), s	0.0	6.9	0.2	0.4	0.0	4.5	0.0	0.4				
Intersection Summary												
HCM 6th Ctrl Delay			17.5									
HCM 6th LOS			В									

Intersection						
Int Delay, s/veh	1.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	\$	LDI	ሻ	<u>₩</u>	HUL	T T
Traffic Vol. veh/h	740	60	210	615	0	15
Future Vol, veh/h	740	60	210	615	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	_	-	150	-	_	0
Veh in Median Storage,		_	-	0	0	_
Grade, %	0	_	_	0	0	_
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	1	1	1	1
Mymt Flow	779	63	221	647	0	16
WWW.CT IOW	110	00		011		10
	/lajor1		Major2		Minor1	
Conflicting Flow All	0	0	842	0	-	811
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.11	-	-	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.209	-	-	3.309
Pot Cap-1 Maneuver	-	-	798	-	0	381
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	798	-	-	381
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Annragah	EB		WB		NB	
Approach						
HCM Control Delay, s	0		2.9		14.9	
HCM LOS					В	
Minor Lane/Major Mvm	t l	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)		381	_	-	798	_
HCM Lane V/C Ratio		0.041	-	-	0.277	-
HCM Control Delay (s)		14.9	-	-	11.2	-
HCM Lane LOS		В	-	-	В	-
HCM 95th %tile Q(veh)		0.1	-	-	1.1	-

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	^	7	ሻ	44	7		4			4	
Traffic Volume (veh/h)	100	1525	5	5	745	165	25	40	10	245	20	30
Future Volume (veh/h)	100	1525	5	5	745	165	25	40	10	245	20	30
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	4	No	4		No		1000	No	1000	4==0	No	4==0
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	105	1605	5	5	784	0	26	42	11	258	21	32
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	145	1750	780	73	1583	0.00	32	52	14	303	25	38
Arrive On Green	0.09	0.52	0.52	0.04	0.48	0.00	0.07	0.06	0.07	0.22	0.22	0.22
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	507	818	214	1387	113	172
Grp Volume(v), veh/h	105	1605	5	5	784	0	79	0	0	311	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1540	0	0	1672	0	0
Q Serve(g_s), s	6.2	45.1	0.2	0.3	16.7	0.0	5.2	0.0	0.0	18.4	0.0	0.0
Cycle Q Clear(g_c), s	6.2	45.1	0.2	0.3	16.7	0.0	5.2	0.0	0.0	18.4	0.0	0.0
Prop In Lane	1.00	4750	1.00	1.00	4500	1.00	0.33	•	0.14	0.83	^	0.10
Lane Grp Cap(c), veh/h	145	1750	780	73	1583		97	0	0	365	0	0
V/C Ratio(X)	0.73	0.92	0.01	0.07	0.50		0.81	0.00	0.00	0.85	0.00	0.00
Avail Cap(c_a), veh/h	229	1765	787	73	1583	4.00	97	0	0	552	0	0
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	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	45.9 4.2	22.7 8.4	11.9 0.0	47.2 0.2	18.4 0.5	0.0	47.5 36.8	0.0	0.0	38.7 8.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh %ile BackOfQ(50%),veh/ln	2.6	17.0	0.0	0.0	5.7	0.0	3.0	0.0	0.0	8.3	0.0	0.0
Unsig. Movement Delay, s/veh		17.0	0.1	0.1	5.7	0.0	3.0	0.0	0.0	0.3	0.0	0.0
LnGrp Delay(d),s/veh	50.1	31.1	11.9	47.5	18.9	0.0	84.3	0.0	0.0	46.7	0.0	0.0
LnGrp LOS	D	01.1 C	11.3 B	47.3 D	10.9 B	0.0	04.5 F	Α	Α	40.7 D	Α	Α
Approach Vol, veh/h	<u> </u>	1715	D	ט	789	А	ı	79		ט	311	
Approach Delay, s/veh		32.2			19.1	A		84.3			46.7	
Approach LOS		32.2 C			19.1 B			04.3 F			40.7 D	
Approach LOS		C			Ь			Г			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.8	53.2		26.5	8.5	57.5		10.5				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	13.5	41.5		33.0	4.0	51.0		6.0				
Max Q Clear Time (g_c+l1), s	8.2	18.7		20.4	2.3	47.1		7.2				
Green Ext Time (p_c), s	0.1	7.3		1.1	0.0	3.5		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			31.6									
HCM 6th LOS			С									

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ሻ	^	7	ሻሻ	^	7	ሻሻ	†	7	ሻ	†	7	
Traffic Volume (veh/h)	300	670	450	235	635	365	185	250	315	40	145	150	
Future Volume (veh/h)	300	670	450	235	635	365	185	250	315	40	145	150	
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 Approac		No			No		1100	No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772	
Adj Flow Rate, veh/h	316	705	474	247	668	384	195	263	332	42	153	158	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2	
Cap, veh/h	447	1461	1015	296	1306	750	761	402	343	203	214	181	
Arrive On Green	0.13	0.43	0.43	0.18	0.79	0.76	0.23	0.23	0.23	0.12	0.12	0.12	
Sat Flow, veh/h	1688	3367	1502	3222	3313	1502	3300	1772	1512	1688	1772	1502	
Grp Volume(v), veh/h	316	705	474	247	668	384	195	263	332	42	153	158	
Grp Sat Flow(s), veh/h/l		1683	1502	1611	1657	1502	1650	1772	1512	1688	1772	1502	
Q Serve(g_s), s	14.2	19.5	19.4	9.6	9.3	13.3	6.3	17.5	28.3	2.9	10.8	13.4	
Cycle Q Clear(g_c), s	14.2	19.5	19.4	9.6	9.3	13.3	6.3	17.5	28.3	2.9	10.8	13.4	
Prop In Lane	1.00	10.0	1.00	1.00	0.0	1.00	1.00	17.5	1.00	1.00	10.0	1.00	
Lane Grp Cap(c), veh/h		1461	1015	296	1306	750	761	402	343	203	214	181	
V/C Ratio(X)	0.71	0.48	0.47	0.83	0.51	0.51	0.26	0.65	0.97	0.21	0.72	0.87	
Avail Cap(c_a), veh/h	614	1461	1015	397	1306	750	761	402	343	234	245	208	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	0.83	0.83	0.83	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/ve		26.4	10.0	52.1	9.3	7.7	40.9	45.6	49.8	51.6	55.0	56.2	
• • • •	1.8	1.1	1.5	8.0	1.2	2.1	0.1	3.3	39.8	0.4	7.4	27.6	
Incr Delay (d2), s/veh Initial Q Delay(d3),s/vel		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	
• • • • • • • • • • • • • • • • • • • •		7.6	11.8	3.8	2.5	3.5	2.6	8.0	14.3	1.3	5.3	6.4	
%ile BackOfQ(50%),ve			11.0	3.0	2.3	3.3	2.0	0.0	14.3	1.3	ე.ა	0.4	
Unsig. Movement Delay	•	27.5	11.5	60.1	10.5	9.7	41.0	48.9	89.6	51.9	62.4	83.7	
LnGrp Delay(d),s/veh	20.9												
LnGrp LOS	С	C 1405	В	<u>E</u>	1200	A	D	700	F	D	E 252	<u> </u>	
Approach Vol, veh/h		1495			1299			790			353		
Approach Delay, s/veh		21.0			19.7			64.1			70.7		
Approach LOS		С			В			Е			Е		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc), \$5.9	60.4		19.7	21.1	55.2		34.0					
Change Period (Y+Rc),		6.0		4.0	4.0	6.0		4.5					
Max Green Setting (Gr		48.0		18.0	30.0	34.0		29.5					
Max Q Clear Time (g_c		21.5		15.4	16.2	15.3		30.3					
Green Ext Time (p_c),		15.5		0.2	0.9	15.8		0.0					
Intersection Summary				,									
HCM 6th Ctrl Delay			33.7										
HCM 6th LOS			C										
Notes													
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User approved pedestrian interval to be less than phase max green.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	∱ î≽		Ť	^	7	7	֔		ሻሻ	f)	
Traffic Volume (vph)	50	965	10	55	920	50	190	25	145	220	45	135
Future Volume (vph)	50	965	10	55	920	50	190	25	145	220	45	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0	3.0	4.0		4.0	4.0	
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.87		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1676	3313		1644	3358	1471	1693	1555		3317	1580	
Flt Permitted	0.24	1.00		0.21	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	422	3313		361	3358	1471	1693	1555		3317	1580	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	51	985	10	56	939	51	194	26	148	224	46	138
RTOR Reduction (vph)	0	0	0	0	0	22	0	126	0	0	98	0
Lane Group Flow (vph)	51	995	0	56	939	29	194	48	0	224	86	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						
Actuated Green, G (s)	77.3	72.6		76.1	72.0	72.0	19.2	19.2		16.7	16.7	
Effective Green, g (s)	78.3	74.0		76.1	73.4	73.4	20.2	19.2		16.7	16.7	
Actuated g/C Ratio	0.60	0.57		0.59	0.56	0.56	0.16	0.15		0.13	0.13	
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4	3.0	3.0		2.3	2.3	
Lane Grp Cap (vph)	304	1885		251	1895	830	263	229		426	202	
v/s Ratio Prot	0.01	c0.30		c0.01	0.28		c0.11	0.03		c0.07	0.05	
v/s Ratio Perm	0.09			0.12		0.02						
v/c Ratio	0.17	0.53		0.22	0.50	0.03	0.74	0.21		0.53	0.43	
Uniform Delay, d1	19.9	17.2		23.3	17.1	12.6	52.4	48.7		52.9	52.2	
Progression Factor	0.58	0.61		0.40	0.46	0.06	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.9		0.2	0.8	0.1	10.3	0.5		8.0	8.0	
Delay (s)	11.7	11.5		9.4	8.6	0.8	62.7	49.2		53.7	53.1	
Level of Service	В	В		Α	Α	Α	Е	D		D	D	
Approach Delay (s)		11.5			8.3			56.3			53.4	
Approach LOS		В			Α			Е			D	
Intersection Summary												
HCM 2000 Control Delay			22.0	H	CM 2000	Level of	Service		С			
HCM 2000 Volume to Capa	city ratio		0.56									
Actuated Cycle Length (s)			130.0	Sı	um of lost	t time (s)			16.0			
Intersection Capacity Utiliza	ation		68.8%			of Service			С			
Analysis Period (min)			15									

c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ች	^	7	ች	^	1	*	\$		ሻሻ	î,		
Traffic Volume (veh/h)	130	1105	90	85	775	105	90	70	25	220	50	150	
Future Volume (veh/h)	130	1105	90	85	775	105	90	70	25	220	50	150	
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	_	0.99	1.00		0.99	
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 Approacl		No			No	,,,,,		No			No		
	1772	1772	1772	1744	1744	1744	1758	1758	1758	1800	1800	1800	
Adj Flow Rate, veh/h	131	1116	0	86	783	106	91	71	25	222	51	152	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
Percent Heavy Veh, %	2	2	2	4	4	4	3	3	3	0	0	0	
Cap, veh/h	634	2049		279	1248	543	163	111	39	409	49	145	
Arrive On Green	0.57	1.00	0.00	0.05	0.37	0.37	0.10	0.09	0.09	0.12	0.12	0.12	
	1688	3331	1502	1661	3383	1472	1674	1237	436	3326	395	1179	
Grp Volume(v), veh/h	131	1116	0	86	783	106	91	0	96	222	0	203	
Grp Sat Flow(s),veh/h/ln		1666	1502	1661	1692	1472	1674	0	1673	1663	0	1574	
Q Serve(g_s), s	0.0	0.0	0.0	4.7	24.7	6.4	6.7	0.0	7.2	8.2	0.0	16.0	
Cycle Q Clear(g_c), s	0.0	0.0	0.0	4.7	24.7	6.4	6.7	0.0	7.2	8.2	0.0	16.0	
Prop In Lane	1.00	0.0	1.00	1.00	27.1	1.00	1.00	0.0	0.26	1.00	0.0	0.75	
ane Grp Cap(c), veh/h		2049	1.00	279	1248	543	163	0	150	409	0	194	
//C Ratio(X)	0.21	0.54		0.31	0.63	0.20	0.56	0.00	0.64	0.54	0.00	1.05	
Avail Cap(c_a), veh/h	634	2049		300	1379	600	476	0.00	463	409	0.00	194	
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Jpstream Filter(I)	0.84	0.84	0.00	0.87	0.87	0.87	1.00	0.00	1.00	1.00	0.00	1.00	
Jniform Delay (d), s/veh		0.0	0.0	29.6	33.7	27.9	56.0	0.0	57.2	53.6	0.0	57.0	
ncr Delay (d2), s/veh	0.1	0.9	0.0	0.3	2.1	0.7	1.8	0.0	2.8	1.1	0.0	77.8	
nitial 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	
%ile BackOfQ(50%),veh		0.3	0.0	1.9	10.3	2.3	3.0	0.0	3.2	3.5	0.0	10.6	
Jnsig. Movement Delay			0.0	1.0	10.0	2.0	0.0	0.0	J.L	3.0	0.0	10.0	
_nGrp Delay(d),s/veh	14.2	0.9	0.0	30.0	35.8	28.6	57.8	0.0	59.9	54.6	0.0	134.8	
_nGrp LOS	В	Α	3.0	C	D	C	E	Α	E	D	A	F	
Approach Vol, veh/h		1247	Α		975		_	187			425		
Approach Delay, s/veh		2.3	A		34.5			58.9			92.9		
Approach LOS		Α.			C			E			52.5 F		
Fimer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc)	t0 4	84.0		20.0	42.4	52.0		15.7					
Change Period (Y+Rc),		* 5.4		4.0	* 5.4	* 5.4		4.0					
Max Green Setting (Gm		* 53		16.0	* 9	* 52		36.0					
Max Green Setting (Gm Max Q Clear Time (g_c+		2.0		18.0	2.0	26.7		9.2					
Green Ext Time (p_c), s		43.3		0.0	0.2	19.8		0.6					
· ,	0.0	40.0		0.0	0.2	13.0		0.0					
Intersection Summary			20.7										
HCM 6th Ctrl Delay			30.7										
HCM 6th LOS			С										
Notos													

Notes

^{*} HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ች	^	7	*	^	1	*	(1		*	ĵ.		
Traffic Volume (veh/h)	75	1175	90	45	790	210	60	5	15	255	60	90	
Future Volume (veh/h)	75	1175	90	45	790	210	60	5	15	255	60	90	
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		0.97	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 Approac		No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786	
Adj Flow Rate, veh/h	77	1199	92	46	806	214	61	5	15	260	61	92	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1	
Cap, veh/h	536	1282	570	425	1037	516	77	36	109	278	137	206	
Arrive On Green	0.24	0.38	0.38	0.22	0.35	0.35	0.05	0.09	0.10	0.16	0.21	0.22	
Sat Flow, veh/h	1688	3367	1498	1647	2941	1464	1701	384	1152	1701	641	967	
Grp Volume(v), veh/h	77	1199	92	46	806	214	61	0	20	260	0	153	
Grp Volume(v), ven/m Grp Sat Flow(s),veh/h/l		1683	1498	1647	1470	1464	1701	0	1536	1701	0	1609	
Q Serve(g_s), s	0.0	37.7	3.5	0.0	26.9	7.7	3.9	0.0	1.3	16.6	0.0	9.1	
Cycle Q Clear(g_c), s	0.0	37.7	3.5	0.0	26.9	7.7	3.9	0.0	1.3	16.6	0.0	9.1	
Prop In Lane	1.00	31.1	1.00	1.00	20.9	1.00	1.00	0.0	0.75	1.00	0.0	0.60	
•		1282	570	425	1037	516	77	0	146	278	0	342	
Lane Grp Cap(c), veh/h	0.14	0.94	0.16	0.11	0.78	0.41	0.79	0.00	0.14	0.93	0.00	0.45	
V/C Ratio(X)	536			425	1123				419	278		570	
Avail Cap(c_a), veh/h		1285	572			559	139	0			0		
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)	0.79	0.79	0.79	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/ve		32.7	13.9	33.8	31.7	10.9	52.0	0.0	45.5	45.4	0.0	37.5	
Incr Delay (d2), s/veh	0.1	11.5	0.5	0.1	5.7	2.4	10.3	0.0	0.3	36.4	0.0	0.6	
Initial Q Delay(d3),s/vel		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%),ve		16.6	1.6	1.0	10.3	2.8	1.9	0.0	0.5	9.8	0.0	3.7	
Unsig. Movement Delay			440	22.0	27.5	40.0	CO 0	0.0	45.0	04.0	0.0	20.4	
LnGrp Delay(d),s/veh	27.0	44.2	14.3	33.9	37.5	13.3	62.3	0.0	45.8	81.9	0.0	38.1	
LnGrp LOS	С	D	В	С	D	В	E	A	D	F	Α	D	
Approach Vol, veh/h		1368			1066			81			413		
Approach Delay, s/veh		41.3			32.5			58.2			65.6		
Approach LOS		D			С			Е			Е		
Timer - Assigned Phs	1	2	3	4	5	6	7	8					
Phs Duration (G+Y+Rc) 267 7	45.9	9.0	27.4	30.8	42.8	22.0	14.4					
Change Period (Y+Rc)		4.8	4.0	4.5	4.0	4.0	4.0	4.5					
Max Green Setting (Gn		41.2	9.0	38.5	4.0	42.0	18.0	29.5					
Max Q Clear Time (g_c		39.7	5.9	11.1	2.0	28.9	18.6	3.3					
Green Ext Time (p_c),		1.4	0.0	0.6	0.0	9.9	0.0	0.0					
Intersection Summary	J.0		3.0	3.0	5.5	3.0	J.0	J.0					
HCM 6th Ctrl Delay			42.0										
HCM 6th LOS			42.0 D										
			U										
Notes													

User approved pedestrian interval to be less than phase max green.

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Movement EBL EI	BT EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations			€Î}•		ሻ	↑			f)		
Traffic Volume (veh/h) 0	0 0	280	705	15	395	50	0	0	35	5	
Future Volume (veh/h) 0	0 0	280	705	15	395	50	0	0	35	5	
Initial Q (Qb), veh		0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)		1.00		0.98	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	
Work Zone On Approach			No			No			No		
Adj Sat Flow, veh/h/ln		1730	1730	1730	1772	1772	0	0	1772	1772	
Adj Flow Rate, veh/h		295	742	16	416	53	0	0	37	5	
Peak Hour Factor		0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %		5	5	5	2	2	0	0	2	2	
Cap, veh/h		357	956	21	734	870	0	0	750	101	
Arrive On Green		0.39	0.39	0.39	0.82	0.82	0.00	0.00	0.49	0.49	
Sat Flow, veh/h		910	2439	54	1398	1772	0	0	1527	206	
Grp Volume(v), veh/h		546	0	507	416	53	0	0	0	42	
Grp Sat Flow(s),veh/h/ln		1684	0	1719	1398	1772	0	0	0	1734	
Q Serve(g_s), s		32.1	0.0	28.0	13.1	0.6	0.0	0.0	0.0	1.4	
Cycle Q Clear(g_c), s		32.1	0.0	28.0	14.5	0.6	0.0	0.0	0.0	1.4	
Prop In Lane		0.54		0.03	1.00		0.00	0.00		0.12	
Lane Grp Cap(c), veh/h		660	0	674	734	870	0	0	0	851	
V/C Ratio(X)		0.83	0.00	0.75	0.57	0.06	0.00	0.00	0.00	0.05	
Avail Cap(c_a), veh/h		735	0	750	734	870	0	0	0	851	
HCM Platoon Ratio		1.00	1.00	1.00	1.67	1.67	1.00	1.00	1.00	1.00	
Upstream Filter(I)		1.00	0.00	1.00	0.86	0.86	0.00	0.00	0.00	1.00	
Uniform Delay (d), s/veh		30.1	0.0	28.8	6.6	5.1	0.0	0.0	0.0	14.6	
Incr Delay (d2), s/veh		11.4	0.0	7.6	2.7	0.1	0.0	0.0	0.0	0.0	
Initial Q Delay(d3),s/veh		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln		14.9	0.0	12.9	2.7	0.3	0.0	0.0	0.0	0.6	
Unsig. Movement Delay, s/veh											
LnGrp Delay(d),s/veh		41.5	0.0	36.4	9.4	5.2	0.0	0.0	0.0	14.6	
LnGrp LOS		D	Α	D	Α	Α	Α	Α	Α	В	
Approach Vol, veh/h			1053			469			42		
Approach Delay, s/veh			39.0			8.9			14.6		
Approach LOS			D			Α			В		
Timer - Assigned Phs		4		6		8					
Phs Duration (G+Y+Rc), s		58.0		47.1		58.0					
Change Period (Y+Rc), s		4.0		4.0		4.0					
Max Green Setting (Gmax), s		54.0		48.0		54.0					
Max Q Clear Time (g_c+I1), s		3.4		34.1		16.5					
Green Ext Time (p_c), s		0.1		9.0		2.2					
Intersection Summary											
mitor occurrence y											
HCM 6th Ctrl Delay	29.3										

	۶	→	•	•	←	•	1	†	/	>	↓	✓	
Movement E	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		414	7					^	7	*	^		
Traffic Volume (veh/h)	85	850	520	0	0	0	0	360	270	15	300	0	
Future Volume (veh/h)	85	850	520	0	0	0	0	360	270	15	300	0	
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0	
	1.00	*	1.00				1.00	•	0.99	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		
• • •	772	1772	1772				0	1772	1772	1730	1730	0	
Adj Flow Rate, veh/h	89	895	0				0	379	284	16	316	0	
).95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0	
	153	1613	_				0	644	539	23	716	0	
• •).51	0.51	0.00				0.00	0.36	0.36	0.00	0.14	0.00	
	297	3143	1502				0.00	1772	1482	1647	1730	0.00	
•	526	458	0				0	379	284	16	316	0	
Grp Sat Flow(s),veh/h/ln17		1683	1502				0	1772	1482	1647	1730	0	
. ,	22.9	20.0	0.0				0.0	19.0	16.6	1.1	18.5	0.0	
	22.9	20.0	0.0				0.0	19.0	16.6	1.1	18.5	0.0	
(6=)).17	20.0	1.00				0.00	13.0	1.00	1.00	10.5	0.00	
	902	864	1.00				0.00	644	539	23	716	0.00	
1 1 1 7).58	0.53					0.00	0.59	0.53	0.69	0.44	0.00	
. ,	902	864					0.00	644	539	60	755	0.00	
1 \ - /	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00	
	1.00	1.00	0.00				0.00	1.00	1.00	1.00	1.00	0.00	
Uniform Delay (d), s/veh 1		17.9	0.00				0.00	28.3	27.6	54.5	35.8	0.00	
• ():	2.8	2.3	0.0				0.0	3.9	3.7	20.0	0.3	0.0	
y \ //		0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
Initial Q Delay(d3),s/veh		8.2	0.0				0.0	8.4	6.2	0.6	8.6		
%ile BackOfQ(50%),veh/lı			0.0				0.0	0.4	0.2	0.0	0.0	0.0	
Unsig. Movement Delay, s			0.0				0.0	20.0	24.0	715	26.4	0.0	
• • • • • • • • • • • • • • • • • • • •	21.3	20.2	0.0				0.0	32.2	31.2	74.5	36.1	0.0	
LnGrp LOS	С	С	Δ.				<u> </u>	С	С	E	D	A	
Approach Vol, veh/h		984	Α					663			332		
Approach Delay, s/veh		20.8						31.8			37.9		
Approach LOS		С						С			D		
Timer - Assigned Phs		2		4			7	8					
Phs Duration (G+Y+Rc), s	s	60.5		49.5			5.5	44.0					
Change Period (Y+Rc), s		4.0		4.0			4.0	4.8					
Max Green Setting (Gmax		54.0		48.0			4.0	39.2					
Max Q Clear Time (g_c+l		24.9		20.5			3.1	21.0					
Green Ext Time (p_c), s	.,, 5	13.6		0.9			0.0	2.0					
ntersection Summary													
HCM 6th Ctrl Delay			27.4										
HCM 6th LOS			С										
Notes													

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

	ᄼ	-	•	•	•	•	•	†	/	>	↓	✓	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	*	^	7	*	^	7	*	î,		*	ĵ.		
Traffic Volume (veh/h)	190	850	150	10	750	20	100	25	10	50	20	150	
Future Volume (veh/h)	190	850	150	10	750	20	100	25	10	50	20	150	
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	
Nork Zone On Approac		No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758	
Adj Flow Rate, veh/h	200	895	158	11	789	21	105	26	11	53	21	158	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	7	7	7	0.00	0.00	0.00	3	3	3	
Cap, veh/h	599	2196	979	24	1025	457	203	263	111	341	39	293	
Arrive On Green	0.35	0.65	0.65	0.01	0.32	0.32	0.21	0.22	0.21	0.21	0.22	0.21	
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	1259	1201	508	1399	178	1339	
Grp Volume(v), veh/h	200	895	158	11	789	21	105	0	37	53	0	179	
Grp Sat Flow(s),veh/h/li		1683	1500	1621	1617	1442	1259	0	1709	1399	0	1517	
. ,	9.5	13.8	4.5	0.7	24.3	1.1	8.9	0.0	1.9	3.5	0.0	11.6	
Q Serve(g_s), s	9.5	13.8	4.5	0.7	24.3	1.1	20.5	0.0	1.9	5.4	0.0	11.6	
Cycle Q Clear(g_c), s		13.0			24.3			0.0			0.0		
Prop In Lane	1.00	0406	1.00	1.00	1005	1.00	1.00	۸	0.30	1.00	٥	0.88	
Lane Grp Cap(c), veh/h		2196	979	24	1025	457	203	0	374	341	0	332	
V/C Ratio(X)	0.33	0.41	0.16	0.45	0.77	0.05	0.52	0.00	0.10	0.16	0.00	0.54	
Avail Cap(c_a), veh/h	599	2196	979	74	1323	590	236	0	419	378	0	372	
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	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/vel		9.1	7.4	53.7	33.9	26.0	47.6	0.0	34.5	36.8	0.0	38.6	
ncr Delay (d2), s/veh	0.2	0.6	0.4	7.9	5.6	0.2	1.5	0.0	0.1	0.2	0.0	1.0	
nitial Q Delay(d3),s/vel		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%),vel		5.0	1.5	0.3	10.0	0.4	2.9	0.0	0.8	1.2	0.0	4.4	
Unsig. Movement Delay													
LnGrp Delay(d),s/veh	26.2	9.6	7.8	61.7	39.5	26.2	49.1	0.0	34.5	37.0	0.0	39.7	
LnGrp LOS	С	Α	Α	<u>E</u>	D	С	D	A	С	D	A	D	
Approach Vol, veh/h		1253			821			142			232		
Approach Delay, s/veh		12.0			39.5			45.3			39.0		
Approach LOS		В			D			D			D		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc)), s5.6	76.3		28.1	43.0	38.9		28.1					
Change Period (Y+Rc),		* 4.5		5.5	4.5	4.0		5.5					
Max Green Setting (Gm		* 66		25.5	25.5	45.0		25.5					
Max Q Clear Time (g_c		15.8		13.6	11.5	26.3		22.5					
Green Ext Time (p_c), s		19.2		0.6	0.4	8.6		0.1					
ntersection Summary													
HCM 6th Ctrl Delay			25.7										
HCM 6th LOS			23.7 C										
Notes													

^{*} HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	0.9					
	EBT	EBR	WBL	WBT	NBL	NBR
		EDR 7	VVDL		INDL T	NDK
Lane Configurations Traffic Vol, veh/h	†† 740	150	1 35	↑↑ 800	1 25	r 40
Future Vol, veh/h	740	150	35	800	25	40
•	0	0	0	000	0	0
Conflicting Peds, #/hr Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	riee -	None	Stop -	None
Storage Length	-	100	300	NOHE -	0	0
Veh in Median Storage, #						
	<i>+</i> 0	- -	-	0	0	-
Grade, %			-			
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	779	158	37	842	26	42
Major/Minor Ma	ajor1	N	Major2	N	/linor1	
Conflicting Flow All	0	0	937	0	1274	390
Stage 1	-	-	-	-	779	-
Stage 2	_	_	_	_	495	_
Critical Hdwy	_	_	4.22	_	6.8	6.9
Critical Hdwy Stg 1	_	_	-	_	5.8	-
Critical Hdwy Stg 2	_	_	_	_	5.8	_
Follow-up Hdwy	_	_	2.26	_	3.5	3.3
Pot Cap-1 Maneuver	_	_	703	_	162	614
Stage 1	_	<u>-</u>	-	_	418	-
Stage 2	_	_	_	_	584	_
Platoon blocked, %	_	_		_	JUT	
Mov Cap-1 Maneuver	_	_	703	_	153	614
Mov Cap-1 Maneuver		_		_	153	014
	-	_	-		418	
Stage 1	-	-		-		-
Stage 2	-	-	-	-	553	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.4		19.8	
HCM LOS					С	
Minor Lane/Major Mvmt		NBLn11	JRI n2	EBT	EBR	WBL
	ı			LDI	LDK	
Capacity (veh/h)		153	614	-	-	703
HCM Cartes Dalay (a)		0.172		-		0.052
HCM Control Delay (s)		33.4	11.3	-	-	10.4
HCM Lane LOS		D	В	-	-	В
HCM 95th %tile Q(veh)		0.6	0.2	-	-	0.2

	۶	→	•	•	←	•	1	†	~	/	+	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		^	7	7	ħβ			₩.			4	
Traffic Volume (veh/h)	145	630	5	100	745	5	5	5	5	25	0	110
Future Volume (veh/h)	145	630	5	100	745	5	5	5	5	25	0	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	4.00	1.00	1.00	4.00	1.00	1.00	4.00	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	4750	No	4770	4770	No	4740	4770	No	4770	4000	No	4000
Adj Sat Flow, veh/h/ln	1758	1758	1772	1772	1716	1716	1772	1772	1772	1800	1723	1800
Adj Flow Rate, veh/h	153	663	5	106	784	5	5	5	5	26	0.05	116
Peak Hour Factor	0.95	0.95	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	679	3 1754	2 789	704	6 1662	6 11	2	2	2	0 207	2	0 7
Cap, veh/h Arrive On Green	678 0.11	0.53	0.53	0.09	0.50	0.36	235 0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	1674	3340	1502	1688	3321	21	581	581	581	313	0.00	1395
						404				142		
Grp Volume(v), veh/h	153	663	5 1502	106	385		15	0	0	1707	0	0
Grp Sat Flow(s),veh/h/ln	1674 1.1	1670 2.4	0.0	1688 0.8	1630 3.2	1712 3.2	1743 0.0	0.0	0.0	0.0	0.0	0.0
Q Serve(g_s), s	1.1	2.4	0.0	0.8	3.2	3.2	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s Prop In Lane	1.00	2.4	1.00	1.00	3.2	0.01	0.33	0.0	0.33	0.18	0.0	0.82
Lane Grp Cap(c), veh/h	678	1754	789	704	816	857	240	0	0.33	214	0	0.62
V/C Ratio(X)	0.23	0.38	0.01	0.15	0.47	0.47	0.06	0.00	0.00	0.66	0.00	0.00
Avail Cap(c_a), veh/h	2187	10812	4861	1697	4725	4963	2496	0.00	0.00	2385	0.00	0.00
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	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	3.5	2.9	2.3	3.5	3.4	3.4	10.4	0.0	0.0	10.4	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.1	0.0	0.1	0.3	0.3	0.1	0.0	0.0	2.6	0.0	0.0
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	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.6	0.0	0.0
Unsig. Movement Delay, s/veh		0.0	0.0	0.0	• • • • • • • • • • • • • • • • • • • •	•	0.0	0.0	0.0	0.0	0.0	0.0
LnGrp Delay(d),s/veh	3.7	3.0	2.3	3.6	3.7	3.7	10.5	0.0	0.0	13.0	0.0	0.0
LnGrp LOS	Α	А	A	Α	Α	Α	В	Α	Α	В	Α	Α
Approach Vol, veh/h		821			895			15			142	
Approach Delay, s/veh		3.1			3.7			10.5			13.0	
Approach LOS		Α			Α			В			В	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	14.4		0.0	5.8	14.9		0.0				
Change Period (Y+Rc), s	4.0	7.0		4.0	4.0	7.0		4.0				
Max Green Setting (Gmax), s	21.0	57.0		27.0	14.0	64.0		27.0				
Max Q Clear Time (g_c+l1), s	3.1	5.2		0.0	2.8	4.4		0.0				
Green Ext Time (p_c), s	0.3	2.2		0.0	0.2	2.2		0.0				
$u = \gamma$	0.0	۷.۷		0.0	0.2	۷.۲		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			4.2									
HCM 6th LOS			Α									

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	^	7	ሻ	↑ ↑			4		ሻ		
Traffic Vol, veh/h	5	650	5	100	840	50	5	5	5	10	0	0
Future Vol, veh/h	5	650	5	100	840	50	5	5	5	10	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	100	150	-	-	-	-	-	0	-	-
Veh in Median Storage,	# -	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	684	5	105	884	53	5	5	5	11	0	0
Major/Minor N	1ajor1		ľ	Major2		N	Minor1		N	Minor2		
Conflicting Flow All	937	0	0	689	0	0	1346	1841	342	1476	-	-
Stage 1	-	-	-	-	-	-	694	694	-	1121	-	-
Stage 2	-	-	-	-	-	-	652	1147	-	355	-	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	-	_
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	-	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	-	-
Pot Cap-1 Maneuver	727	-	-	901	-	-	110	74	654	88	0	0
Stage 1	-	-	-	-	-	-	399	442	-	220	0	0
Stage 2	-	-	-		-	-	423	272	-	635	0	0
Platoon blocked, %		-	-		-	-						-
Mov Cap-1 Maneuver	727	-	-	901	-	-	100	65	654	74	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	100	65	-	74	-	-
Stage 1	-	-	-	-	-	-	396	439	-	218	-	-
Stage 2	-	-	-	-	-	-	374	240	-	618	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			1			42.7			61.6		
HCM LOS							E			F		
Minor Lane/Major Mvmt		NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1			
Capacity (veh/h)		111	727			901	-	-	74			
HCM Lane V/C Ratio		0.142		<u>-</u>		0.117	_		0.142			
HCM Control Delay (s)		42.7	10	_	_	9.5	_	_	61.6			
HCM Lane LOS		τ <u>2.</u> τ	A	_	_	Α.	_	<u>-</u>	61.6 F			
HCM 95th %tile Q(veh)		0.5	0	_	_	0.4	_	_	0.5			
		0.0	J			J.7			5.0			

SECTION 3. BENEFIT COST ANALYSIS MEMO

DRAFT TECHNICAL MEMORANDUM

DATE: July 26, 2021

TO: Project Management Team

FROM: Reah Flisakowski, Dock Rosenthal | DKS Associates

Chris Beatty, Jeff Elston | HHPR Joel Ainsworth | ECONOrthwest

Darci Rudzinski | APG

SUBJECT: Sandy Bypass Feasibility Reevaluation – Benefit Cost Analysis P# 20020-007

This memorandum presents the benefit cost analysis that was conducted to support the reevaluation of the US 26 bypass project that is identified in the 2011 Sandy Transportation System Plan (TSP). The goal of the analysis is to provide a planning-level assessment of the potential benefits and costs associated with the bypass using measures of performance related to the value of travel time, safety, and local businesses. The Sandy TSP is currently being updated and will incorporate the findings and recommendations from this assessment when developing the motor vehicle project list and priorities.

The following sections present the US 26 preferred conceptual alignment and the benefit cost analysis for value of time, safety, and local businesses.

PREFERRED CONCEPTUAL ALIGNMENT

To support the benefit cost analysis, a conceptual alignment (10% design) and planning-level cost estimate was developed for the bypass. The US 26 bypass conceptual alignment developed for the 2011 Sandy TSP was refined based on updated future traffic operations and more detailed design considerations for topography, environmental constraints, and freeway design standards.

The conceptual alignment for the bypass is shown in Figure 1 and Appendix Section 1. The bypass features and design parameters are summarized below.

- The facility would be located south of the Sandy Urban Growth Boundary and approximately 5.8 miles long.
- The west end of the bypass would connect to US 26 approximately 2,400 feet west of Orient Drive. The new intersection on US 26 would be an interchange configuration.
- The east end of the bypass would connect to US 26 at Firwood Road (Shorty's Corner). The existing intersection would be converted to an interchange configuration.
- The new bypass intersection with OR 211 would be an interchange configuration.
- The bypass facility would provide a grade separated overcrossing at 362nd Drive.

• The facility would provide a 120-foot-wide right-of-way to accommodate four travel lanes (two each direction), raised median, shoulder area, lighting, trees and public utility easement.

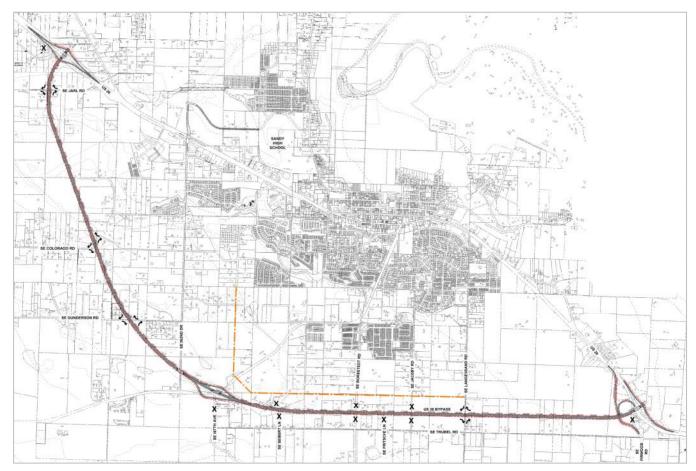


FIGURE 1: US 26 BYPASS CONCEPTUAL ALIGNMENT

The primary purpose of the bypass is to serve regional traffic demand that currently travels on US 26 through Sandy. The interchanges at each end of the bypass and OR 211 would provide the primary access to the bypass. The rest of the facility would be limited to right-in/right-out access at key intersections to reduce conflicts and provide reliable free-flow traffic operations. The remaining streets that intersect the bypass conceptual alignment would be closed and an alternative street network would be provided. The conceptual alignment and potential network changes are shown in Appendix Section 1.

A cost estimate was prepared based on the 10% design concept for the bypass shown in Figure 1. The total cost estimate accounts for construction, utility and slope easements, right-of-way acquisition and professional services to administer design and construction management. The cost estimate is approximately \$365 to \$390 million in current year 2021 dollars. The detailed cost estimate is shown in Appendix Section 2. The cost estimate when adjusted for inflation to represent year 2040 is approximately \$980 million to \$1 billion. Construction in 2040 is the soonest the bypass could reasonably be built due to magnitude of the project related to regulatory and funding challenges.

VALUE OF TIME IN TRAVEL

To identify potential benefits and costs associated with the US 26 bypass, a traffic analysis was conducted to provide a comparison of the future network improvement alternatives listed below. The supporting transportation data, analysis, and findings used for this benefit cost analysis are documented in the Future Transportation System Performance memo¹ in the Appendix Section 3. This includes a detailed description of the projects and improvements included in each alternative.

- 2040 No Build Alternative includes the extension of Dubarko Road to SE Vista Loop Drive (west).
- 2040 Alternative #1 includes a significant investment in local enhancements and minor improvements to US 26.
- 2040 Alternative #3 adds the US 26 bypass to Alternative #1.

The US 26 bypass is expected to serve a moderate future volume and improve traffic flow on US 26 through Sandy. It was estimated that approximately 1,500 vehicles per hour would use the bypass during the peak hour in year 2040. Approximately 60% of the bypass users during the peak hour would be through traffic with no origin or destination in Sandy, while the other 40% would be comprised of local trips accessing the south portion of Sandy.

As an additional measure for evaluating the effectiveness of each alternative, travel times along US 26 through the study area were estimated. Table 1 shows the travel time estimates for each alternative. Improvements in travel times among the alternatives are generally consistent with the improvements shown for intersection operations, with the provision of a bypass in Alternative #3 resulting in moderate reductions in through travel time.

TABLE 1: ESTIMATED US 26 CORRIDOR TRAVEL TIMES (PEAK HOUR)

ALTERNATIVE		TRAVEL TIME EASTBOUND (MM:SS)	TRAVEL TIME WESTBOUND (MM:SS)
2020 EXISTING		09:35	09:55
2040 NO BUILD		16:50	14:25
2040 ALTERNATIVE #1		13:20	10:15
2040 ALTERNATIVE #3	TRAVEL ON US 26 FACILITY	08:55	10:20
2040 ALIERNATIVE #3	TRAVEL ON BYPASS FACILITY	07:55	07:55

¹ Future Transportation System Performance memo, DKS Associates, June 28, 2021.



The future year 2040 travel time estimates developed for the No Build, Alternative #1, and Alternative #3 were used to evaluate potential future travel time benefits. With the bypass facility, year 2040 travel times through Sandy would result in the travel time savings shown in Table 2.

TABLE 2: ESTIMATED US 26 CORRIDOR TRAVEL TIMES SAVINGS (PEAK HOUR)

ALTERNATIVES COMPARED	TRAVEL TIME SAVINGS EASTBOUND (MM:SS)	TRAVEL TIME SAVINGS WESTBOUND (MM:SS)
2040 NO BUILD TO ALTERNATIVE #3	- 8:55	- 6:30
2040 ALTERNATIVE #1 TO ALTERNATIVE #3	- 5:25	- 2:20

The value of time in travel savings (VTTS) was estimated to measure a potential benefit of the bypass. The Benefit-Cost Analysis Guidelines for Discretionary Grant Programs² was the source for the value of travel time savings (cost per person hour) and average vehicle occupancy inputs in the calculations. Detailed assumptions are provided in Appendix Section 4.

The total VTTS was estimated at \$19.21 per person hour for travel along US 26. This value was adjusted to reflect a slightly higher VTTS than the national average based on slightly higher household income and employee compensation in the City of Sandy and the Portland-Vancouver-Hillsboro metropolitan area. The VTTS for commercial traffic was estimated at \$32.19 per person hour. This is consistent with the national rates recommended and scaled to 2021 dollars.

Based on the travel time savings between Alternative #1 and Alternative #3 shown in Table 2, the hourly benefit during the 2040 peak hour is approximately \$1,900. If this benefit is realized for one hour every weekday, the annual benefit is estimated at \$500,000 per year. If the benefit is realized for 6 hours every weekday, the annual benefit is estimate at \$3,000,000 per year. If this time savings benefit can be sustained for 20 years at an interest rate of 5%, the net present value of the benefit is approximately \$37.4 million.

Comparing No Build and Alternative #3, the hourly benefit during the 2040 peak hour is approximately \$3,700. If this benefit is realized for one hour every weekday, the annual benefit is estimated at \$1,000,000 per year. If the benefit is realized for 6 hours every weekday, the annual benefit is estimate at \$6,000,000 per year. If this time savings benefit can be sustained for 20 years at an interest rate of 5%, the net present value of the benefit is approximately \$74.8 million.

² Benefit-Cost Analysis Guidelines for Discretionary Grant Programs, USDOT, December 2018.

SAFETY ANALYSIS

COLLISION DATA

A safety analysis was conducted for US 26 between the end points of the bypass conceptual alignment. The most recent five years of available collision data, 2014 to 2018, was reviewed to document the severity of collisions and calculate the crash rate. The collision data compiled for the Sandy TSP Update is shown in Figure 2 and includes the US 26 safety data used for this analysis.

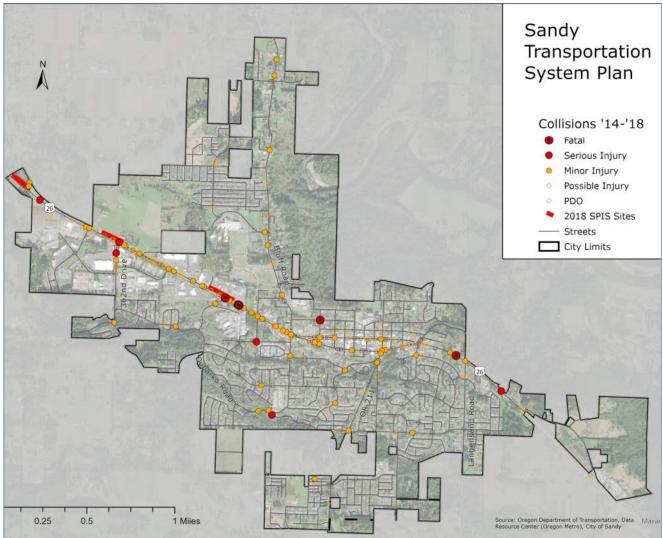


FIGURE 2: SANDY SAFETY ASSESSMENT - 2014 TO 2018

The crash records were summarized by study intersection for intersection-related crashes in Table 2 and non-intersection related crashes by study segments are summarized in Table 3. In total, the study corridor experienced 338 crashes over the five-year study period, including four fatal crashes and five serious injury crashes. The following key findings are summarized below all 338 crashes:

All four fatal crashes involved a driver under the influence of alcohol or drugs.

- o Three of the four crashes involved a pedestrian fatality.
- Two fatal crashes occurred in front of the Safeway along US 26 between Ruben Ln and Industrial Way.
- The most common crash type was rear-end crashes (53%) and the top contributing factor was failure to avoid (34%).
- The study intersection of 362nd Dr and US 26 reported the highest number of crashes and the highest crash rate. Whereas the intersection of US 26 and Ruben Ln experienced the highest number of high severity crashes (one fatal and two serious injury crashes).
- The study segment between Ruben Ln and Bluff Rd experienced the highest number of crashes and the highest crash rate, including two fatal crashes.
- One in four crashes occurred on wet road surface conditions.

TABLE 2: US 26 INTERSECTION COLLISION DATA (2014 TO 2018)

STUDY INTERSECTION	FATAL	INJURY	PROPERTY DAMAGE ONLY	TOTAL ^A	CRASH RATE ^B
ORIENT DR/US 26	0	1	2	3	0.053
362 ND DR/US 26	0	25	10	35	0.566
INDUSTRIAL WAY/ US 26	0	6	5	11	0.201
RUBEN LN/US 26	1	13	4	18	0.309
BLUFF RD/US 26	0	9	10	19	0.311
MEINIG AVE (OR 211)/PROCTER BLVD (US 26)	0	4	6	10	0.391
MEINIG AVE (OR 211)/PIONEER BLVD (US 26)	0	6	5	11	0.290
TEN EYCK RD/US 26	0	7	5	12	0.293
LANGENSAND RD/US 26	0	4	2	6	0.182
VISTA LOOP DR W/US 26	0	0	0	0	0
VISTA LOOP DR E/US 26	0	0	0	0	0

A Intersection crashes were filtered to crashes that were only intersection related.

Overall, the 11 study intersections experienced a total of 125 crashes, including one fatal crash and three serious injury crashes. The following key findings for 125 intersection related crashes are summarized below:

 One fatal crash occurred at the intersection of Ruben Ln and US 26 that involved a driver, who was reported under the influence of alcohol, driving westbound along US 26 and disregarded the traffic signal and hit a pedestrian crossing the crosswalk.

^B Crash rate is calculated based on FHWA intersection crash rate calculation:

https://safety.fhwa.dot.gov/local_rural/training/fhwasa1210/s3.cfm

- Two of the three serious injury crashes involved a vehicle making a turning movement from the westbound approach at Ruben Ln and US 26.
- 362nd Dr and US 26 intersection reported the highest number of crashes and the highest crash rate compared to the other study intersection.
- The top three collision types reported at the study intersections were rear-end (49%), turning (35%), and pedestrian related (6%).
- The top three contributing circumstances were reported failure to avoid (36%), failure to yield (24%), and disregarding the signal (8%).
- 31% of crashes were reported on wet road surface conditions.

TABLE 3: US 26 SEGMENT COLLISION DATA (2014 TO 2018)

HIGHWAY SEGMENT	LENGTH (MILES)	FATAL	INJURY	PROPERTY DAMAGE ONLY	TOTAL	CRASH RATE ^A
1000 FEET WEST OF ORIENT DR - ORIENT DR	0.189	0	0	1	1	9.676
ORIENT DR - 362 ND DR	0.602	0	10	9	19	66.104
362 ND DR - INDUSTRIAL WAY	0.326	0	19	4	23	141.466
INDUSTRIAL WAY - RUBEN LN	0.368	0	18	9	27	139.838
RUBEN LN - BLUFF RD	0.421	2	39	20	61	283.660
BLUFF RD - MEINIG AVE (OR 211) ON PIONEER BLVD	0.526	0	7	13	20	119.152
BLUFF RD - MEINIG AVE (OR 211) ON PROCTOR BLVD	0.523	0	8	19	27	206.289
MEINIG AVE (OR 211) - TEN EYCK RD ON PIONEER BLVD	0.215	0	5	5	10	174.438
MEINIG AVE (OR 211) - TEN EYCK RD ON PROCTOR BLVD	0.204	0	2	5	7	161.571
TEN EYCK RD – LANGENSAND RD	0.292	1	4	1	6	56.007
LANGENSAND RD - VISTA LOOP DR EAST	1.030	0	6	6	12	24.366
VISTA LOOP DR EAST - SE LUZON LN	0.188	0	0	0	0	45.903

A Crash rate is calculated based on FHWA road segment crash rate calculation: https://safety.fhwa.dot.gov/local_rural/training/fhwasa1210/s3.cfm



Overall, the study corridor experienced a total of 213 crashes that were non-intersection related, including three fatal crashes and two serious injury crashes. The following key findings for 213 segment crashes are summarized below:

- Three fatal crashes occurred over the five-year study period:
 - Two fatal crashes occurred along US 26, between Ruben Lane and Industrial Way, including one pedestrian fatality. Both of these crashes involved a driver reportedly under the influence of drugs.
 - The other fatal crash involved a driver, who was reported under the influence of alcohol and drugs, hit a pedestrian walking eastbound along the shoulder of US 26, between Ten Eyck Rd and Langensand Rd, where there is no sidewalk present.
- The segment along US 26 between Ruben Lane and Bluff Road reported the highest number of crashes and the highest crash rate compared to the other segments.
- The top three collision types reported for segments were rear-end (56%), turning (16%), and sideswipe (13%).
- The top three contributing circumstances were reported failure to avoid (32%), failure to yield (16%), and following too close (14%).
- One in five crashes were reported on wet road surface conditions.
- Eight crashes (4%) reported a driver under the influence of alcohol or drugs, including three fatal crashes and four injury crashes.

BYPASS SAFETY EVALUATION

By rerouting traffic around the main corridor of cities, highway bypasses can provide several direct transportation benefits, including improved roadway safety. A high-level safety evaluation of US 26 was conducted to identify potential safety benefits from the bypass. The evaluation included a review of literature and outcomes from bypass facilities as follows:

California Bypass Study (2006)³

This report summarizes the impacts of bypasses for local communities by presenting case studies of bypasses throughout the United States. Based on the case studies found in this report, constructing bypasses can improve traffic safety by reducing the number of conflict points between trucks, automobiles, motorcycles, bicyclists, and pedestrians. In particular, bypasses can divert freight traffic away from downtown areas, and it can improve travel times for goods to be moved between areas. Bypasses can also improve the perception of safety by addressing concerns related to truck traffic, improve local downtown circulation and reduce the idling noise in urban areas. The

³ Caltrans California Bypass Study (2006): https://rosap.ntl.bts.gov/view/dot/27518

report also summarized case studies of bypasses in other states, such as Iowa, where the bypass increased local business sales "due to local residents taking advantage of easier access to downtown businesses as a result of less traffic congestion, improved traffic safety and easier parking".

New Roads and Human Health: A Systemic Review (2003)⁴

This journal article conducted a review of 32 different before-and-after bypass studies worldwide and their safety impacts. The research compared the number of injury accidents on the main road through town in the "before" period and the number of injury accidents in the "after" period for both the main road and the new bypass. In particular, a Norway case study conducted a meta-analysis of 20 bypasses that observed a 19% decrease in injury accidents on average. Overall, the bypass studies showed a general decline in the number of injury accidents after the opening of the new bypass facilities.

A Bayesian Assessment of the Effect of Highway Bypasses in Iowa on Crashes and Crash Rate (2011)⁵

This journal article assessed the impact of highway bypasses in the state of Iowa. The study evaluated several years before and after the construction of a bypass for 19 sites and compared them to 6 other "non-treatment" sites. The "non-treatment" sites were six cities that were scheduled to be bypassed but had not started construction prior to the study completion. The research results indicated the construction of the bypasses resulted in improved safety with a reduction of the number of crashes on both the old and new (bypass) road networks considered in the study. On average, the crash frequencies "were reduced by 50% on the old road network and 62% on the new road network". Also, the "crash rates on average were reduced 33% on the old road network and 59% on the new road network". Overall, the study concluded that the bypass construction increased traffic safety by reducing the number of crashes.

SAFETY BENEFITS

It is estimated the construction of the US 26 bypass in Alternative #3 would moderately improve safety on US 26 between Orient Drive and Firwood Road. Based on the literature review, it is likely that the number of crashes on US 26 through Sandy will be reduced if proper safety measures are implemented for the bypass construction. In particular, appropriate wayfinding signage and speed limit setting for both the main road and the new bypass should be planned thoughtfully for both local residents and regional travelers. Also, ensuring effective collaboration and consultation with relevant stakeholders, such as law enforcement, will ensure the continued safety for local residents and travelers on both routes. Furthermore, the City of Sandy should consider some educational

⁴ Eagan, M., M. Petticrew, D. Ogilvie, V. Hamilton. 2003. American Journal of Public Health: https://ajph.aphapublications.org/doi/full/10.2105/AJPH.93.9.1463

⁵ Lorenzo G. Cena, Nir Keren, Wen Li, Alicia L. Carriquiry, Michael D. Pawlovich, & Steven A. Freeman. (2011). *Journal of Safety Research*: https://doi.org/10.1016/j.jsr.2011.05.007

outreach efforts to inform local residents of how to safely traverse interchanges (merging, diverging and ramps) and to prevent driving under the influence of drugs/alcohol to reduce fatalities.

Overall, the bypass is expected to reduce the number of conflict points and avoid vulnerable travelers (i.e. pedestrians and bicyclists) by rerouting traffic away from the commercial and downtown areas.

BENEFITS OR IMPACTS TO LOCAL BUSINESSES

To establish a baseline understanding of the potential effect of highway bypasses on communities similar to Sandy, available economic literature was reviewed and summarized in the following sections. This information is intended to inform the range of potential benefits or impacts to local businesses from the estimated reduction in vehicle trips on US 26 through Sandy.

CHARACTERISTICS OF BYPASSES

Bypasses arise out of a need to correct safety and traffic concerns for state highways that are serving as both a regional highway and main street by diverting traffic away from a downtown or urban area and providing alternative routes for through traffic. Ideally, this has the potential to improve local access to goods and services for residents and visitors by decreasing traffic delays.⁶ Bypasses can be used to enhance quality of life (e.g., less noise and air pollution), add roadway capacity for existing or anticipated traffic needs, and upgrade existing roadway conditions.⁷

When urban activities become more centered around highways, highways may be unable to efficiently serve the community and are instead used for local trips—as opposed to through traffic. Downtown areas need parking access for businesses and safe, walkable environments while regional travel areas need fewer stops, higher speeds, and limited access facilities.

In Oregon, new bypasses can take the form of freeways or expressways and can be located within an Urban Growth Boundary (UGB) and/or outside of a UGB, with a Transportation Planning Rule goal exception. The primary distinction between these two roadways is the degree of local access. Freeways are high speed and have fully controlled access to prioritize through traffic and safety. When access connections are necessary, grade-separated interchanges are integrated.

Expressways have more access, albeit strictly controlled, to manage inter and intra-urban traffic. When expressway connections are necessary, they are at-grade signalized and unsignalized public

⁶ Amendment to 1999 Oregon Highway Plan BYPASS POLICY, April 16, 2003.

⁷ System Metrics Group, Inc. et al. 2006. *California Bypass Study, The Economic Impacts of Bypasses: Volume 1: Planning Reference.* Sacramento, CA: California Department of Transportation, Transportation Economics.

road intersections and interchanges. In general, rural areas should not have traffic signals and private-property access is discouraged although some exceptions may apply.⁸

THE IMPACT OF BYPASSES ON SMALL-TOWN ECONOMIES

Some business owners and local stakeholders may express concerns about how a bypass will impact their local economy, while elected officials may view the new infrastructure as an opportunity for economic development. These changes can leave residents and local business owners wondering about the economic impacts of diverted traffic or the competitive effects of potential development adjacent to the new roadway. Economic concerns may include, but are not limited to:

- Will the businesses seeking development opportunities be locally owned or national chains or franchises likely to order their supplies and spend profits elsewhere?
- Will there be a loss of local character if the existing business mix is altered?
- Will new business development adjacent to the bypass increase competition for the existing businesses?

Each of these questions are complex and challenging to predict without extensive project and geographic information. Given the limited scope, this assessment focuses on the characteristics of bypasses that can affect a community's economy. The following section describes those differing characteristics.

HOW CAN A BYPASS IMPACT DIFFERENT TYPES OF TOWNS AND BUSINESSES?

How the construction of a new bypass interacts with a local economy depends on several interrelated factors including the types of services and sectors a town specializes in, the customer base that town appeals to, and its geographic location. Key questions that often arise when attempting to evaluate the economic effect of a bypass on a community's economy are:

- Is the town located along a major trade route or near a large metropolitan area?
- What types of industry does the local economy support?
- Does the town cater primarily to tourists and pass-through traffic or residents?

Answering all these questions is imperative when evaluating the economic impacts of bypasses on local economies. While the variance of economic effects can be wide, some generalized relationships have been established through research. In 2006, the California Department of Transportation (Caltrans) published a comprehensive study⁹ that assessed the impacts of bypasses on small-town economies by reviewing existing literature on bypasses, performing field work, and developing a proprietary Highway Bypass Impact (HBI) Model. The authors identified a variety of factors that influence how a bypass interacts with a local, small-town economy.

⁹ California Bypass Study, The Economic Impacts of Bypasses, May 2006.



⁸ Amendment to 1999 Oregon Highway Plan BYPASS POLICY, April 16, 2003.

The study identifies several key features that should be considered during the design phase of bypasses:

- Time savings
- · Direct access
- Proximity to commercial areas
- Visibility

The time savings drivers incur is a determining factor in how many vehicles will opt to utilize the new bypass over the old route. This feature is one of the most significant benefits from bypasses. Bypasses connected to highway interchanges may impact businesses in one of two ways. One positive feature is that they can increase access to existing businesses if they are located along the bypass. A potential drawback is the bypass could draw traffic away from established businesses, encouraging new development adjacent to the bypass and increasing competition for existing businesses. The availability of parking in commercial areas (e.g., downtown) is a strong indicator of how well existing businesses can withstand potential competition from newly accessible land. And lastly, the more visible a business is from a bypass and the closer the business is to a commercial area (e.g., downtown), the less likely it is to experience negative effects from new traffic flows.

Communities with heavy local traffic or through traffic that does not stop are the least likely to be impacted by bypasses while communities that provide goods and services to pass-through traffic are most likely to experience adverse effects. In essence, the more a community relies on local traffic, the less likely the new bypass will impact businesses because there is an existing customer base. Even though local traffic-dependent communities may not stand to gain much from the addition of a bypass, they could experience increased and more efficient traffic flows if a bypass reduces truck traffic.

Residential communities and tourist destinations are the most likely to benefit from bypasses resulting in less traffic congestion and increased safety. Local business owners in these areas may have to partner with government officials to mitigate any potential negative impacts from the new traffic patterns. These strategies could involve capital improvements (e.g., increasing walkability, additional parking) or downtown redevelopment. Towns that offer a variety of visitor services (e.g., hotels, art galleries) attract more tourists as opposed to travelers passing through on their way to somewhere else and may experience positive economic impacts if a downtown area serves as a destination.

The types of towns that will have the most difficult time transitioning their economy after a bypass is constructed are those that are highway oriented. In particular, businesses that cater to pass-through traffic, like fast food chains and gas stations, are the most likely to be affected by bypasses. One critical question for these types of communities is whether travelers make opportunistic stops or if they incorporate the stop into their travel plans ahead of time? If travelers plan in advance on stopping at a particular location, ensuring convenient access for them is crucial to maintain the health of local businesses. If the businesses are more opportunistic for travelers, then advertising and proximity to the bypass is imperative. For example, tourist-related businesses can mitigate negative impacts by relocating to properties adjacent to the bypass.

RESEARCH SUMMARY

Throughout the 1990s and 2000s, researchers and local and state governments evaluated the impacts of bypasses on local economies. A broad range of studies and reports emerged with many focusing on small-town economies.

In 1998, the Wisconsin Department of Transportation (WisDOT) published a report that analyzed the impact of bypasses on 17 smaller communities over the long term on the older routes in the medium-to-large communities were close to the pre-bypass counts. Overall, residents and business owners viewed the bypasses as beneficial, citing development opportunities, less truck traffic, and improved traffic flows. These effects allowed businesses—retail and traffic-dependent businesses, in particular—to flourish and the medium-to-large communities to experience continued economic growth. Additionally, the bypasses caused little relocation of retail businesses adjacent to the new roadway. Despite these positives, the authors noted that bypasses had an increased potential for harm to communities with fewer than 1,000 residents.

Similar to WisDOT's study, the Texas Department of Transportation (TxDOT) asked researchers to perform an analysis investigating the economic impacts of highway bypasses on small communities. While business owners, residents, and local elected officials held mixed reviews of the bypasses initially, they felt that traffic congestion had greatly improved, subsequently increasing safety and local business access. Despite these positives, the traffic diversion had negative impacts on highway-oriented businesses (e.g., service stations, motels, fast food restaurants), downtown businesses, and those along the bypass. However, the authors noted these impacts were not uniformly distributed and depended largely on the function of the downtown area, in particular whether the area focused on civic or service-related businesses.¹³

In 2001, the University of Kentucky Center for Business and Economic Research performed an analysis with the Kentucky Transportation Center to assess the impacts of bypasses on both local economies and quality of life. Researchers found that the construction of new bypasses did impact retail sales, but not overall employment. Employment growth was likely to increase if the bypasses were located near a city's business district. Other key findings included the size of a community was not a determinant in employment growth and some rearrangement of economic activity resulted from bypasses (e.g., increased vacancy rates in downtown areas). Residents reported

¹³ Civic-related businesses include courts, bail bonds companies, title companies, and law offices.



¹⁰ These communities ranged from 300 to 30,000 residents.

¹¹ According to the authors, most of the bypass communities had experienced a significant amount of economic growth prior to the construction of the new infrastructure and exceeded the growth in the control (i.e., non-bypass) communities.

¹² Wisconsin Department of Transportation. 1998. *The Economic Impacts of Highway Bypasses on Communities, Summary*.

greater satisfaction with improved traffic flows and most downtown business owners felt that the bypass either assisted them or had no meaningful impact on their businesses.¹⁴

A larger study conducted through the National Cooperative Highway Research Program (NCHRP) used national survey data from both the United States and Canada to assess the impacts of bypasses on smaller economies (i.e., 5,000 residents). While the findings were largely inconclusive, the authors did determine that highway-oriented businesses in small towns were the most negatively impacted by traffic diversions and that perceived effects were more profound than the actual effects. Although there was an observed initial drop in sales, the local economies typically recovered due to decreased congestion and noise pollution. Small and rural communities stood to benefit as development potential along the new roadway and traffic safety increased. Additionally, land values increased along both the new bypasses and old routes. The researchers also concluded that population density had a large effect on a community's economic performance following bypass construction and that a town's ability to extend its political boundaries (and subsequently garner additional tax revenue from development) could have a positive impact as well.¹⁵

POTENTIAL IMPACTS FOR SANDY

Accounting for a city's unique characteristics and commercial competition outside the city is the only way to truly assess how a particular economy may be impacted by a new bypass. The City of Sandy is a mixed economic environment with local and big-box businesses. Many are auto-oriented and cater to highway pass through traffic such as gas stations, convenience stores, drive-through coffee shops and fast food/high turnover restaurants. A major segment of retail customers are recreational visitors travelling through Sandy to Mt. Hood and Central Oregon. These unique customers support specialized local businesses such as outdoor equipment stores.

Some of these businesses serving pass through traffic may see an impact if their services cannot be easily replaced. For example, customers will need to determine if the travel time savings from taking the bypass outweighs the convenience of shopping in Sandy. Customers may choose to shop near their home before they leave or at their destination instead. Other auto-oriented businesses, such as gas stations, will likely be impacted. Customers may choose to stop for gas outside Sandy to save time travelling on the bypass. There are several gas stations to the east and west of Sandy within a few miles. The existing gas station at Firwood Road (Shorty's Corner) would be conveniently located on the east end of the bypass. Note that Sandy has a local gas tax that generates revenue to fund various transportation needs including facility maintenance. The diversion of vehicles to the bypass would likely reduce local gas tax revenue.

With the forecasted local growth over the next 20 years, it is unlikely these businesses would experience a high impact from a bypass. An analysis of employment inflow and outflow from

¹⁴ Thompson, E., J., Miller, and J., Roenker. 2001. *The Impact of a New Bypass Route on the Local Economy and Quality of Life, Research Report KTC-01-10/SPR219-00-21*. June 2001. Lexington, KY: University of Kentucky.

¹⁵ National Cooperative Highway Research Program (NCHRP). 1996. "Effects of Highway Bypasses on Rural Communities and Small Urban Areas." *Research Results Digest* Number 210.

 2018^{16} (the most recent year available) showed that approximately 5,000 Sandy residents work outside of the city, 3,000 workers commute into the city, and 600 residents work within the city. Of the jobs within Sandy, most are classified as retail trade (\sim 1,000 or 25%) followed by accommodation and food services (\sim 500, 15%) and educational services (\sim 400, 12%). Of these, retail and food services may be the most vulnerable to impacts from a bypass.

The majority of the bypass alignment is outside the urban growth boundary with rural zoning and land use. Urban development would be prohibited, eliminating the possibility for new commercial development along the bypass that could compete with existing businesses on US 26. The biggest commercial competition is the Portland Metro area, approximately seven miles west of Sandy, which can provide almost all the retail and service businesses highway drivers could need.

The bypass is forecasted to serve 1,500 vehicles peak hour in the 2040 peak hour. A portion of these vehicles are potential Sandy business customers that choose the travel time savings of the bypass over the convenience of shopping at a business on US 26. To counter that impact, lower traffic volumes on the highway may make downtown highway fronting businesses more attractive.

OTHER CONSIDERATIONS

There are other potential benefits and costs related to constructing a bypass that should be considered beyond the value of travel time, safety and local businesses previously presented. These other considerations include maintenance of the facility and policy and regulatory requirements as descripted in the following sections.

US 26 JURISDICTIONAL TRANSFER TO CITY

A new bypass facility would be constructed and operated by ODOT. With the bypass in place, ODOT would transfer the jurisdiction of the existing section of US 26 being bypassed to the City. The ongoing maintenance and operation of the facility would be a cost burden for the City. This segment of US 26 is approximately 5 miles long with four to five travel lanes, street lighting and numerous traffic signals. The average annual cost to maintain a comparable urban highway is \$20,000 to \$30,000 per miles. Over the next 20 years, the maintenance cost for the City is estimated to be \$2 to \$3 million.

The City taking jurisdiction of US 26 also brings opportunities to make local changes to the facility. With the bypass in place, the future traffic volumes on US 26 will decrease significantly and potentially allow the reconstruction of the existing five-lane sections (outside the downtown couplet) to three-lanes and provide additional design features such as landscaping, wider sidewalks, protected bicycle lanes, median treatments, and diagonal parking with the extra roadway width. This would result in benefits to overall safety and livability and encourage more walking, biking, and transit activity. Reconstruction of US 26 would be a major capital project with

¹⁶ https://onthemap.ces.census.gov/



potential modifications to traffic signals, drainage, utilities, street lighting, pavement markings and signage. Based on planning level cost estimates for comparable corridor reconstruction projects, the cost estimate could range from \$20 to \$40 million for improvements.

POLICY AND REGULATORY REQUIREMENTS

A detailed evaluation of the policy and regulatory considerations associated with a potential bypass was conducted for this analysis, as provided in the Appendix, Section 4 and summarized below.

The construction of a US 26 bypass around the city of Sandy represents a significant investment in public infrastructure with the potential to impact transportation, urban and rural lands, Goal 5 resources, and the local and regional economy. Demonstration of compliance with several related policies and regulations will need to be addressed if this alternative is pursued and further developed.

A preferred bypass alternative would be documented in a facility plan, ultimately adopted by the Oregon Transportation Commission (OTC) and Oregon Department of Transportation (ODOT), thereby amending the Oregon Highway Plan (OHP). The City of Sandy and Clackamas County will need to work collaboratively on developing any necessary amendments to local plans (such as the comprehensive plan, TSPs, local land use, and subdivision codes) to ensure consistency with the facility plan for the proposed bypass. While both the state and the local governments adopt the facility plan, or elements thereof, the adoption processes are different and the roles and responsibilities for the different levels of government are not the same.

Both the City of Sandy and Clackamas County would amend their respective TSPs to incorporate elements of the facility plan. Local approval may require the adoption of new transportation-related policies, consistent with the findings and supportive of the recommendations of the facility plan. New ordinances or amendments to existing ordinances, resolutions, and Inter-Governmental Agreements (IGA) may be necessary to ensure that the access management, the land use management, and the coordination elements of the facility plan are achieved. The approval process would include Planning Commission/City Council hearings with the City of Sandy and Planning Commission/County Commission hearings with Clackamas County.

If the preferred bypass alignment impacts County land designated for EFU or Forest use, the County would need to support adoption with goal exception findings.¹⁷ Following successful local adoption by the City and County, the facility plan could be presented to the OTC for its review and approval.

¹⁷ Note that the adoption action is an amendment to the TSP, the transportation element of the local Comprehensive Plan. The comprehensive plan amendment becomes acknowledged after the 21-day appeal period and no appeals have been filed (see https://www.oregonlaws.org/ors/197.625.)

SUMMARY

To support the reevaluation of the US 26 bypass project, a planning-level assessment of the potential benefits and costs of the bypass was conducted with measures of performance related to various measures. The key findings are summarized in Table 4. These findings will contribute to the content and analysis in subsequent memoranda including the Sandy Bypass Feasibility Reevaluation Report.

TABLE 4: COST AND BENEFIT SUMMARY OF BYPASS FACILITY

Measure	Cost/Impact	Benefit	Consideration		
Project Planning and Construction	\$980 million to \$1 billion for construction, right-of- way acquisition, easements, design and construction management		The cost estimate is for planning purposes only and could change significantly due to the high level of uncertainty regarding the construction year, NEPA process and final design and alignment.		
Future Volume and Travel Time		Bypass estimated to serve 1,500 vehicles per hour in 2040 peak hour. Bypass compared to 2040 No Build alternative peak hour: Estimated to save 9 minutes eastbound and 6.5 minutes westbound	Other roadway capacity projects are likely to be built by 2040 that would improve US 26 traffic flow and reduce the estimated time savings (5.5 minutes eastbound and 2.5 minutes westbound).		
Travel Time Value		\$6 million per year, \$75 million over 20 years	Cost saving estimate is highly variable depending on future traffic patterns and duration of congested conditions.		
Safety		Overall reduction in crashes on US 26 expected with lower volumes and fewer conflicts with pedestrians and cyclists downtown.			
Local Businesses	Diverts potential customers from highway-oriented businesses on US 26. Local gas tax revenue would likely be lower.	Reducing traffic volumes in the downtown area could increase walking and biking activity and make fronting businesses more attractive.	Current zoning and land use patterns encourage commercial development along the highway. A bypass outside the UGB would not allow for adjacent commercial development. If the bypass was inside the UGB, new adjacent commercial development may compete with businesses on US 26.		

Jurisdictional Transfer to City	City would be responsible for US 26 maintenance, estimated to cost \$2 to 3 million over next 20 years.	Potential reconstruction of US 26 with reduced vehicle lanes and multimodal improvements, estimated to cost \$20 to \$40 million	City would need to find new ongoing funding for maintenance. The cost for reconstruction is highly variable due to uncertainty regarding the final design and year of construction.
			Amendments to the Oregon
			Highway Plan require
Delieusend	Demonstration of compliance		adoption by the OTC and
Policy and	with numerous related policies,		ODOT.
Regulation	regulations and ordinances will		A robust NEPA planning
Requirements	need to be addressed to gain		process will be needed to
	project approval.		address potential impacts to
			Goal 5 resources and
			designated forest use lands.

APPENDIX

CONTENTS

SECTION 1. BYPASS CONCEPT DRAWINGS

SECTION 2. BYPASS COST ESTIMATES

SECTION 3. FUTURE TRANSPORTATION SYSTEM PERFORMANCE MEMO

SECTION 4. VALUE OF TRAVEL TIME SAVINGS ASSUMPTIONS AND CALCULATIONS

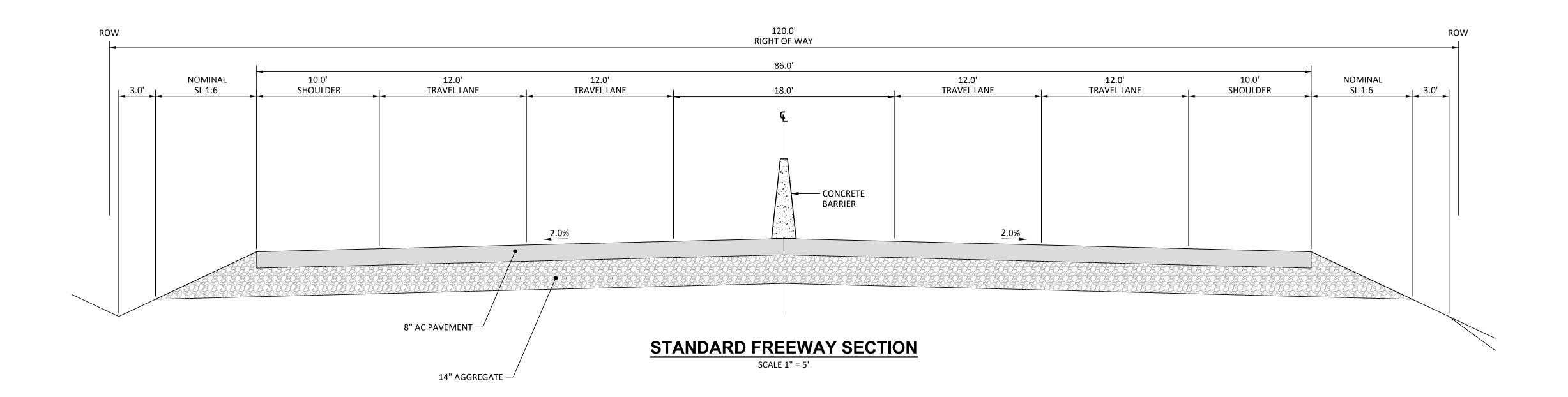
SECTION 5. POLICY AND REGULATORY CONSIDERATIONS MEMO

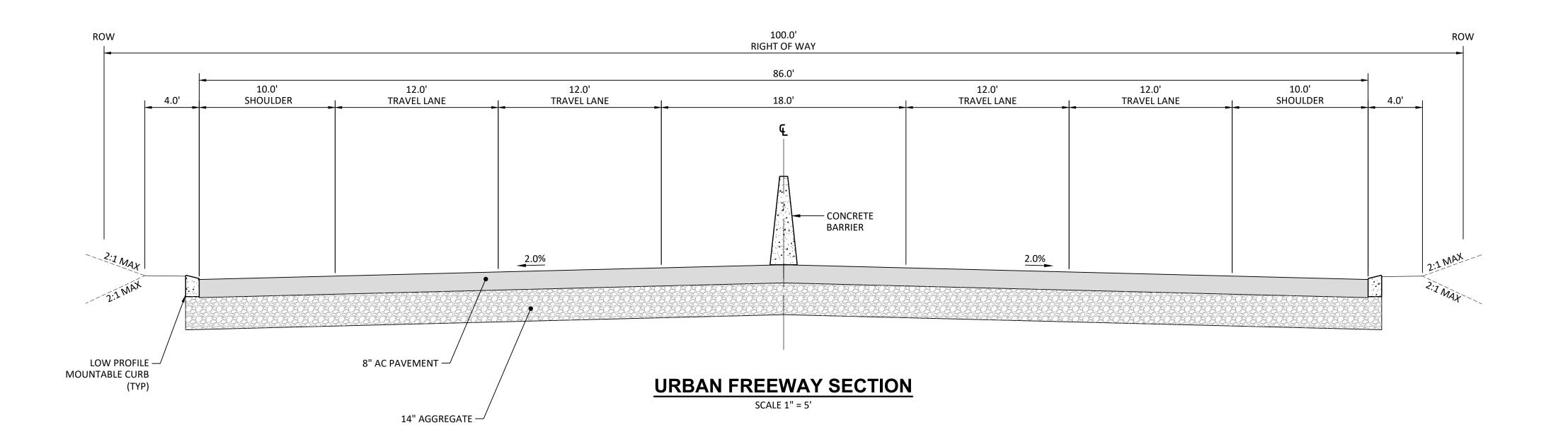


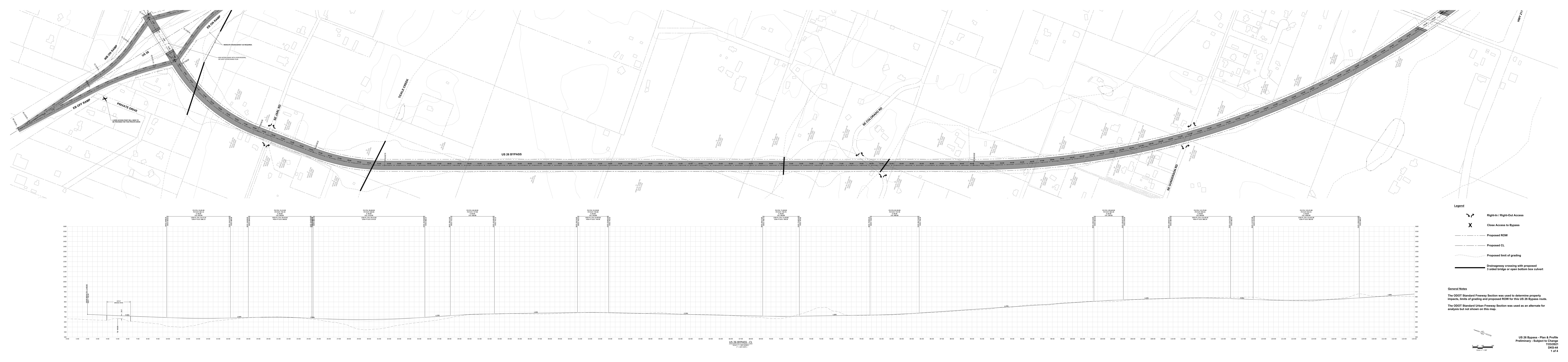
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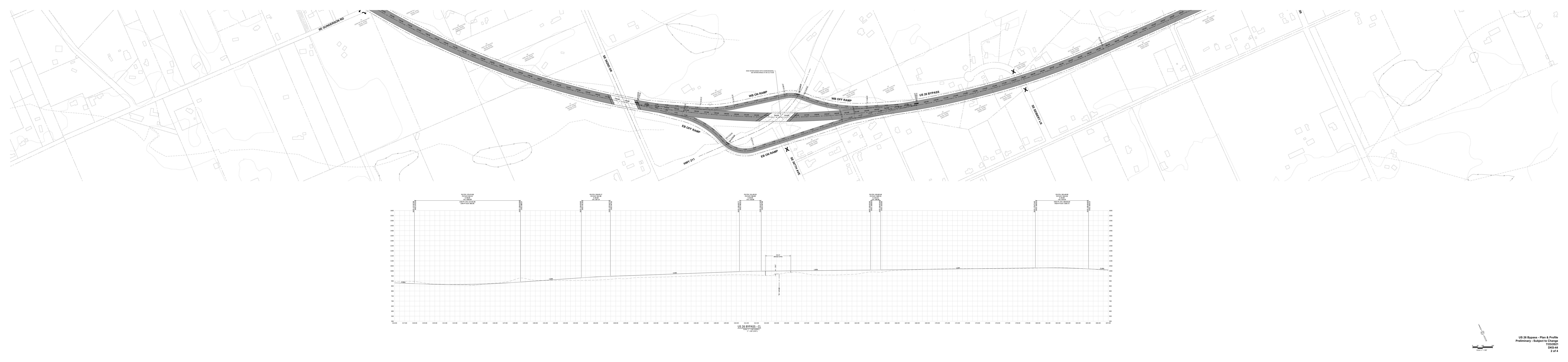
SECTION 1. BYPASS CONCEPT DRAWINGS

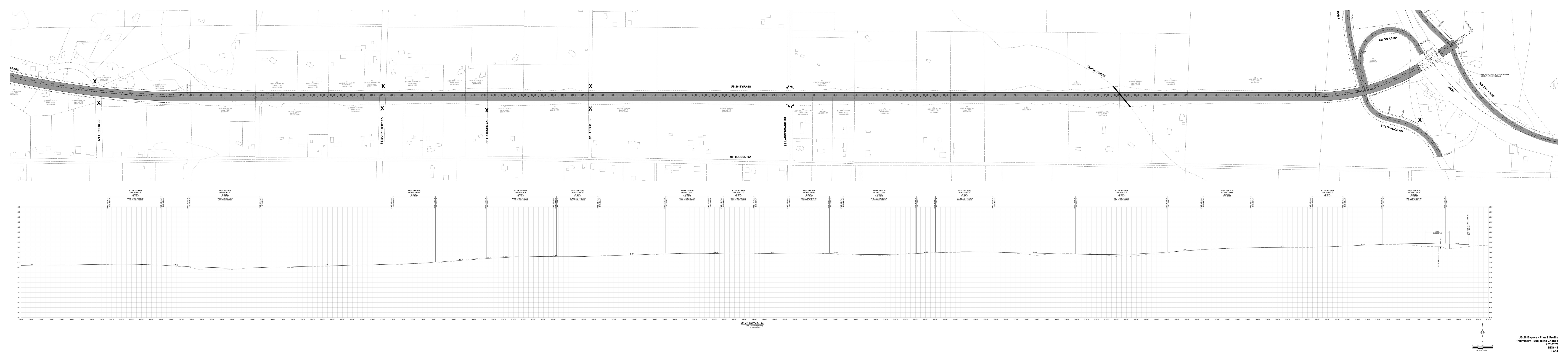


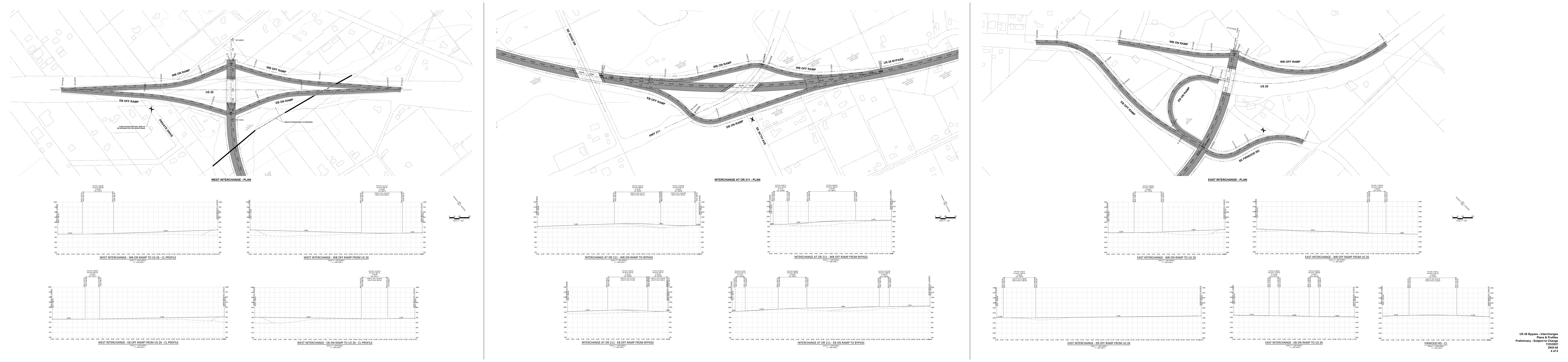












SECTION 2. BYPASS COST ESTIMATES

Conceptual 10% Design / Estimate - Summary with Freeway Section

Job No. DKS-44 Date: 7/23/2021

Major Street Segments

US 26 Bypass - Freeway Section

Interchange Ramps & SE Firwood Rd Realignment

Estimated Cost

\$ 224,600,000
\$ 72,700,000

Overcrossings

Overcrossing at West Interchange

Overcrossing at SE 362nd Dr

Overcrossing at OR211 Interchange

Overcrossing at East Interchange

Estimated Cost

\$ 16,700,000
\$ 17,100,000
\$ 17,800,000
\$ 17,300,000

Major Intersections/Structures

Private Drive / West Interchange EB Off Ramp

US 26 Bypass / SE Jarl Rd

US 26 Bypass / SE Colorado Rd

US 26 Bypass / SE Gunderson Rd

US 26 Bypass / SE 367th Ave

US 26 Bypass / SE Seibert Ln

US 26 Bypass / SE Bornstedt Rd

US 26 Bypass / SE Fritsche Ln

US 26 Bypass / SE Jacoby Rd

US 26 Bypass / SE Langensand Rd

Estimated Cost

 illiated Cost
\$ 2,000,000
\$ 1,200,000
\$ 1,200,000
\$ 1,200,000
\$ 500,000
\$ 1,000,000
\$ 1,000,000
\$ 500,000
\$ 1,000,000
\$ 1,200,000

Other

Sanitary Sewer

Waterline

Section Cost

\$ 5,400,000
\$ 5.700.000

Total Project Development Cost (10%)

\$ 388,100,000

ODOT Sandy Bypass Conceptual 10% Design / Estimate - Summary with Freeway Section

Job No. DKS-44 Date: 7/23/2021

Global Cost Assumptions Construction Cost Contingency Contractor LS Incidental	% %		30% 15%	(Mob, TPDT, EC, RSO, Staking, etc.)
Capital Project Mgmt. (design & const.) Design Engineering Design Survey Public Involvement Const. Engineering Support Inspection			10.0% 10.0% 1.5% 0.5% 6.0% 5.0%	
Roadwork				Assumptions
Bridge Structure Concrete Curb & Gutter Concrete Curb, Std. Type C Concrete Curb, Low Profile Mountable Concrete Barrier, Permanent Sidewalk Concrete Median (Paving) Asphalt Mixture Aggregate Base	SQFT FOOT FOOT FOOT SQFT SQFT TON CUYD	\$ \$ \$ \$ \$ \$ \$ \$	100.00 78.00	excludes curb
Geotextile Fabric	SQYD	\$	1.00	
Earthwork Topsoil Bark Mulch (3" depth)	CUYD CUYD CUYD	\$ \$ \$	30.00 45.00 90.00	
Groundcovers	SQFT	\$		At 12" OC spacing, approx. 1/SF
Street Trees	EACH	\$	650.00	
Root Barrier	FOOT	\$	10.00	
Irrigation	SQFT	\$	4.00	
Storm Main (24" dia) Storm Lateral (12" dia) Storm Manhole (48" dia) Storm Catch Basin Water Quality & Detention Drainageway Crossing, 3 Sided Box Culvert	FOOT FOOT EACH EACH SQFT FOOT	\$ \$ \$ \$	240.00 115.00 5,000.00 3,000.00 20.00 300.00	using 6% of imp. Area
		_		
Sanitary Main (24" dia) Sanitary Main (8" dia) Sanitary Manhole (60" dia) Sanitary Manhole (48" dia)	FOOT FOOT EACH EACH	\$ \$ \$ \$	350.00 150.00 15,000.00 9,000.00	no laterals - to be installed with development
Water Main (18" DI)	FOOT	\$	225.00	
Water Main (8" DI)	FOOT	\$	110.00	
Fire Hydrants (w/ lat & fittings)	EACH		10,000.00	
Purple Pipe (12" PVC)	FOOT	\$	100.00	
Streetlights (incl conduit)	EACH	\$	4,000.00	
Joint Trench	FOOT	\$	40.00	
Underground Power (conduit)	EACH	\$	15,000.00 10.00	
Underground Power (conduit)	FOOT	\$	10.00	
Right-of-Way Right-of-Way (SF)	SQFT	\$		Note: ROW costs are budgetary only and appr
Easement (SF)	SQFT	\$	2.00	Note: ROW costs are budgetary only and appr

ODOT Sandy Bypass Conceptual 10% Design / Estimate - Summary with Freeway Section Roadway Section Analysis Job No. DKS-44 Date: 7/23/2021

Major Intersection

Major Intersections											
Includes extra width for turn lanes, signal	ls, interconnect, RC	OW, ADA ramps, p	ped buttons, etc.								
		- /	- 1	1	1	1	1	1	/	/	
	/ _	/	/	/	/	1	/	/	/	/	
	Ramp	1	/	/	/	/	/	/	/	/	
	\ £	/	/	/	/	/	/	/	/	/	/
	/ 6	/	/	/	/	/	/	/	/	/ .	/
	/ #	/		2	1	/	/ -	/	/	/ &	
	/ g	1	do Rd	On Rd	/ "	/ -	B	5	/ 5	Pu	
	change	/ 5		J-SG	Ave	#Ln	ledt	gche [V Rd	angensar	
		Rd	Colors	Jg.	3678	<u></u>	\ \&	l sct	√(go _p)	/ 8	
	st Inte	Jau	/ රී	/ 3	/ % /	ø,	8	Frits	4		
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/	Drive	g /	bas /	bas /	ga /	bas /	bas /	Pag /	bas /		/
/	e D	ã /	β ₂	B/p	B/4	Byp.	By	8h	à /	Ð.	/
/	/aře	98	% /	% /	% /	% /	% /	98	% /	%	
Intersection	, P	8 /	8 /	8 /	8 /	8 /	8 /	8 /	S /	8 /	
Construction Cost											
LS Base Cost: \$	1,000,000 \$	600,000 \$	600,000 \$	600,000 \$	250,000 \$	500,000 \$	500,000 \$	250,000 \$	500,000 \$	600,000	\$300,000 Assumed \$300,000 right-in/right-out per side.
											\$250,000 Will a cul-de-sac be created at each road closure? Assume \$250,000 per CDS.
30% Const. Contingency: \$ Construction Subtotal: \$	300,000 \$ 1,300,000 \$	180,000 \$ 780,000 \$	180,000 \$ 780,000 \$	180,000 \$ 780,000 \$	75,000 \$ 325,000 \$	150,000 \$ 650,000 \$	150,000 \$ 650,000 \$	75,000 \$ 325,000 \$	150,000 \$ 650,000 \$	180,000 780,000	
15% Construction Incidentals: \$	195,000 \$	117,000 \$	117,000 \$	117,000 \$	48,750 \$	97,500 \$	97,500 \$	48,750 \$	97,500 \$	117,000	
Construction modernate. \$	100,000 \$	117,000 φ	111,000 ¢	111,000 \$	10,700 \$	07,000 ¢	07,000	10,700 \$	01,000 Q	117,000	
Total Construction Cost \$	1,495,000 \$	897,000 \$	897,000 \$	897,000 \$	373,750 \$	747,500 \$	747,500 \$	373,750 \$	747,500 \$	897,000	
Professional Services (Design &	& Construction))									
10% Cap. Proj Mgmt. (des & con) \$	149,500 \$	89,700 \$	89,700 \$	89,700 \$	37,375 \$	74,750 \$	74,750 \$	37,375 \$	74,750 \$	89,700	
10% Design Engineering \$	149,500 \$	89,700 \$	89,700 \$	89,700 \$	37,375 \$	74,750 \$	74,750 \$	37,375 \$	74,750 \$	89,700	
2% Design Survey \$	22,425 \$	13,455 \$	13,455 \$	13,455 \$	5,606 \$	11,213 \$	11,213 \$	5,606 \$	11,213 \$	13,455	
1% Public Involvement \$ 6% Const. Engineering Support \$	7,475 \$ 89,700 \$	4,485 \$ 53,820 \$	4,485 \$ 53,820 \$	4,485 \$ 53,820 \$	1,869 \$ 22,425 \$	3,738 \$ 44,850 \$	3,738 \$ 44,850 \$	1,869 \$ 22,425 \$	3,738 \$ 44,850 \$	4,485 53,820	
5% Inspection \$	74,750 \$	44,850 \$	44,850 \$	44,850 \$	18,688 \$	37,375 \$	37,375 \$	18,688 \$	37,375 \$	44,850	
Total Professional Services \$	493,350 \$	296,010 \$	296,010 \$	296,010 \$	123,338 \$	246,675 \$	246,675 \$	123,338 \$	246,675 \$	296,010	
· · · · · · · · · · · · · · · · · · ·	,500 ¥	,0.0 \$,0.0 \$,0.0	,,,,,,	,,,,,	,0.0 •	,,,,,,	,5.0 \$		
Right-of-Way											
Extra R/W at Intersections											Note: ROW costs are budgetary only and appraisals have not been completed or a value established.
Total R/W Services \$	- \$	- \$	- \$	- \$	- \$	- \$	- \$	- \$	- \$	-	
Total Intersection Cost \$	1,988,350 \$	4 400 040 -	1,193,010 \$	1,193,010 \$	497.088 \$	994,175 \$					
							994,175 \$	497,088 \$	994,175 \$	1,193,010	

Conceptual 10% Design / Estimate - Summary with Freeway Section Roadway Section Analysis

Job No. DKS-44 Date: 7/23/2021

Road Section: US 26 Bypass - Freeway Section

Typical Road Section					
Asphalt	8				
Ann Base	14				

Road	Section	Data	Fntry:

Segment	Begin STA	End STA	Length (ft) Road		Right of	Way	Public Utility Easements		
Geginent	DegilionA	LINGUIA	Length (it)	Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
freeway section	200	31500	30,323	86.0	2,607,778	120.0	3,638,760	16.0	485,168
			-		-		-		-
			-		-		-		
			-		-		-		-
			30,323		2,607,778		3,638,760		485,168

Roadway		

	Area (st)	Deptn (π)	volume (CY)	vvt (Ton)	U	nit Price	ıotai
Asphalt (Ton)	2,607,778	0.67	64,390	136,506	\$	100.00	\$ 13,650,591
Aggregate Base			138,512		\$	78.00	\$ 10,803,936
Earthwork						LS	\$ 41,066,200

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	SY	U	nit Price	Total
Concrete Median		30,323	-		\$	20.00	\$ -
Planted Median		30,323	-		\$	21.50	\$ -
Sidewalk		30,323	-		\$	7.00	\$ -
Landscape Strip		30,323	-		\$	21.50	\$ -
Geotextile Fabric	-	-	-	373,984	\$	1.00	\$ 373,984
W.Q. & Detention			156,467		\$	20.00	\$ 3,129,334

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Ut	nit Price	_	Total
Curb & Gutter	30,323		-	\$	28.00	\$	-
Concrete Curb, Std. Type C	30,323		-	\$	20.00	\$	-
Concrete Curb, Low Profile Mountable	30,323		-	\$	25.00	\$	-
Concrete Barrier, Permanent	29,380	1	29,380	\$	75.00	\$	2,203,500
Street Trees	30,323	2	60,646	\$	25.00	\$	1,516,150
Street Lights	30,323	2	60,646	\$	40.00	\$	2,425,840
Storm System	30,323	1	30,323	\$	344.45	\$	10,444,757
Joint Trench + PGE	30,323	1	30,323	\$	117.50	\$	3,562,953
Drainageway Crossing, 3 Sided Box Culvert			2,230	\$	300.00	\$	669,000

Contingency	30%	\$ 26,953,873

		Construction Subtotal. 3	110,000,110
O	450/	•	47 500 040

Total Construction Cost \$ 134,320,135

89,846,244

Combined Items Subtotal: \$

Professional Services (Design & Construction)

rolessional octvices (besign & construction)			
Capital Project Mgmt. (design & construction)	10.0%	\$	13,432,014
Design Engineering	10.0%	\$	13,432,014
Design Survey	1.5%	\$	2,014,802
Public Involvement	0.5%	\$	671,601
Const. Engineering Support	6.0%	\$	8,059,208
Inspection	5.0%	\$	6,716,007
		•	

Professional Services Total: \$ 44,325,645

Right-of-Way

	Area (st)	Reduce %	Area (st)	EA	Uni	t Price	l otal
Right-of-Way	3,638,760		3,638,760		\$	10.00	\$ 36,387,600
PUE's	485,168		485,168		\$	2.00	\$ 970,336
Permanent Slope Easement	839,279		839,279		\$	2.00	\$ 1,678,558
Building Removals	-		-	23	\$ 300	0,000.00	\$ 6,900,000

Right-of-Way Subtotal \$ 45,936,494

Total Project Cost: \$ 224,582,274

Conceptual 10% Design / Estimate - Summary with Freeway Section Roadway Section Analysis

Job No. DKS-44 Date: 7/23/2021

Road Section: Interchange Ramps & SE Firwood Rd Realignment

Typical Road Section						
Asphalt	8					

Road	Section	Data	Fntry:

Seament	Begin STA	End STA	Length (ft)	R	oad	Right of Way		Public U	tility Easements	
Geginent	Degili OTA	Lind 6171	LIIGUTA	Length (it)	Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
West Interchange Ramps			6,780		210,396		129,844		-	
Interchange at OR211			5,787		175,242		437,206		-	
East Interchange Ramps			5,995		189,664		602,315		-	
SE Firwood Rd			1,062		25,488		72,208		-	
			19,624		600,790		1,241,572		-	

Roadway Section Costs (Volume)

	Area (st)	Depth (ft)	Volume (CY)	Wt (Ion)	U	nit Price	lotal
Asphalt (Ton)	600,790	0.67	14,834	31,449	\$	100.00	\$ 3,144,876
Aggregate Base			38,588		\$	78.00	\$ 3,009,864
Earthwork						LS	\$ 11,305,770

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	SY	Uı	nit Price	Total
Concrete Median		19,624	-		\$	20.00	\$ -
Planted Median		19,624	-		\$	21.50	\$ -
Sidewalk		19,624	-		\$	7.00	\$ -
Landscape Strip		19,624	-		\$	21.50	\$ -
Geotextile Fabric	-	-	-	121,266	\$	1.00	\$ 121,266
W.Q. & Detention			36,047		\$	20.00	\$ 720,948

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	 Un	it Price	Total
Curb & Gutter	19,624		-	\$	28.00	\$ -
Concrete Curb, Std. Type C	19,624		-	\$	20.00	\$ -
Concrete Curb, Low Profile Mountable	19,624		-	\$	25.00	\$ -
Concrete Barrier, Permanent	19,624		-	\$	75.00	\$ -
Street Trees	19,624	2	39,248	\$	25.00	\$ 981,200
Street Lights	19,624	2	39,248	\$	40.00	\$ 1,569,920
Storm System	19,624	1	19,624	\$	295.00	\$ 5,789,080
Joint Trench + PGE	19,624	1	19,624	\$	117.50	\$ 2,305,820

Combined Items Subtotal:	\$ 28,948,744

Contingency	30%	\$	8,684,623
		Construction Subtotal: \$	37,633,367
Construction Incidentals	15%	¢	5.645.005

Total Construction Cost \$ 43,278,372

Professional Services (Design & Construction)

Capital Project Mgmt. (design & construction)	10.0%	\$ 4,327,837
Design Engineering	10.0%	\$ 4,327,837
Design Survey	1.5%	\$ 649,176
Public Involvement	0.5%	\$ 216,392
Const. Engineering Support	6.0%	\$ 2,596,702
Inspection	5.0%	\$ 2,163,919

Professional Services Total: \$ 14,281,863

Right-of-Way

	Area (st)	Reduce %	Area (st)	ŁΑ	Ur	nit Price	l otal
Right-of-Way	1,241,572		1,241,572		\$	10.00	\$ 12,415,724
PUE's	-		-		\$	2.00	\$ -
Building Removals	-		-	9	\$ 30	00.000.00	\$ 2.700.000

Right-of-Way Subtotal \$ 15,115,724

Total Project Cost: \$ 72,675,959

Conceptual 10% Design / Estimate - Summary with Freeway Section Roadway Section Analysis Job No. DKS-44

Date: 7/23/2021

Road Section: Overcrossing at West Interchange

Road Section Data Entry:

Segment	Begin STA	End STA	Length (ft)	R	oad	Right of	Way	Public U	tility Easements
degment	DegilionA	LINGUIA	Lild STA Leligtii (it)	Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
Overcrossing at West Interchange			237	86.0	20,382	120.0	28,440		-
									-
									-
									-
_			237		20,382		28,440		-

		201	20,002	
Roadway Section Costs (Area)				
Bridge Structure	Width (ft) Length (ft) 237	Area (sf) 20,382	SY	Total 8,152,800
Roadway Section Costs (Length)	Locath (6) No of Time	. T.A.II	Holf Drive	Total
Street Lights	Length (ft) No. of Times	Total Length 474	Unit Price \$ 40.00 \$	Total 18,960
Storm System	237 1	237	\$ 344.45 \$	81,635
			Combined Items Subtotal: \$	8,253,395
Contingency		30%	\$ Construction Subtotal:	
Construction Incidentals		15%	\$	1,609,412
		To	tal Construction Cost	12,338,825
Professional Services (Design & Co	nstruction)	To	tal Construction Cost	12,338,825
Capital Project Mgmt. (design & construction		10.0%	\$	1,233,883
				, ,
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement		10.0% 10.0% 1.5% 0.5%	\$ \$ \$ \$ \$	1,233,883 1,233,883 185,082 61,694
Capital Project Mgmt. (design & construction Design Engineering Design Survey		10.0% 10.0% 1.5%	\$ \$ \$	1,233,883 1,233,883 185,082
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support		10.0% 10.0% 1.5% 0.5% 6.0% 5.0%	\$ \$ \$ \$ \$	1,233,883 1,233,883 185,082 61,694 740,330 616,941
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support		10.0% 10.0% 1.5% 0.5% 6.0% 5.0%	\$ \$ \$ \$ \$ \$	1,233,883 1,233,883 185,082 61,694 740,330 616,941
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support Inspection Right-of-Way	Area (sf) Reduce %	10.0% 10.0% 1.5% 0.5% 6.0% 5.0% Profes	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,233,883 1,233,883 185,082 61,694 740,330 616,941 4,071,812
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support Inspection	n)	10.0% 10.0% 1.5% 0.5% 6.0% 5.0%	\$ \$ \$ \$ ssional Services Total: \$	1,233,883 1,233,883 185,082 61,694 740,330 616,941 4,071,812
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support Inspection Right-of-Way	Area (sf) Reduce %	10.0% 10.0% 1.5% 0.5% 6.0% 5.0% Profes	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,233,883 1,233,883 1,85,082 61,694 740,330 616,941 4,071,812 Total 284,400

Total Project Cost: \$ 16,695,037

ODOT Sandy Bypass Conceptual 10% Design / Estimate - Summary with Freeway Section Roadway Section Analysis Job No. DKS-44

Date: 7/23/2021

Road Section: Overcrossing at SE 362nd Dr

Road Section Data Entry:

Segment	Begin STA	End STA Length (ft	Length (ft)	R	oad	Right of	Way	Public U	tility Easements
Geginent	begin o 1A		Length (it)	Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
Overcrossing at SE 362nd Dr			243	86.0	20,898	120.0	29,160		-
									-
									-
			243		20,898		29,160		-

			243		20,090	J
Roadway Section Costs (Area)						
Bridge Structure	Width (ft) 86.00	Length (ft) 243	Area (sf) 20,898	SY	Unit Price \$ 400.00 \$	Total 8,359,200
Roadway Section Costs (Length)		N 67	-			-
Street Lights	Length (ft) 243		Total Length 486		Unit Price \$ 40.00 \$	Total 19,440
Storm System	243		243		\$ 344.45 \$	83.701
Glorin Gystein	240		240		ψ 044.40 ψ	00,701
				Combin	ed Items Subtotal: \$	8,462,341
Contingency			30%		\$	2,538,702
Contingency			0070	Con	struction Subtotal: \$	11,001,044
Construction Incidentals			15%		\$	1,650,157
			To	tal Cons	truction Cost \$	12,651,200
Professional Services (Design & Co	nstruction)		To	tal Cons	truction Cost \$	12,651,200
Professional Services (Design & Co Capital Project Mgmt. (design & construction			10.0%	tal Cons	\$	1,265,120
Capital Project Mgmt. (design & construction Design Engineering			10.0%	tal Cons	\$	1,265,120 1,265,120
Capital Project Mgmt. (design & construction Design Engineering Design Survey			10.0% 10.0% 1.5%	tal Cons	\$ \$ \$	1,265,120 1,265,120 189,768
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement			10.0% 10.0% 1.5% 0.5%	tal Cons	\$ \$ \$ \$	1,265,120 1,265,120 189,768 63,256
Capital Project Mgmt. (design & construction Design Engineering Design Survey			10.0% 10.0% 1.5%	tal Cons	\$ \$ \$	1,265,120 1,265,120 189,768
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support			10.0% 10.0% 1.5% 0.5% 6.0% 5.0%		\$ \$ \$ \$ \$	1,265,120 1,265,120 189,768 63,256 759,072
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support			10.0% 10.0% 1.5% 0.5% 6.0% 5.0%		\$ \$ \$ \$ \$ \$	1,265,120 1,265,120 189,768 63,256 759,072 632,560
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support Inspection	n)	Reduce %	10.0% 10.0% 1.5% 0.5% 6.0% 5.0%		\$ \$ \$ \$ \$ \$	1,265,120 1,265,120 189,768 63,256 759,072 632,560
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support Inspection			10.0% 10.0% 1.5% 0.5% 6.0% 5.0%	sional S	\$ \$ \$ \$ Services Total: \$	1,265,120 1,265,120 189,768 63,256 759,072 632,560 4,174,896

Total Project Cost: \$ 17,117,696

ODOT Sandy Bypass Conceptual 10% Design / Estimate - Summary with Freeway Section Roadway Section Analysis Job No. DKS-44

Date: 7/23/2021

Road Section: Overcrossing at OR211 Interchange

Road Section Data Entry:

Seament	Segment Begin STA		Length (ft)	Road		Right of Way		Public Utility Easements	
Segment	Degilion	End STA	Length (It)	Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
Overcrossing at OR211 Interchange			252	86.0	21,672	120.0	30,240		-
									-
									-
									-
			252		21,672		30,240		-

			252		21,672	L
Roadway Section Costs (Area)						
Bridge Structure	Width (ft) 86.00	Length (ft) 252	Area (sf) 21,672	SY	Unit Price \$ 400.00 \$	Total 8,668,800
Roadway Section Costs (Length)						
Street Lights	Length (ft) 252	No. of Times 2	Total Length 504		Unit Price \$ 40.00 \$	Total 20,160
Storm System	252	1	252		\$ 344.45 \$	86,801
				Combined	d Items Subtotal: \$	8,775,761
Contingency		j	30%		\$	2,632,728
				Const	ruction Subtotal: \$	11,408,490
Construction Incidentals			15%		\$	1,711,273
			Tot	al Constr	ruction Cost \$	13,119,763
Professional Services (Design & Cor	nstruction)		Tot	al Constr	ruction Cost \$	13,119,763
Capital Project Mgmt. (design & construction			10.0%	al Constr	\$	1,311,976
Capital Project Mgmt. (design & construction Design Engineering			10.0% 10.0%	al Constr	\$	1,311,976 1,311,976
Capital Project Mgmt. (design & construction			10.0% 10.0% 1.5%	al Constr	\$ \$ \$	1,311,976 1,311,976 196,796
Capital Project Mgmt. (design & construction Design Engineering Design Survey			10.0% 10.0%	al Constr	\$ \$ \$ \$	1,311,976 1,311,976
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement			10.0% 10.0% 1.5% 0.5%	al Constr	\$ \$ \$	1,311,976 1,311,976 196,796 65,599
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support			10.0% 10.0% 1.5% 0.5% 6.0% 5.0%		\$ \$ \$ \$ \$	1,311,976 1,311,976 196,796 65,599 787,186
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support	,		10.0% 10.0% 1.5% 0.5% 6.0% 5.0%	sional Se	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,311,976 1,311,976 196,796 65,599 787,186 655,988 4,329,522
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support Inspection	Area (sf)	Reduce %	10.0% 10.0% 1.5% 0.5% 6.0% 5.0% Profes		\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,311,976 1,311,976 196,796 65,599 787,186 655,988 4,329,522
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support Inspection	,	Reduce %	10.0% 10.0% 1.5% 0.5% 6.0% 5.0%	sional Se	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,311,976 1,311,976 196,796 65,599 787,186 655,988 4,329,522

Total Project Cost: \$ 17,751,685

ODOT Sandy Bypass Conceptual 10% Design / Estimate - Summary with Freeway Section Roadway Section Analysis Job No. DKS-44

Date: 7/23/2021

Road Section: Overcrossing at East Interchange

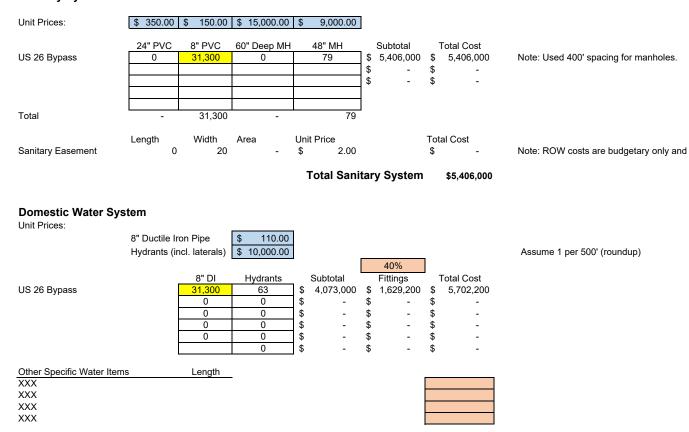
Road Section Data Entry:

Seament	Segment Begin STA	egin STA End STA	Length (ft)	Road		Right of Way		Public Utility Easements	
Segment	Degilion			Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
Overcrossing at East Interchange			245	86.0	21,070	120.0	29,400		-
									-
									-
									-
			245		21,070		29,400		-

			245		21,070	
Roadway Section Costs (Area)						
Bridge Structure	Width (ft) 86.00	Length (ft) 245	Area (sf) 21,070	SY	Unit Price \$ 400.00 \$	Total 8,428,000
Roadway Section Costs (Length)	141- (6)	No. of Theore	T-4-11 4b		Heit Deise	Total
Street Lights	Length (ft) 245	2	Total Length 490		Unit Price \$ 40.00 \$	Total 19,600
Storm System	245	1	245		\$ 344.45 \$	84,390
				Combin	ed Items Subtotal: \$	8,531,990
Contingency			30%	Con	\$ struction Subtotal:	2,559,597 11,091,587
Construction Incidentals			15%		\$	1,663,738
			To	tal Cons	truction Cost \$	12,755,325
Professional Services (Design & Co	nstruction)		To	tal Cons	truction Cost \$	12,755,325
Capital Project Mgmt. (design & construction			10.0%	tal Cons	\$	1,275,533
Capital Project Mgmt. (design & construction Design Engineering Design Survey			10.0% 10.0% 1.5%	tal Cons	\$ \$ \$	1,275,533 1,275,533 191,330
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement			10.0% 10.0% 1.5% 0.5%	tal Cons	\$ \$ \$ \$	1,275,533 1,275,533 191,330 63,777
Capital Project Mgmt. (design & construction Design Engineering Design Survey			10.0% 10.0% 1.5%	tal Cons	\$ \$ \$	1,275,533 1,275,533 191,330
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support			10.0% 10.0% 1.5% 0.5% 6.0% 5.0%		\$ \$ \$ \$ \$	1,275,533 1,275,533 191,330 63,777 765,320 637,766
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support			10.0% 10.0% 1.5% 0.5% 6.0% 5.0%		\$ \$ \$ \$ \$ \$	1,275,533 1,275,533 191,330 63,777 765,320 637,766
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support Inspection	Area (sf)	Reduce %	10.0% 10.0% 1.5% 0.5% 6.0% 5.0% Profes		\$ \$ \$ \$ Services Total: \$	1,275,533 1,275,533 191,330 63,777 765,320 637,766 4,209,257
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support Inspection	, ,	Reduce %	10.0% 10.0% 1.5% 0.5% 6.0% 5.0%	sional S	\$ \$ \$ \$ Services Total: \$	1,275,533 1,275,533 191,330 63,777 765,320 637,766 4,209,257
Capital Project Mgmt. (design & construction Design Engineering Design Survey Public Involvement Const. Engineering Support Inspection	Area (sf)	Reduce %	10.0% 10.0% 1.5% 0.5% 6.0% 5.0% Profes	s sional S EA	\$ \$ \$ \$ Services Total: \$	1,275,533 1,275,533 191,330 63,777 765,320 637,766 4,209,257

Total Project Cost: \$ 17,258,583

Sanitary System



Total Domestic Water System

\$5,702,200

ODOT Sandy Bypass

Conceptual 10% Design / Estimate - Summary with Urban Freeway Section

Job No. DKS-44 Date: 7/23/2021

Major Street Segments

US 26 Bypass - Urban Freeway Section Interchange Ramps & SE Firwood Rd Realignment

Estimated Cost

\$	205,900,000
\$	72,700,000

Overcrossings

Overcrossing at West Interchange
Overcrossing at SE 362nd Dr
Overcrossing at OR211 Interchange
Overcrossing at East Interchange

Estimated Cost

\$ 16,700,000
\$ 17,100,000
\$ 17,800,000
\$ 17,300,000

Major Intersections/Structures

Private Drive / West Interchange EB Off Ramp
US 26 Bypass / SE Jarl Rd
US 26 Bypass / SE Colorado Rd
US 26 Bypass / SE Gunderson Rd
US 26 Bypass / SE 367th Ave
US 26 Bypass / SE Seibert Ln
US 26 Bypass / SE Bornstedt Rd
US 26 Bypass / SE Fritsche Ln
US 26 Bypass / SE Jacoby Rd
US 26 Bypass / SE Langensand Rd

Estimated Cost

ESU	mated Cost
\$	2,000,000
\$	1,200,000
\$	1,200,000
\$	1,200,000
\$	500,000
\$	1,000,000
\$	1,000,000
\$	500,000
\$	1,000,000
\$	1,200,000

Other

Sanitary Sewer Waterline

Section Cost

\$ 5,400,000
\$ 5,700,000

Total Project Development Cost (10%)

\$ 369,400,000

ODOT Sandy Bypass

Conceptual 10% Design / Estimate - Summary with Urban Freeway Section

Job No. DKS-44 Date: 7/23/2021

Global Cost Assumptions				
Construction Cost Contingency	%		30%	
Contractor LS Incidental	%		15%	(Mob, TPDT, EC, RSO, Staking, etc.)
Capital Project Mgmt. (design & const.)			10.0%	1
Design Engineering			10.0%	
Design Survey			1.5%	•
Public Involvement			0.5%	
Const. Engineering Support			6.0%	
Inspection			5.0%	
				-
Roadwork	0057	•	000.00	Assumptions
Bridge Structure	SQFT	\$	300.00	
Concrete Curb & Gutter Concrete Curb, Std. Type C	FOOT FOOT	\$ \$	28.00 20.00	
Concrete Curb, Std. Type C Concrete Curb, Low Profile Mountable	FOOT	\$	25.00	
Concrete Barrier, Permanent	FOOT	\$	75.00	
Sidewalk	SQFT	\$	7.00	
Concrete Median (Paving)	SQFT	\$		excludes curb
Asphalt Mixture	TON	\$	100.00	onorados cars
Aggregate Base	CUYD	\$	78.00	
Geotextile Fabric	SQYD	\$	1.00	
Earthwork	CUYD	\$	30.00	
Topsoil	CUYD	\$	45.00	
Bark Mulch (3" depth)	CUYD	\$	90.00	
Groundcovers	SQFT	\$		At 12" OC spacing, approx. 1/SF
Street Trees	EACH	\$	650.00	
Root Barrier	FOOT	\$	10.00	
Irrigation	SQFT	\$	4.00	
Storm Main (24" dia)	FOOT	\$	240.00	
Storm Lateral (12" dia)	FOOT	\$	115.00	
Storm Manhole (48" dia)	EACH	\$	5,000.00	
Storm Catch Basin	EACH	\$	3,000.00	
Water Quality & Detention	SQFT	\$	20.00	using 6% of imp. Area
Sanitary Main (24" dia)	FOOT	\$	350.00	
Sanitary Main (8" dia)	FOOT	\$		no laterals - to be installed with development
Sanitary Manhole (60" dia)	EACH	\$	15,000.00	
Sanitary Manhole (48" dia)	EACH	\$	9,000.00	
Water Main (18" DI)	FOOT	\$	225.00	
Water Main (8" DI)	FOOT	\$	110.00	
Fire Hydrants (w/ lat & fittings)	EACH	\$	10,000.00	
Purple Pipe (12" PVC)	FOOT	\$	100.00	
Streetlights (incl conduit)	EACH	\$	4,000.00	
Joint Trench	FOOT	\$	40.00	
Underground Power (vaults)	EACH	\$	15,000.00	
Underground Power (vaults)	FOOT	\$	10.00	
chasigisana i evoi (condan)	. 55.	Ψ	10.00	
Right-of-Way	COLT	•	40.00	Notes DOW soots are builting and builting
Right-of-Way (SF)	SQFT	\$		Note: ROW costs are budgetary only and appr
Easement (SF)	SQFT	\$	2.00	Note: ROW costs are budgetary only and appr

ODOT Sandy Bypass

Conceptual 10% Design / Estimate - Summary with Urban Freeway Section Roadway Section Analysis

Job No. DKS-44 Date: 7/23/2021

Road Section: US 26 Bypass - Urban Freeway Section

Typical Road Section				
Asphalt	8			
Ann Base	14			

Road	Section	Data	Entry:

Segment	Segment Begin STA End STA L		Regin STA Fnd STA		Length (ft)	R	oad	Right of	Way	Public Utility Easements		
Segment	DegilionA	LINGUTA	Longin (it)	Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)			
urban freeway section	200	31500	30,323	86.0	2,607,778	100.0	3,032,300	16.0	485,168			
			-				-					
			-		-		-		-			
			-		-		1		-			
	30,323		2,607,778		3,032,300		485,168					

Roadway Section Costs (Volume)

	Area (st)	Depth (ft)	Volume (CY)	VVt (Ton)	U	nit Price	lotal
Asphalt (Ton)	2,607,778	0.67	64,390	136,506	\$	100.00	\$ 13,650,591
Aggregate Base			113,992		\$	78.00	\$ 8,891,376
Earthwork						LS	\$ 35,681,770

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (st)	SY	U	nit Price	l otal
Concrete Median		30,323	-		\$	20.00	\$ -
Planted Median		30,323	-		\$	21.50	\$ -
Sidewalk		30,323	-		\$	7.00	\$ -
Landscape Strip		30,323	-		\$	21.50	\$ -
Geotextile Fabric	-	-	-	347,633	\$	1.00	\$ 347,633
W.Q. & Detention			156,467		\$	20.00	\$ 3,129,334

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Ur	nit Price	Total
Curb & Gutter	30,323		-	\$	28.00	\$ -
Concrete Curb, Std. Type C	30,323		-	\$	20.00	\$ -
Concrete Curb, Low Profile Mountable	30,323	2	60,646	\$	25.00	\$ 1,516,150
Concrete Barrier, Permanent	29,380	1	29,380	\$	75.00	\$ 2,203,500
Street Trees	30,323	2	60,646	\$	25.00	\$ 1,516,150
Street Lights	30,323	2	60,646	\$	40.00	\$ 2,425,840
Storm System	30,323	1	30,323	\$	344.45	\$ 10,444,757
Joint Trench + PGE	30,323	1	30,323	\$	117.50	\$ 3,562,953
Drainageway Crossing, 3 Sided Box Culvert			2,180	\$	300.00	\$ 654,000

Contingency	30%	\$	25,207,216
		Construction Subtotal: \$	109,231,270

Construction Incidentals	15%	\$ 16.384.690

Total Construction Cost \$ 125,615,960

84,024,053

Combined Items Subtotal: \$

Professional Services (Design & Construction)

Professional Services (Design & Construction)		
Capital Project Mgmt. (design & construction)	10.0%	\$ 12,561,596
Design Engineering	10.0%	\$ 12,561,596
Design Survey	1.5%	\$ 1,884,239
Public Involvement	0.5%	\$ 628,080
Const. Engineering Support	6.0%	\$ 7,536,958
Inspection	5.0%	\$ 6,280,798

Professional Services Total: \$ 41,453,267

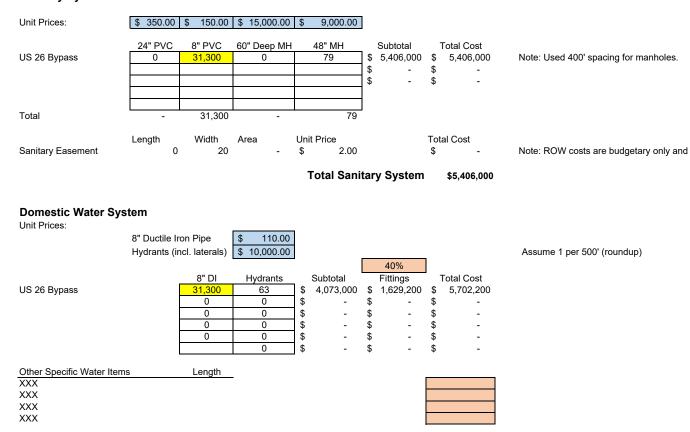
Right-of-Way

	Area (sf)	Reduce %	Area (sf)	EA	Unit Price		Total
Right-of-Way	3,032,300		3,032,300		\$	10.00	\$ 30,323,000
PUE's	485,168		485,168		\$	2.00	\$ 970,336
Permanent Slope Easements	746,353		746,353		\$	2.00	\$ 1,492,706
Building Removals	-		-	20	\$ 30	00.000,0	\$ 6,000,000

Right-of-Way Subtotal \$ 38,786,042

Total Project Cost: \$205,855,269

Sanitary System



Total Domestic Water System

\$5,702,200

SECTION 3. FUTURE TRANSPORTATION SYSTEM PERFORMANCE MEMO

FUTURE TRANSPORTATION SYSTEM PERFORMANCE

DATE: June 28, 2021

TO: Project Management Team

FROM: Reah Flisakowski, Dock Rosenthal | DKS Associates

SUBJECT: Sandy Bypass Feasibility Reevaluation P# 20020-007

This memorandum summarizes the future transportation system performance along US 26 through the City of Sandy, Oregon. This assessment generally includes the US 26 segment between the intersections with SE Orient Drive and Firwood Drive at Shorty's Corner. Analyzing the future transportation system performance documents, the expected year 2040 vehicle travel conditions through the City and provides an evaluation of a potential alternative route to US 26 as identified in the 2011 City of Sandy Transportation System Plan. A documentation of future pedestrian, bicycle and transit conditions will be provided as part of the on-going update of the City's Transportation System Plan (TSP).

MOTOR VEHICLE CONDITIONS

Future year 2040 operating conditions for vehicles were assessed using data and findings developed for the existing conditions analysis¹ and available growth pattern data for the study area and US 26. The following sections summarize this analysis.

MOTOR VEHICLE ALTERNATIVES

Future improvement alternatives were previously developed and evaluated as part of the 2011 Sandy TSP² to enhance connectivity, provide access to developing lands, and address congestion in the US 26 corridor. The objective for each improvement alternative ranged from relying mainly on management and enhancement of the existing transportation system to large investments in new facilities to increase corridor capacity.

Three of the prior TSP alternatives were carried forward and incorporated into this Sandy Bypass Feasibility Reevaluation, as described in the following sections. Note the prior TSP Alternative #2 – US 26 Widening was not included in this analysis.

¹ Existing Transportation System Performance memo, DKS Associates, April 19, 2021.

² Sandy TSP Update, Technical Memo #2: Transportation Alternatives and Improvement Strategies, DKS Associates, February 25, 2011.

2040 NO BUILD ALTERNATIVE

A No Build Alternative would typically be based on the existing system and not include future improvements. However, there are several roadway projects that are fully funded and/or currently in the design phase. It was determined these projects should be included in the No Build Alternative due to the high level of certainty that they will be part of the future system. These projects are listed below. A figure showing the project locations by project ID is provided in the appendix.

- Dubarko Road connection to Champion Way (#2)
- Extend Bell Street to 362nd Avenue (portion of #3)
- Extend 362nd Avenue to Bell Street (portion of #4)
- Extend Dubarko Road to US 26 opposite Vista Loop Drive West (#9)
- Signalized control at the intersection of OR 211 and Dubarko Road and US 26 and Vista Loop Drive (west)/Dubarko extension

2040 ALTERNATIVE #1 - LOCAL SYSTEM ENHANCEMENTS AND MINOR HIGHWAY IMPROVEMENTS

The emphasis of this alternative was to improve overall street connectivity, provide access to lands that would develop in the future, and improve operations on US 26 by enhancing the supporting City street network so that local trips would have less need to travel on US 26.

The future improvement projects included in the 2040 Alternative #1 are listed below. They include roadway and intersection capacity projects. A figure showing the project locations by project ID is provided in the appendix.

Roadway Improvements

- Industrial Way extension to Jarl Road/ US 26 (#1)
- Dubarko Road connection to Champion Way (#2)
- Extend Bell Street to Orient Drive (#3)
- Extend 362nd Drive to Kelso Road (#4)
- Extend Kate Schmidt Street from US 26 to the proposed Bell Street extension (#5)
- Extend Industrial Way north of US 26 to Bell Street Extension (#6)
- Extend Olson Road from 362nd Drive to Jewelberry Avenue (#7)
- Extend Agnes Street to Jewelberry Avenue (#8)
- Extend Dubarko Road to US 26 opposite Vista Loop Drive West (#9)
- Gunderson Road, Sandy Heights St./370th Avenue, Colorado Road, Arletha Court (#10)
- Construct a new road from Dubarko Road to US 26 opposite Vista Loop Drive East (#11)

Intersection Improvements

- US 26/ 362nd Drive Construct a second westbound left turn lane, receiving lane for second westbound left turn lane, northbound through lane, new southbound leg with through, right turn and left turn lane
- US 26/ Industrial Way Change southbound approach to dual left turn lanes and a shared through/right lane, construct a northbound left turn lane
- US 26/Ruben Lane Change southbound approach to dual left turn lanes and a shared through/right lane, change northbound approach to left turn lane, and shared through/right lane
- OR 211/ Proctor Boulevard (US 26) Construct a northbound left turn lane (restriping only)
- US 26/ Ten Eyck Road/Wolf Drive Construct a northbound and southbound left turn lane
- US 26/ Vista Loop Drive West Realign Vista Loop Drive to be perpendicular to US 26
- OR 211/ Dubarko Road Construct a traffic signal, northbound right turn lane, southbound left turn lane, northbound left turn lane
- OR 211/ Bornstedt Road Prohibit left turn movements out
- OR 211/ Arletha Court Realign intersection to create a four-legged intersection with the Gunderson Road extension
- 362nd Drive/ Industrial Way (West) Construct an eastbound left turn lane with 50 feet of storage
- 362nd Drive/ Dubarko Road Construct a single-lane roundabout

2040 ALTERNATIVE #3 - LOCAL SYSTEM ENHANCEMENTS AND US 26 BYPASS

Alternative #3 included all the same projects as Alternative #1 but added a bypass of the existing US 26 corridor around the south side of the City from a point west of Orient Drive to approximately Shorty's Corner. A figure showing the high-level conceptual alignment of the bypass (#13) is provided in the appendix.

For the purpose of this analysis, the bypass concept was assumed to have the following design characteristics:

- Four-lane facility (two lanes in each direction)
- 45 mph posted speed and 50 mph design speed
- Limited access facility
 - o interchange at the east and west end connections with US 26
 - o at-grade intersection at OR 211 controlled by a traffic signal or roundabout
 - $\circ \quad \text{remaining key street intersections limited to right-in/right-out} \\$

The bypass conceptual alignment and design characteristics will be further refined during the next phase of the analysis, the Bypass Benefit Cost Analysis.

FUTURE FORECASTING

Traffic forecasts for each of the future 2040 alternatives were developed using a combination of available data and prior modeling analysis and findings. The forecasts relied on recent year 2020 intersection counts³, year 2029 analysis from the 2011 Sandy TSP and ODOT Volume Tables. The forecasts were developed for the TSP study intersections and focused on the peak hour. Future volumes can be found in the operation reports in the appendix.

Future 2040 No Build Alternative forecasts were based on the 2020 count data and growth rates available from the 2029 forecasts. The addition of the Alternative #1 improvements would result in moderate changes to local travel patterns with better connectivity and intersection capacity. The 2040 No Build Alternative forecasts were refined to represent the 2040 Alternative #1 using growth rates available from the 2029 forecasts.

The addition of the bypass would result in significant changes to regional travel patterns. Future 2040 Alternative #3 forecasts were developed using the Alternative #1 volumes, growth rates available from the 2029 forecasts and current travel pattern data.

A travel pattern analysis was completed using StreetLight data which provided information on where vehicle trips are coming from through the City, how much delay these trips experience and how long it takes them to make their trip. The data showed the proposed bypass would attract up to 28% of the total US 26 traffic during the peak hour. For a conservative analysis and for alignment with the 2011 Sandy TSP findings, the forecasting assumed 40% of the total US 26 traffic would divert to the bypass.

The 2040 Alternative #1 volumes were adjusted to account for use of the US 26 bypass to develop 2040 Alternative #3 volumes. US 26 is forecasted to serve approximately 3,800 vehicles during the peak hour under the 2040 No Build Alternative. Under the 2040 Alternative #3, US 26 is forecasted to serve approximately 2,300 vehicles and the bypass is forecasted to serve approximately 1,500 vehicles during the peak hour.

JURISDICTIONAL MOBILITY STANDARDS

The mobility standards for intersections vary according to the agency of jurisdiction for each intersection. Five of the study intersections are under City jurisdiction (362nd Drive/Industrial Way – North and South, Bluff Road/Bell Street, OR 211/Bornstedt, and OR 211/Dubarko) while the remaining 11 intersections are under ODOT jurisdiction. Current ODOT mobility targets require a volume to capacity ratio between 0.80 and 0.90 or less to be maintained at study intersections (see Table 2) and the City of Sandy operating standards require that a level of service "D" or better

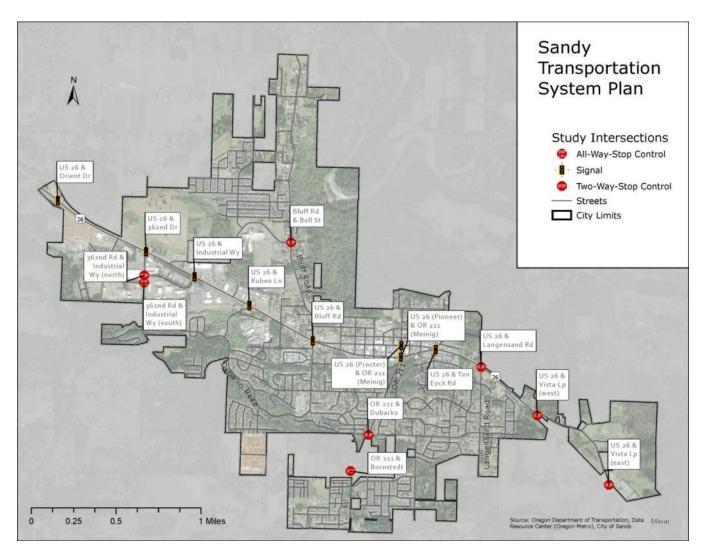
³ Traffic counts were collected on October 22, 2020.

be maintained for any signalized intersection and unsignalized intersections with stop control on the minor approach⁴.

FUTURE INTERSECTION OPERATIONS

Motor vehicle conditions were evaluated for the 2040 peak hour at the 16 study intersections under each of the future improvement alternatives. The evaluation utilized the Highway Capacity Manual (HCM) 6^{th} Edition methodology. The detailed intersection operation reports are shown in the appendix.

FIGURE 1: STUDY INTERSECTIONS WITH EXISTING CONTROL



⁴ City of Sandy Transportation System Plan, DKS Associates, 2011.

2040 No Build

As shown in Table 1, eight intersections are forecasted to exceed mobility targets.

- **US 26 and Orient Drive** The eastbound through movement at this intersection requires more capacity but is limited by the split phasing for Orient Drive/Jarl Road which serves a high southbound left turn volume with only a single approach lane.
- **US 26 and 362nd Drive** More capacity is needed for the eastbound and westbound left and through movements at this intersection but green time for those movements is limited by the split phasing of the northbound and southbound approaches.
- **US 26 and Industrial Way** The eastbound through movement and northbound approach are both over capacity at this intersection. The split phasing of the northbound and southbound approaches also limits the green time available to the US 26 movements.
- **362**nd **Drive and Industrial Way (north)** High northbound and southbound volumes result in limited gaps for the Industrial Way approach at this two-way-stop-controlled intersection.
- **362**nd **Drive and Industrial Way (south)** High traffic volumes at all approaches result in long delays for all movements at this all-way-stop-controlled intersection.
- **US 26 and Ruben Lane** The eastbound through movement and southbound approach are both over capacity at this intersection. The split phasing of the northbound and southbound approaches also limits the green time available to the US 26 movements.
- **US 26 and Bluff Road** The eastbound left and through, westbound left and through, and northbound left movements are all over capacity at this intersection.
- **OR 211 and Bornstedt Road** High eastbound and westbound volumes result in limited gaps for the Bornstedt Road approach at this two-way-stop-controlled intersection.

TABLE 1: 2040 NO BUILD INTERSECTION OPERATIONS (PEAK HOUR)

STUDY INTERSECTION	CONTROL TYPE	JURISDICTION	MOBILITY TARGET	LEVEL OF SERVICE	DELAY (SECONDS)	V/C RATIO
US 26/ORIENT DRIVE	Signal	ODOT	0.80	F	134	1.19
US 26/362 ND DRIVE	Signal	ODOT	0.80	F	121	1.16
US 26/INDUSTRIAL WAY	Signala	ODOT	0.80	Е	74	1.10
362 ND DRIVE/ INDUSTRIAL WAY (NORTH)	TWSC⁵	City of Sandy	D	В [F]	11 [117]	0.49 [0.94]
362 ND DRIVE/ INDUSTRIAL WAY (SOUTH)	AWSC	City of Sandy	D	F	214	1.43
US 26/RUBEN LANE	Signala	ODOT	0.80	С	35	0.97
US 26/BLUFF ROAD	Signal	ODOT	0.85	F	112	1.12
BLUFF ROAD/BELL STREET	TWSC	City of Sandy	D	A [C]	9 [23]	0.29 [0.09]
PIONEER BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	30	0.81
PROCTOR BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	32	0.84
OR 211/ DUBARKO ROAD	Signal	City of Sandy	D	С	21	0.81
OR 211/BORNSTEDT ROAD	TWSC	City of Sandy	D	A [F]	10 [240]	0.35 [1.32]
US 26/TEN EYCK ROAD	Signal	ODOT	0.85	С	29	0.80
US 26/LANGENSAND ROAD	TWSC	ODOT	0.80	C [F]	16 [>300]	0.48 [0.91]
US 26/VISTA LOOP DRIVE W	Signal	ODOT	0.80	С	25	0.66
US 26/VISTA LOOP DRIVE E	TWSC	ODOT	0.80	B [F]	12 [117]	0.48 [0.25]

a. This signal reported using HCM 2000 due to non-standard characteristics.

b. Two-way Stop Controlled (TWSC) measures are reported as worst major [worst minor] approach for LOS and Delay and as worst movement for V/C.

2040 Alternative #1

The improvements included in Alternative 1 were analyzed to assess operation benefits at the study intersections resulting from new system network and added capacity. Two intersections that did not meet mobility targets will do so with the improvements in Alternative #1.

- The intersection of US 26 and Industrial Way meets mobility targets with a reduction in demand at the eastbound, westbound and northbound approaches.
- The intersection of OR 211 and Bornstedt Road meets mobility targets with the prohibition of the northbound left turn movement.

Operations under Alternative #1 conditions are show in Table 2. With the new local network connections north of US 26, particularly the Bell Street extension to Orient Drive, through volumes along US 26 are reduced in Alternative #1 which results in improvements to the operation of intersections along the highway.

Six intersections still fail to meet mobility targets under Alternative #1.

- **US 26 and Orient Drive** There is a higher eastbound left traffic volume and lower eastbound through volume relative to the No Build condition however this reduction does not improve conditions enough for this intersection to meet mobility targets.
- **US 26 and 362nd Drive** Lower traffic volumes for the eastbound and westbound approaches improve conditions at this intersection but it still fails to meet mobility targets.
- **362nd Drive and Industrial Way (north)** With an additional southbound through lane that widens this intersection and increased traffic volumes, conditions remain LOS F for the Industrial Way approach.
- **362nd Drive and Industrial Way (south)** The eastbound left turn lane improves conditions for that approach, but higher northbound and southbound volumes degrade conditions for the major approaches.
- **US 26 and Ruben Lane** Lower traffic volumes for the eastbound and westbound approaches improve conditions at this intersection but it still fails to meet mobility targets.
- **US 26 and Bluff Road** Lower traffic volumes for the eastbound left and through and westbound through movements improve conditions at this intersection but it still fails to meet mobility targets.

TABLE 2: 2040 ALTERNATIVE #1 INTERSECTION OPERATIONS (PEAK HOUR)

STUDY INTERSECTION	CONTROL TYPE	JURISDICTION	MOBILITY TARGET	LEVEL OF SERVICE	DELAY (SECONDS)	V/C RATIO
US 26/ORIENT DRIVE	Signal	ODOT	0.80	F	134	1.11
US 26/362 ND DRIVE	Signal	ODOT	0.80	D	41	1.00
US 26/INDUSTRIAL WAY	Signala	ODOT	0.80	D	18	0.79
362 ND DRIVE/ INDUSTRIAL WAY (NORTH)	TWSC ^b	City of Sandy	D	A [F]	10 [107]	0.46 [1.04]
362 ND DRIVE/ INDUSTRIAL WAY (SOUTH)	AWSC	City of Sandy	D	F	>300	1.52
US 26/RUBEN LANE	Signala	ODOT	0.80	D	48	0.84
US 26/BLUFF ROAD	Signal	ODOT	0.85	Е	73	0.86
BLUFF ROAD/BELL STREET	TWSC	City of Sandy	D	A [C]	8 [16]	0.24 [0.10]
PIONEER BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	32	0.80
PROCTOR BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	27	0.72
OR 211/ DUBARKO RD	Signal	City of Sandy	D	В	16	0.68
OR 211/BORNSTEDT ROD	TWSC	City of Sandy	D	B [B]	11 [15]	0.5 [0.04]
US 26/TEN EYCK ROAD	Signal	ODOT	0.85	С	28	0.73
US 26/LANGENSAND ROAD	TWSC	ODOT	0.80	C [F]	18 [>300]	0.51 [1.21]
US 26/VISTA LOOP DRIVE W	Signal	ODOT	0.80	В	17	0.61
US 26/VISTA LOOP DRIVE E	TWSC	ODOT	0.80	B [F]	12 [121]	0.48 [0.26]

a. This signal reported using HCM 2000 due to non-standard characteristics.

b. Two-way Stop Controlled (TWSC) measures are reported as worst major [worst minor] approach for LOS and Delay and as worst movement for V/C.

Alternative #3

The improvements included in Alternative 1, combined with the bypass of the existing US 26 corridor, were analyzed to assess operation benefits at the study intersections. Because the impacts on the City street network will vary significantly with the locations and types of access allowed to the bypass, only the US 26 corridor intersections were evaluated to see how much the bypass could relieve congestion.

As shown in Table 3, with the addition of a US 26 bypass only the intersection of US 26 and Orient Drive would exceed mobility targets. The eastbound through and southbound left movements at this intersection continue to compete for available green time in the cycle even with the addition of the bypass.

TABLE 3: 2040 ALTERNATIVE #3 INTERSECTION OPERATIONS (PEAK HOUR)

STUDY INTERSECTION	CONTROL TYPE	JURISDICTION	MOBILITY TARGET	LEVEL OF SERVICE	DELAY (SECONDS)	V/C RATIO
US 26/ORIENT DRIVE	Signal	ODOT	0.80	С	32	0.83
US 26/362 ND DRIVE	Signal	ODOT	0.80	С	34	0.76
US 26/INDUSTRIAL WAY	Signala	ODOT	0.80	С	22	0.56
US 26/RUBEN LANE	Signala	ODOT	0.80	С	31	0.65
US 26/BLUFF ROAD	Signal	ODOT	0.85	D	42	0.64
PIONEER BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	27	0.59
PROCTOR BOULEVARD (US 26)/MEINIG AVENUE (OR 211)	Signal	ODOT	0.90	С	29	0.67
US 26/TEN EYCK ROAD	Signal	ODOT	0.85	С	26	0.54
US 26/LANGENSAND ROAD	TWSC	ODOT	0.80	B [D]	10 [33]	0.25 [0.17]
US 26/VISTA LOOP DRIVE W	Signal	ODOT	0.80	Α	4	0.48
US 26/VISTA LOOP DRIVE E	TWSC	ODOT	0.80	A [F]	10 [62]	0.28 [0.14]

a. This signal reported using HCM 2000 due to non-standard characteristics.

b. Two-way Stop Controlled (TWSC) measures are reported as worst major [worst minor] approach for LOS and Delay and as worst movement for V/C.

MOTOR VEHICLE TRAVEL TIME ESTIMATES

The US 26 bypass is expected to serve a moderate future volume and improve traffic flow on US 26 through Sandy. It was estimated that approximately 1,500 vehicles per hour would use the bypass during the year 2040 peak hour. Approximately 60% of the bypass users during the peak hour would be through traffic with no origin or destination in Sandy, while the other 40% would be comprised of local trips accessing the southern end of Sandy.

As an additional measure for evaluating the effectiveness of each alternative, travel times along US 26 through the study area were estimated. Table 4 shows the travel time estimates for each alternative. Improvements in travel times among the alternatives are generally consistent with the improvements shown for intersection operations, with the provision of a bypass in Alternative #3 resulting in moderate reductions in through travel time.

TABLE 4: ESTIMATED US 26 CORRIDOR TRAVEL TIMES (PEAK HOUR)

ALTERNATIVE		TRAVEL TIME EASTBOUND (MM:SS)	TRAVEL TIME WESTBOUND (MM:SS)
2020 EXISTING		09:36	09:54
2040 NO BUILD		16:49	14:26
2040 ALTERNATIVE #1		13:18	10:15
2040 ALTERNATIVE #2	US 26 FACILITY	08:54	10:19
2040 ALTERNATIVE #3	BYPASS FACILITY	07:56	07:56

BYPASS FACILITY CROSS-SECTION CONSIDERATION

The expected 2040 peak hour volumes using the bypass suggest the facility could adequately accommodate demands with a narrower cross-section providing 2 lanes (one in each direction). The highest 2040 volume on the bypass is not expected to exceed 1,000 vehicles in either direction. If the bypass concept was reduced to a 2- lane facility, the connection with OR 211 may require a full interchange instead of an at-grade intersection with traffic signal or roundabout control. The analysis and findings in this future conditions memo would not change since free-flow operations are expected on the bypass with either 2 or 4 lanes and the same future volumes would be served. Both cross-sections options will be considered and further refined during the next phase of the analysis, the Bypass Benefit Cost Analysis.

SUMMARY

The future conditions findings from this analysis will contribute to the content and analysis in subsequent memoranda including the Benefit Cost Analysis Memorandum and the Sandy Bypass Feasibility Reevaluation Report.

Key findings from the future conditions alternative analysis include:

- Under the 2040 No Build Alternative, 8 study intersections (4 on US 26) would exceed mobility targets.
- The addition of local connections and intersection improvements under 2040 Alternative #1,
 6 study intersections (4 on US 26) would continue to exceed mobility targets.
- Adding the bypass under Alternative #3 would improve traffic operations, only one study intersection would continue to exceed mobility targets (US 26 and Orient Drive)
- Approximately 1,500 vehicles an hour would use the bypass during the 2040 peak hour.
- Approximately 60% of bypass users during peak periods would represent through trips,
 40% would be local trips accessing the southern end of Sandy.
- Compared to the 2040 No Build Alternative, the addition of local connections and intersection improvements under 2040 Alternative #1 would decrease travel times on US 26 approximately 3 minutes 30 seconds eastbound and 4 minutes westbound
- Compared to the 2040 No Build Alternative, the addition of the bypass under 2040
 Alternative #3 would decrease travel times on US 26 approximately 8 minutes eastbound and 4 minutes westbound
- Under Alternative #3, the bypass would save travel time through the study area compared to US 26 (1 minute eastbound and 2 minutes 30 seconds westbound)

APPENDIX

CONTENTS

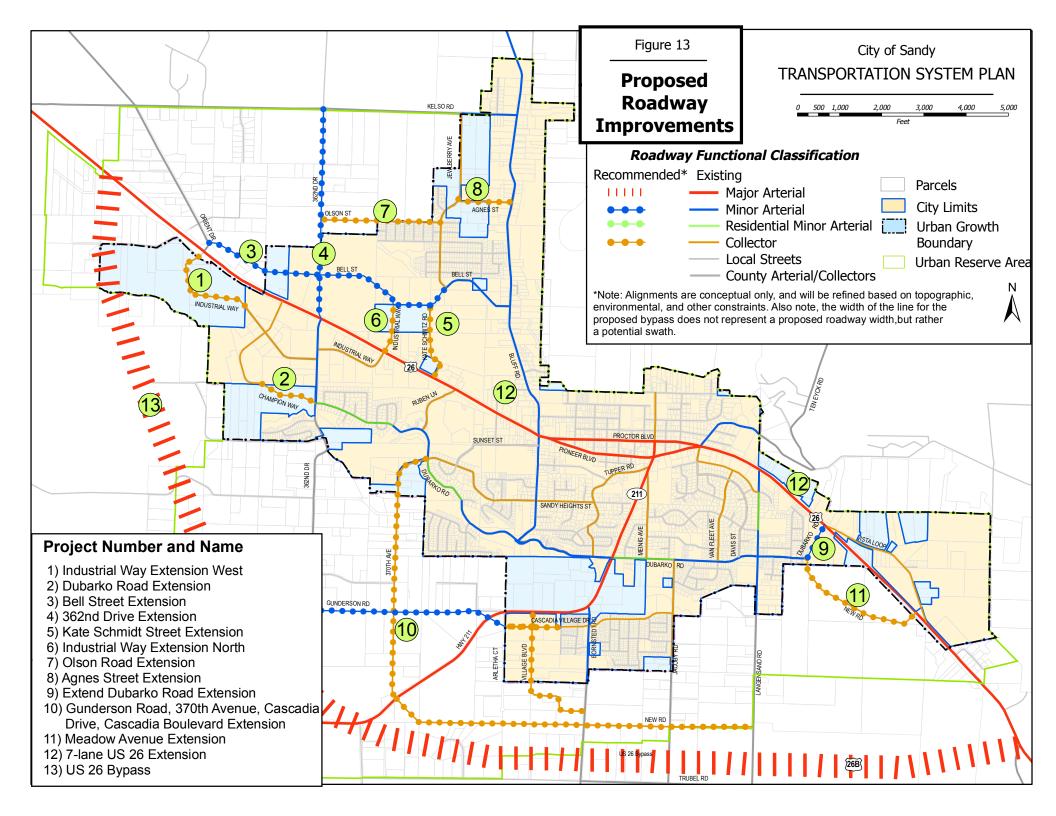
SECTION 1. FUTURE ROADWAY

SECTION 2. FUTURE CONDITION HCM REPORTS



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SECTION 1. FUTURE ROADWAY



SECTION	2.	FUTURE	CONDIT	ION	нсм	REPORTS	

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		^	7	ሻ	^	7		4			4	
Traffic Volume (veh/h)	60	2520	5	10	1750	225	10	50	10	260	10	20
Future Volume (veh/h)	60	2520	5	10	1750	225	10	50	10	260	10	20
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	4	No	4==0		No		1000	No	1000	4==0	No	4==0
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	63	2653	5	11	1842	0	11	53	11	274	11	21
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	81	1907	850	65	1847	0.00	14	69	14	288	12	22
Arrive On Green	0.05	0.57	0.57	0.04	0.56	0.00	0.07	0.06	0.07	0.19	0.19	0.19
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	227	1096	227	1501	60	115
Grp Volume(v), veh/h	63	2653	5	11	1842	0	75	0	0	306	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1551	0	0	1676	0	0
Q Serve(g_s), s	4.2	65.0	0.2	0.7	63.6	0.0	5.5	0.0	0.0	20.7	0.0	0.0
Cycle Q Clear(g_c), s	4.2	65.0	0.2	0.7	63.6	0.0	5.5	0.0	0.0	20.7	0.0	0.0
Prop In Lane	1.00	4007	1.00	1.00	40.47	1.00	0.15	•	0.15	0.90	^	0.07
Lane Grp Cap(c), veh/h	81	1907	850	65	1847		98	0	0	321	0	0
V/C Ratio(X)	0.78	1.39	0.01	0.17	1.00		0.76	0.00	0.00	0.95	0.00	0.00
Avail Cap(c_a), veh/h	81	1907	850	80	1847	4.00	101	0	0	321	0	0
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 25.3	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	54.0 35.6	24.9 179.5	10.8	53.3 0.7	20.2	0.0	52.8 24.9	0.0	0.0	45.9 37.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh %ile BackOfQ(50%),veh/ln	2.5	69.1	0.0	0.0	26.1	0.0	2.8	0.0	0.0	12.0	0.0	0.0
Unsig. Movement Delay, s/veh		09.1	0.1	0.3	20.1	0.0	2.0	0.0	0.0	12.0	0.0	0.0
LnGrp Delay(d),s/veh	89.7	204.4	10.8	54.1	45.5	0.0	77.7	0.0	0.0	83.5	0.0	0.0
LnGrp LOS	09.1 F	204.4 F	В	D D	43.3 D	0.0	77.7 E	Α	Α	03.5 F	Α	Α
Approach Vol, veh/h	ı ı	2721	D	ט	1853	А	<u> </u>	75		l l	306	
Approach Delay, s/veh		201.3			45.6	A		77.7			83.5	
Approach LOS		201.3 F			45.0 D			77.7 E			65.5 F	
Approach LOS		Г			D						Г	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	68.0		26.0	8.5	69.0		11.3				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	5.0	61.0		21.0	5.0	61.0		7.0				
Max Q Clear Time (g_c+l1), s	6.2	65.6		22.7	2.7	67.0		7.5				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			133.9									
HCM 6th LOS			F									

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	*	^	7		^	7	ሻሻ	†	7	ች	†	7	
Traffic Volume (veh/h)	300	1600	420	265	1525	340	335	150	325	150	175	170	
Future Volume (veh/h)	300	1600	420	265	1525	340	335	150	325	150	175	170	
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 Approac		No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772	
Adj Flow Rate, veh/h	316	1684	442	279	1605	358	353	158	342	158	184	179	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2	
Cap, veh/h	198	1243	884	258	1397	820	761	402	343	236	248	210	
Arrive On Green	0.08	0.37	0.36	0.16	0.56	0.54	0.23	0.23	0.23	0.14	0.14	0.14	
Sat Flow, veh/h	1688	3367	1502	1661	3313	1502	3300	1772	1512	1688	1772	1502	
Grp Volume(v), veh/h	316	1684	442	279	1605	358	353	158	342	158	184	179	
		1683	1502	1661	1605	1502	1650	1772	342 1512	1688	1772	1502	
Grp Sat Flow(s),veh/h/l													
Q Serve(g_s), s	11.0	48.0	22.3	15.8	54.8	15.9	12.0	9.8	29.4	11.6	13.0	15.1	
Cycle Q Clear(g_c), s	11.0	48.0	22.3	15.8	54.8	15.9	12.0	9.8	29.4	11.6	13.0	15.1	
Prop In Lane	1.00	4040	1.00	1.00	4007	1.00	1.00	400	1.00	1.00	0.40	1.00	
Lane Grp Cap(c), veh/h		1243	884	258	1397	820	761	402	343	236	248	210	
V/C Ratio(X)	1.59	1.35	0.50	1.08	1.15	0.44	0.46	0.39	1.00	0.67	0.74	0.85	
Avail Cap(c_a), veh/h	198	1243	884	258	1397	820	761	402	343	376	395	335	
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	0.20	0.20	0.20	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/ve		41.0	15.6	52.8	28.5	13.2	43.1	42.7	50.2	53.1	53.7	54.6	
Incr Delay (d2), s/veh			2.0	50.9	68.8	0.3	0.3	0.4	47.8	2.4	3.3	9.5	
nitial Q Delay(d3),s/ve		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%),ve		47.0	12.5	11.3	30.1	6.0	4.9	4.3	15.5	5.1	6.0	6.2	
Unsig. Movement Dela													
LnGrp Delay(d),s/veh			17.6	103.7	97.4	13.5	43.3	43.0	98.0	55.5	56.9	64.1	
_nGrp LOS	F	F	В	F	F	В	D	D	F	Е	Е	Е	
Approach Vol, veh/h		2442			2242			853			521		
Approach Delay, s/veh		187.6			84.8			65.2			59.0		
Approach LOS		F			F			Е			Е		
Γimer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Ro	3), 281.8	52.0		22.2	15.0	58.8		34.0					
Change Period (Y+Rc)		* 6		4.0	4.0	6.0		4.5					
Max Green Setting (Gn	•	* 46		29.0	11.0	42.0		29.5					
Max Q Clear Time (g. c		50.0		17.1	13.0	56.8		31.4					
Green Ext Time (p_c),	, .	0.0		1.0	0.0	0.0		0.0					
Intersection Summary								J. 5					
			121.2										
HCM 6th Ctrl Delay HCM 6th LOS			121.2 F										
I IOW OUI LOS			Г										

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	*	∱ }		ሻ	^	7		4		*	ર્ન	7
Traffic Volume (vph)	65	1945	5	25	1795	50	170	35	250	230	15	170
Future Volume (vph)	65	1945	5	25	1795	50	170	35	250	230	15	170
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0		4.0		4.0	4.0	4.0
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (prot)	1676	3316		1644	3358	1471		1620		1624	1638	1508
Flt Permitted	0.06	1.00		0.06	1.00	1.00		0.98		0.95	0.96	1.00
Satd. Flow (perm)	100	3316		101	3358	1471		1620		1624	1638	1508
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	66	1985	5	26	1832	51	173	36	255	235	15	173
RTOR Reduction (vph)	0	0	0	0	0	23	0	33	0	0	0	112
Lane Group Flow (vph)	66	1990	0	26	1832	28	0	431	0	125	125	61
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						4
Actuated Green, G (s)	74.3	70.3		71.1	68.7	68.7		22.6		17.3	17.3	17.3
Effective Green, g (s)	75.3	71.7		71.1	70.1	70.1		22.6		17.3	17.3	17.3
Actuated g/C Ratio	0.58	0.55		0.55	0.54	0.54		0.17		0.13	0.13	0.13
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4		4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4		3.0		2.3	2.3	2.3
Lane Grp Cap (vph)	112	1828		83	1810	793		281		216	217	200
v/s Ratio Prot	c0.02	c0.60		0.01	0.55			c0.27		c0.08	0.08	
v/s Ratio Perm	0.32			0.16		0.02						0.04
v/c Ratio	0.59	1.09		0.31	1.01	0.03		1.53		0.58	0.58	0.31
Uniform Delay, d1	56.5	29.1		59.7	30.0	14.1		53.7		52.9	52.9	50.9
Progression Factor	0.43	0.45		0.79	0.67	2.57		1.00		1.00	1.00	1.00
Incremental Delay, d2	2.8	45.0		0.8	19.5	0.0		257.3		2.8	2.7	0.5
Delay (s)	27.4	58.1		47.8	39.4	36.2		311.0		55.7	55.6	51.4
Level of Service	С	Е		D	D	D		F		Е	Е	D
Approach Delay (s)		57.1			39.5			311.0			53.9	
Approach LOS		E			D			F			D	
Intersection Summary												
•			74.0		<u> </u>	l accal af (
HCM 2000 Control Delay			74.2	Н	CIVI 2000	Level of S	service		Е			
HCM 2000 Volume to Cap	acity ratio		1.10		um afla	t time a /->			10.0			
Actuated Cycle Length (s)			130.0		um of los	. ,			16.0			
Intersection Capacity Utiliz	ation		102.9%	IC	U Level	of Service			G			
Analysis Period (min)			15									

Analysis Period (min) c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ች	^	7	*	^	7		ર્ન	7	*	4	7
Traffic Volume (vph)	175	2045	195	45	1650	100	120	35	40	270	35	135
Future Volume (vph)	175	2045	195	45	1650	100	120	35	40	270	35	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	*0.94	1.00	1.00	*0.97	1.00		1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97		1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (prot)	1676	3318	1467	1644	3358	1432		1682	1461	1624	1646	1506
Flt Permitted	0.07	1.00	1.00	0.06	1.00	1.00		0.96	1.00	0.95	0.96	1.00
Satd. Flow (perm)	132	3318	1467	96	3358	1432		1682	1461	1624	1646	1506
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	177	2066	197	45	1667	101	121	35	40	273	35	136
RTOR Reduction (vph)	0	0	40	0	0	36	0	0	34	0	0	126
Lane Group Flow (vph)	177	2066	157	45	1667	65	0	156	6	153	155	10
Confl. Peds. (#/hr)			1			3	1		4	4		1
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6		8	8			4
Actuated Green, G (s)	81.5	80.1	80.1	75.5	75.5	75.5		19.3	19.3	10.0	10.0	10.0
Effective Green, g (s)	81.5	81.5	81.5	75.5	76.9	76.9		19.3	19.3	10.0	10.0	10.0
Actuated g/C Ratio	0.63	0.63	0.63	0.58	0.59	0.59		0.15	0.15	0.08	0.08	0.08
Clearance Time (s)	4.0	5.4	5.4	4.0	5.4	5.4		4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.3	5.4	5.4	2.3	5.4	5.4		2.3	2.3	2.3	2.3	2.3
Lane Grp Cap (vph)	175	2080	919	93	1986	847		249	216	124	126	115
v/s Ratio Prot	0.06	c0.62		0.01	c0.50			c0.09		c0.09	0.09	
v/s Ratio Perm	c0.57		0.11	0.27		0.05			0.00			0.01
v/c Ratio	1.01	0.99	0.17	0.48	0.84	0.08		0.63	0.03	1.23	1.23	0.09
Uniform Delay, d1	42.5	24.0	10.1	30.2	21.5	11.4		52.0	47.3	60.0	60.0	55.8
Progression Factor	0.66	0.41	0.29	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	23.3	4.6	0.0	2.3	4.5	0.2		3.9	0.0	156.7	154.7	0.2
Delay (s)	51.1	14.5	2.9	32.5	26.0	11.5		55.9	47.4	216.7	214.7	56.0
Level of Service	D	В	Α	С	С	В		Е	D	F	F	Е
Approach Delay (s)		16.2			25.4			54.2			166.8	
Approach LOS		В			С			D			F	
Intersection Summary												
HCM 2000 Control Delay			34.8	Н	CM 2000	Level of S	Service		С			
HCM 2000 Volume to Capa	acity ratio		0.97									
Actuated Cycle Length (s)			130.0	S	um of los	t time (s)			16.0			
Intersection Capacity Utiliz	ation		90.4%			of Service			Е			
Analysis Period (min)			15									
0 111 11 0												

c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ች	^	7	ች	^	7	ች	f)		*	ĵ.		
Traffic Volume (veh/h)	285	1910	155	95	1430	245	145	55	120	155	45	255	
Future Volume (veh/h)	285	1910	155	95	1430	245	145	55	120	155	45	255	
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	•	0.98	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 Approa		No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786	
Adj Flow Rate, veh/h	291	1949	158	97	1459	250	148	56	122	158	46	260	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1	
Cap, veh/h	247	1681	748	75	1150	572	139	78	170	250	53	299	
Arrive On Green	0.15	0.50	0.50	0.05	0.39	0.39	0.08	0.16	0.16	0.15	0.23	0.23	
Sat Flow, veh/h	1688	3367	1499	1647	2941	1464	1701	493	1075	1701	232	1313	
Grp Volume(v), veh/h	291	1949	158	97	1459	250	148	0	178	158	0	306	
Grp Volume(v), ven/h/ Grp Sat Flow(s),veh/h/l		1683	1499	1647	1470	1464	1701	0	1569	1701	0	1546	
Q Serve(g_s), s	16.1	54.9	6.5	5.0	43.0	13.8	9.0	0.0	11.8	9.6	0.0	20.9	
Cycle Q Clear(g_c), s	16.1	54.9	6.5	5.0	43.0	13.8	9.0	0.0	11.8	9.6	0.0	20.9	
Prop In Lane	1.00	54.9	1.00	1.00	43.0	1.00	1.00	0.0	0.69	1.00	0.0	0.85	
Lane Grp Cap(c), veh/l		1681	748	75	1150	572	139	0	248	250	0	352	
V/C Ratio(X)	1.18	1.16	0.21	1.30	1.27	0.44	1.06	0.00	0.72	0.63	0.00	0.87	
Avail Cap(c_a), veh/h	247	1681	748	75	1150	572	139	0.00	428	250	0.00	422	
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)	0.13	0.13	0.13	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	
• • • • • • • • • • • • • • • • • • • •		27.5	15.4	52.5	33.5	24.6	50.5	0.00	43.8	44.1	0.00	40.7	
Uniform Delay (d), s/ve Incr Delay (d2), s/veh	85.1	72.7	0.1	202.2	128.1	2.4	94.2	0.0	2.4	44.1	0.0	14.3	
• ():		0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	
Initial Q Delay(d3),s/ve			2.2	6.3	0.0	5.2	0.0		4.8	4.4	0.0	9.4	
%ile BackOfQ(50%),ve		37.1	2.2	0.3	35.5	J.Z	7.5	0.0	4.0	4.4	0.0	9.4	
Unsig. Movement Dela	•		15 5	254.7	161.6	27.0	144.7	0.0	46.2	48.5	0.0	54.9	
LnGrp Delay(d),s/veh		100.2			161.6	27.0		0.0					
LnGrp LOS	F	F	<u>B</u>	F	F 4000	<u>C</u>	F	A 200	D	D	A 404	D	
Approach Vol, veh/h		2398			1806			326			464		
Approach Delay, s/veh		98.5			148.0			90.9			52.7		
Approach LOS		F			F			F			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8					
Phs Duration (G+Y+Ro	s), s9.0	58.9	13.0	29.1	20.9	47.0	20.7	21.4					
Change Period (Y+Rc)	, s 4.0	4.8	4.0	4.5	4.8	* 4	4.5	* 4.5					
Max Green Setting (Gr		49.2	9.0	29.5	12.0	* 43	9.0	* 30					
Max Q Clear Time (g_c		56.9	11.0	22.9	18.1	45.0	11.6	13.8					
Green Ext Time (p_c),		0.0	0.0	0.7	0.0	0.0	0.0	0.6					
Intersection Summary													
HCM 6th Ctrl Delay			111.7										
HCM 6th LOS			F										
110101 001 000			'										

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	1.5					
	EBL	EDD	NDI	NDT	CDT	CDD
Movement		EBR	NBL	NBT	SBT	SBR
Lane Configurations	ጟ	7	100	€	♣	_
Traffic Vol, veh/h	5	55	100	465	405	5
Future Vol, veh/h	5	55	100	465	405	5
Conflicting Peds, #/hr	1	1	_ 2	_ 0	_ 0	_ 2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	180	0	150	-	-	-
Veh in Median Storage		-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	1	1	3	3
Mvmt Flow	5	58	105	489	426	5
Major/Minor	Minor		Major1		Majara	
	Minor2		Major1		Major2	
Conflicting Flow All	1131	432	433	0	-	0
Stage 1	431	-	-	-	-	-
Stage 2	700		-	-	-	-
Critical Hdwy	6.44	6.24	4.11	-	-	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	2.209	-	-	-
Pot Cap-1 Maneuver	223	619	1132	-	-	-
Stage 1	651	-	-	-	-	-
Stage 2	489	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	201	617	1130	-	-	-
Mov Cap-2 Maneuver	201	-	-	_	_	_
Stage 1	589	_	_	_	-	-
Stage 2	488	_	_	_	_	_
Olago 2	100					
Approach	EB		NB		SB	
HCM Control Delay, s	12.4		1.5		0	
HCM LOS	В					
Minor Lane/Major Mvm	nt	NBL	NRT	EBLn1 l	FRI n2	SBT
	IL					
Capacity (veh/h)		1130	-		617	-
HCM Lane V/C Ratio		0.093		0.026		-
HCM Control Delay (s)		8.5	0	23.4	11.4	-
HCM Lane LOS	,	A	Α	С	В	-
HCM 95th %tile Q(veh)	0.3	-	0.1	0.3	-

Intersection						
Int Delay, s/veh	10.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	₩.	וטוי	1\ B1	וטוז	JDL Š	<u> </u>
Traffic Vol, veh/h	55	80	575	210	190	530
Future Vol, veh/h	55	80	575	210	190	530
Conflicting Peds, #/hr	0	2	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-		-	None
Storage Length	0	-	_	-	125	-
Veh in Median Storage			0	_	123	0
Grade, %	s, # 0 0	<u>-</u>	0	_	_	0
Peak Hour Factor	95	95	95	95	95	95
	4	4			3	3
Heavy Vehicles, %			1	1		
Mvmt Flow	58	84	605	221	200	558
Major/Minor	Minor1	N	Major1	N	Major2	
Conflicting Flow All	1674	718	0	0	826	0
Stage 1	716	-	_	_	-	_
Stage 2	958	_	_	_	_	_
Critical Hdwy	6.44	6.24	_	_	4.13	_
Critical Hdwy Stg 1	5.44	-	_	_	-	_
Critical Hdwy Stg 2	5.44	_	_	_	_	_
Follow-up Hdwy	3.536		_	_	2.227	_
Pot Cap-1 Maneuver	104	426	_		800	_
Stage 1	481	-	_	_	-	_
Stage 2	369	_	-		-	_
Platoon blocked, %	309	-	_	-	_	_
	78	425	-	-	800	-
Mov Cap-1 Maneuver	78			-		-
Mov Cap-2 Maneuver		-	-	-	-	-
Stage 1	481	-	_	-	-	-
Stage 2	277	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s			0		2.9	
HCM LOS	F		U		2.0	
1 TOWN LOO	'					
Minor Lane/Major Mvm	nt	NBT	NBRV	VBLn1	SBL	SBT
Capacity (veh/h)		-	-	151	800	-
HCM Lane V/C Ratio		-	-	0.941	0.25	-
HCM Control Delay (s)		-	-	116.9	11	-
HCM Lane LOS		-	-	F	В	-
HCM 95th %tile Q(veh)	-	-	6.8	1	-

Intersection						
Intersection Delay, s/veh	133.5					
Intersection LOS	F					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	N/		.,02	4	<u> </u>	
Traffic Vol, veh/h	180	230	125	605	555	30
Future Vol, veh/h	180	230	125	605	555	30
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	189	242	132	637	584	32
Number of Lanes	1	0	0	1	1	0
Approach	EB		NB		SB	
Opposing Approach			SB		NB	
Opposing Lanes	0		1		1	
Conflicting Approach Left	SB		EB			
Conflicting Lanes Left	1		1		0	
Conflicting Approach Right	NB				EB	
Conflicting Lanes Right	1		0		1	
HCM Control Delay	35.2		214.3		101.6	
LIOMICO			_			
HCM LOS	Е		F		F	
HCM LOS	E		F		F	
Lane	E	NBLn1	EBLn1	SBLn1	F	
	E	NBLn1 17%		SBLn1	-	
Lane	E	17% 83%	EBLn1 44% 0%	0% 95%		
Lane Vol Left, %	-	17%	EBLn1 44%	0%		
Lane Vol Left, % Vol Thru, %		17% 83% 0% Stop	EBLn1 44% 0% 56% Stop	0% 95% 5% Stop	-	
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane		17% 83% 0% Stop 730	EBLn1 44% 0% 56% Stop 410	0% 95% 5% Stop 585	-	
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol		17% 83% 0% Stop 730 125	EBLn1 44% 0% 56% Stop 410 180	0% 95% 5% Stop 585 0		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol		17% 83% 0% Stop 730 125 605	EBLn1 44% 0% 56% Stop 410 180 0	0% 95% 5% Stop 585 0 555	-	
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol		17% 83% 0% Stop 730 125 605	EBLn1 44% 0% 56% Stop 410 180 0 230	0% 95% 5% Stop 585 0 555 30		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate		17% 83% 0% Stop 730 125 605 0	EBLn1 44% 0% 56% Stop 410 180 0 230 432	0% 95% 5% Stop 585 0 555 30 616		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp		17% 83% 0% Stop 730 125 605 0 768	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1	0% 95% 5% Stop 585 0 555 30 616		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X)		17% 83% 0% Stop 730 125 605 0 768 1	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809	0% 95% 5% Stop 585 0 555 30 616 1		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd)		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495	0% 95% 5% Stop 585 0 555 30 616 1 1.116 7.139		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes	0% 95% 5% Stop 585 0 555 30 616 1 1.116 7.139 Yes		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes 538	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes 488	0% 95% 5% Stop 585 0 555 30 616 1 1.116 7.139 Yes 511		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes 538 4.863	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes 488 5.495	0% 95% 5% Stop 585 0 555 30 616 1.116 7.139 Yes 511 5.139		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes 538 4.863 1.428	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes 488 5.495 0.885	0% 95% 5% Stop 585 0 555 30 616 1.116 7.139 Yes 511 5.139 1.205		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio HCM Control Delay		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes 538 4.863 1.428 214.3	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes 488 5.495 0.885 35.2	0% 95% 5% Stop 585 0 555 30 616 1 1.116 7.139 Yes 511 5.139 1.205		
Lane Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio		17% 83% 0% Stop 730 125 605 0 768 1 1.407 6.863 Yes 538 4.863 1.428	EBLn1 44% 0% 56% Stop 410 180 0 230 432 1 0.809 7.495 Yes 488 5.495 0.885	0% 95% 5% Stop 585 0 555 30 616 1.116 7.139 Yes 511 5.139 1.205		

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					4î∌			4			f)		
Traffic Volume (veh/h)	0	0	0	175	1375	15	270	45	0	0	65	40	
Future Volume (veh/h)	0	0	0	175	1375	15	270	45	0	0	65	40	
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)				1.00		0.99	1.00		1.00	1.00		0.99	
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approac	h				No			No			No		
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772	
Adj Flow Rate, veh/h				184	1447	16	284	47	0	0	68	42	
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2	
Cap, veh/h				205	1702	20	422	60	0	0	362	224	
Arrive On Green				0.56	0.56	0.56	0.35	0.35	0.00	0.00	0.35	0.35	
Sat Flow, veh/h				366	3034	35	1018	169	0	0	1022	631	
Grp Volume(v), veh/h				861	0	786	331	0	0	0	0	110	
Grp Sat Flow(s), veh/h/lr	n			1712	0	1723	1187	0	0	0	0	1653	
Q Serve(g_s), s				48.9	0.0	40.5	24.4	0.0	0.0	0.0	0.0	5.1	
Cycle Q Clear(g_c), s				48.9	0.0	40.5	29.4	0.0	0.0	0.0	0.0	5.1	
Prop In Lane				0.21		0.02	0.86		0.00	0.00		0.38	
Lane Grp Cap(c), veh/h				960	0	967	482	0	0	0	0	586	
V/C Ratio(X)				0.90	0.00	0.81	0.69	0.00	0.00	0.00	0.00	0.19	
Avail Cap(c_a), veh/h				980	0	987	482	0	0	0	0	586	
HCM Platoon Ratio				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	0.79	0.00	0.00	0.00	0.00	1.00	
Uniform Delay (d), s/vel	h			21.3	0.0	19.5	34.7	0.0	0.0	0.0	0.0	24.5	
Incr Delay (d2), s/veh				12.8	0.0	7.5	6.2	0.0	0.0	0.0	0.0	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	
%ile BackOfQ(50%),vel				22.0	0.0	17.5	8.9	0.0	0.0	0.0	0.0	2.0	
Unsig. Movement Delay	/, s/veh												
LnGrp Delay(d),s/veh				34.1	0.0	26.9	40.9	0.0	0.0	0.0	0.0	24.7	
LnGrp LOS				С	A	С	D	Α	Α	Α	Α	С	
Approach Vol, veh/h					1647			331			110		
Approach Delay, s/veh					30.7			40.9			24.7		
Approach LOS					С			D			С		
Timer - Assigned Phs				4		6		8					
Phs Duration (G+Y+Rc)), s			43.0		65.7		43.0					
Change Period (Y+Rc),				4.0		4.0		4.0					
Max Green Setting (Gm				39.0		63.0		39.0					
Max Q Clear Time (g_c-	+l1), s			7.1		50.9		31.4					
Green Ext Time (p_c), s	3			0.3		10.8		0.9					
Intersection Summary													
HCM 6th Ctrl Delay			32.0										
HCM 6th LOS			С										

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		414	7						7	ች	↑		
Traffic Volume (veh/h)	75	1535	555	0	0	0	0	240	245	40	210	0	
Future Volume (veh/h)	75	1535	555	0	0	0	0	240	245	40	210	0	
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	•	1.00				1.00	•	0.98	1.00	Ū	1.00	
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approac		No						No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772				0	1772	1772	1730	1730	0	
Adj Flow Rate, veh/h	79	1616	0				0	253	258	42	221	0	
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2				0.00	2	2	5	5	0.00	
Cap, veh/h	97	2082					0	403	334	52	498	0	
Arrive On Green	0.63	0.63	0.00				0.00	0.23	0.23	0.01	0.10	0.00	
Sat Flow, veh/h	153	3294	1502				0.00	1772	1470	1647	1730	0.00	
Grp Volume(v), veh/h	908	787	0				0	253	258	42	221	0	
Grp Sat Flow(s), veh/h/l		1683	1502				0	1772	1470	1647	1730	0	
Q Serve(g_s), s	42.9	35.5	0.0				0.0	14.2	18.1	2.8	13.3	0.0	
, T. /		35.5	0.0				0.0	14.2	18.1	2.8	13.3		
Cycle Q Clear(g_c), s	42.9	აე.ე	1.00					14.2			13.3	0.0	
Prop In Lane	0.09	1061	1.00				0.00	402	1.00	1.00	400		
Lane Grp Cap(c), veh/h		1064					0	403	334	52	498	0	
V/C Ratio(X)	0.81	0.74					0.00	0.63	0.77	0.81	0.44	0.00	
Avail Cap(c_a), veh/h	1115	1064	4.00				0	403	334	75	535	0	
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00	
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.97	0.97	0.99	0.99	0.00	
Uniform Delay (d), s/ve		14.0	0.0				0.0	38.3	39.8	54.1	41.5	0.0	
Incr Delay (d2), s/veh	6.6	4.6	0.0				0.0	7.0	15.4	26.3	0.4	0.0	
Initial Q Delay(d3),s/vel		0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),ve		14.0	0.0				0.0	6.8	7.8	1.6	6.2	0.0	
Unsig. Movement Delay								4= 0	^	00.4	47.0		
LnGrp Delay(d),s/veh	21.9	18.6	0.0				0.0	45.3	55.2	80.4	41.8	0.0	
LnGrp LOS	С	В					Α	D	E	F	D	Α	
Approach Vol, veh/h		1695	Α					511			263		
Approach Delay, s/veh		20.4						50.3			48.0		
Approach LOS		С						D			D		
Timer - Assigned Phs		2		4			7	8					
Phs Duration (G+Y+Rc), s	73.5		36.5			7.5	29.0					
Change Period (Y+Rc),		4.0		* 4.8			4.0	4.8					
Max Green Setting (Gr		68.0		* 34			5.0	24.2					
Max Q Clear Time (g_c		44.9		15.3			4.8	20.1					
Green Ext Time (p_c),		19.7		0.5			0.0	0.7					
Intersection Summary													
			20.5										
HCM 6th LCC			29.5										
HCM 6th LOS			С										
Notes													

Notes

^{*} HCM 6th computational engine requires equal clearance times for the phases crossing the barrier. Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement Lane Configurations Traffic Volume (veh/h) Future Volume (veh/h) Initial Q (Qb), veh	170 170	EBT	EBR	WBL	WBT								
Lane Configurations Traffic Volume (veh/h) Future Volume (veh/h)	170 170	^			VVDI	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Traffic Volume (veh/h) Future Volume (veh/h)	170 170		7	- 1	^	1		4			4		
Future Volume (veh/h)	170	1450	125	10	1180	25	100	25	10	175	20	120	
, ,		1450	125	10	1180	25	100	25	10	175	20	120	
11111111 Q (QD), VOII	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	U	1.00	1.00		1.00	1.00		1.00	1.00	J	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	1.00	1.00	No	1.00	1.00	No	1.00	1.00	No	1.00	
	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758	
Adj Flow Rate, veh/h	179	1526	132	11	1242	26	105	26	11	184	21	126	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	7	7	7	0.50	0.30	0.50	3	3	3	
Cap, veh/h	343	2075	925	24	1398	623	272	64	23	258	24	142	
Arrive On Green	0.20	0.62	0.62	0.01	0.43	0.43	0.25	0.26	0.24	0.25	0.26	0.24	
	1688	3367	1500	1621	3233	1442	842	250	92	812	96	558	
Grp Volume(v), veh/h	179	1526	132	11	1242	26	142	0	0	331	0	0	
			1500	1621		1442	1185	0	0	1465		0	
Grp Sat Flow(s),veh/h/ln		1683 35.0	4.1	0.7	1617 39.0		0.0	0.0	0.0	12.7	0.0	0.0	
Q Serve(g_s), s	10.4					1.1							
Cycle Q Clear(g_c), s	10.4	35.0	4.1	0.7	39.0	1.1	11.3	0.0	0.0	24.0	0.0	0.0	
Prop In Lane	1.00	2075	1.00	1.00	1200	1.00	0.74	Λ	0.08	0.56	۸	0.38	
_ane Grp Cap(c), veh/h	343	2075	925	24	1398	623	354	0	0	418	0	0	
V/C Ratio(X)	0.52	0.74	0.14	0.45	0.89	0.04	0.40	0.00	0.00	0.79	0.00	0.00	
Avail Cap(c_a), veh/h	343	2075	925	66	1446	645	413	0	0	481	0	0	
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	0.00	0.00	1.00	0.00	0.00	
Uniform Delay (d), s/veh		14.8	8.9	53.7	28.8	18.1	34.8	0.0	0.0	39.8	0.0	0.0	
ncr Delay (d2), s/veh	1.0	2.4	0.3	7.9	8.8	0.1	0.5	0.0	0.0	7.2	0.0	0.0	
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	
%ile BackOfQ(50%),veh		13.4	1.4	0.3	15.8	0.4	3.3	0.0	0.0	9.5	0.0	0.0	
Jnsig. Movement Delay					^	40.0			• • •				
LnGrp Delay(d),s/veh	40.0	17.2	9.2	61.7	37.5	18.2	35.3	0.0	0.0	47.1	0.0	0.0	
LnGrp LOS	D	В	Α	<u>E</u>	D	В	D	Α	Α	D	A	A	
Approach Vol, veh/h		1837			1279			142			331		
Approach Delay, s/veh		18.8			37.4			35.3			47.1		
Approach LOS		В			D			D			D		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc),	. s5 6	72.3		32.1	26.4	51.5		32.1					
Change Period (Y+Rc),		* 4.5		5.5	4.5	4.0		5.5					
Max Green Setting (Gma		* 61		31.3	15.5	49.2		31.3					
Max Q Clear Time (g_c+		37.0		26.0	12.4	41.0		13.3					
Green Ext Time (p_c), s		19.6		0.5	0.1	6.6		0.4					
ntersection Summary		. 3.0		J.0	J .,	3.0		J.,					
HCM 6th Ctrl Delay			28.7										
HCM 6th LOS			C										
Notes													

^{*} HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	3.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	^	7	ሻ	^	*	7
Traffic Vol, veh/h	1535	90	30	1230	25	70
Future Vol, veh/h	1535	90	30	1230	25	70
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	_	100	300	-	0	0
Veh in Median Storage	,# 0	-	-	0	0	-
Grade, %	0	_	_	0	0	_
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	6	6	0	0
Mymt Flow	1616	95	32	1295	26	74
IVIVIIIL FIOW	1010	95	32	1295	20	14
Major/Minor N	Major1	N	Major2	N	Minor1	
Conflicting Flow All	0	0	1711	0	2328	808
Stage 1	-	-	-	-	1616	-
Stage 2	-	-	-	-	712	-
Critical Hdwy	_	-	4.22	_	6.8	6.9
Critical Hdwy Stg 1	_	_	_	_	5.8	-
Critical Hdwy Stg 2	_	_	_	_	5.8	_
Follow-up Hdwy	_	_	2.26	_	3.5	3.3
Pot Cap-1 Maneuver	_	_	350	_	32	328
Stage 1	_	_	-	_	151	-
Stage 2	_	_	_	_	453	_
Platoon blocked, %	_	<u>-</u>		_	700	
Mov Cap-1 Maneuver	_		350	_	29	328
Mov Cap-1 Maneuver		-	330	-	29	J20 -
•	-	-			151	
Stage 1	-	-	-	-		-
Stage 2	-	-	-	-	412	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.4		102.1	
HCM LOS					F	
Minard and Market Ad	1 .	UDL 41	IDI C	CDT	EDD	MDI
Minor Lane/Major Mvm	τ Γ	VBLn11		EBT	EBR	WBL
Capacity (veh/h)		29	328	-	-	350
HCM Lane V/C Ratio		0.907		-	-	0.09
HCM Control Delay (s)	\$	334.4	19.1	-	-	16.3
HCM Lane LOS		F	С	-	-	С
HCM 95th %tile Q(veh)		3	0.8	-	-	0.3

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	^↑	7	ሻ	∱ ∱			4			4	
Traffic Volume (veh/h)	170	1435	0	100	1140	0	5	5	100	5	0	120
Future Volume (veh/h)	170	1435	0	100	1140	0	5	5	100	5	0	120
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	1758	1758	1723	1723	1716	1716	1723	1723	1723	1800	1723	1800
Adj Flow Rate, veh/h	179	1511	0	105	1200	0	5	5	105	5	0	126
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	2	2	6	6	2	2	2	0	2	0
Cap, veh/h	547	2609	1141	436	2509	0	74	0	3	74	0	3
Arrive On Green	0.07	0.78	0.00	0.06	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	1674	3340	1460	1641	3346	0	75	75	1569	66	0	1654
Grp Volume(v), veh/h	179	1511	0	105	1200	0	115	0	0	131	0	0
Grp Sat Flow(s),veh/h/ln	1674	1670	1460	1641	1630	0	1719	0	0	1719	0	0
Q Serve(g_s), s	1.2	9.2	0.0	0.7	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.2	9.2	0.0	0.7	6.8	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00	0-00	0.00	0.04		0.91	0.04		0.96
Lane Grp Cap(c), veh/h	547	2609	1141	436	2509	0	77	0	0	77	0	0
V/C Ratio(X)	0.33	0.58	0.00	0.24	0.48	0.00	1.48	0.00	0.00	1.70	0.00	0.00
Avail Cap(c_a), veh/h	888	4942	2160	660	4566	0	855	0	0	851	0	0
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	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	1.8	2.2	0.0	2.2	2.1	0.0	25.4	0.0	0.0	25.4	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.4	0.0	0.2	0.3	0.0	228.6	0.0	0.0	323.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0 0.2	0.0	0.0	0.0	0.0	0.0 5.8	0.0	0.0	0.0 7.8	0.0	0.0
%ile BackOfQ(50%),veh/ln Unsig. Movement Delay, s/veh		0.2	0.0	0.0	0.1	0.0	5.0	0.0	0.0	1.0	0.0	0.0
LnGrp Delay(d),s/veh	2.1	2.7	0.0	2.4	2.4	0.0	254.0	0.0	0.0	348.6	0.0	0.0
LnGrp LOS	Z.1	2.1 A	0.0 A	2.4 A	2.4 A	0.0 A	204.0 F	0.0 A	0.0 A	340.0 F	0.0 A	0.0 A
	^	1690		^	1305	^	<u> </u>	115	^	Г	131	
Approach Vol, veh/h		2.6			2.4			254.0			348.6	
Approach LOS								_				
Approach LOS		Α			Α			F			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.7	43.0		0.0	7.1	43.6		0.0				
Change Period (Y+Rc), s	4.0	6.0		4.0	4.0	6.0		4.0				
Max Green Setting (Gmax), s	14.0	69.0		23.0	10.0	73.0		23.0				
Max Q Clear Time (g_c+l1), s	3.2	8.8		0.0	2.7	11.2		0.0				
Green Ext Time (p_c), s	0.3	17.7		0.0	0.1	26.4		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			25.4									
HCM 6th LOS			С									

Intersection						
Int Delay, s/veh	0.4					
<u> </u>		EDT	WDT	MDD	CDI	CDD
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	Ž	^	†	05	Y	^
Traffic Vol, veh/h	5	1535	1235	25	10	0
Future Vol, veh/h	5	1535	1235	25	10	0
Conflicting Peds, #/hr	_ 0	_ 0	_ 0	_ 0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized		None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage,	# -	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	1616	1300	26	11	0
Major/Minor M	1ajor1	N	Major2	P	Minor2	
	1326	0	-	0	2131	663
		U			1313	
Stage 1	-	-	-	-		-
Stage 2	-	-	-	-	818	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	517	-	-	-	42	404
Stage 1	-	-	-	-	216	-
Stage 2	-	-	-	-	394	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	517	-	-	-	42	404
Mov Cap-2 Maneuver	-	-	-	-	42	-
Stage 1	-	-	-	-	214	-
Stage 2	-	-	-	-	394	-
A	ED		WD		OD.	
Approach	EB		WB		SB	
HCM Control Delay, s	0		0		117.3	
HCM LOS					F	
	•	EBL	EBT	WBT	WBR :	SBLn1
Minor Lane/Major Mymt						42
Minor Lane/Major Mvmt		517				
Capacity (veh/h)		517	-	-	-	
Capacity (veh/h) HCM Lane V/C Ratio		0.01	-	-	-	0.251
Capacity (veh/h) HCM Lane V/C Ratio HCM Control Delay (s)		0.01 12	-	-	-	0.251 117.3
Capacity (veh/h) HCM Lane V/C Ratio		0.01	-	-	-	0.251

	•	→	•	•	←	•	4	†	~	>	ţ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	₽		ሻ	₽		ሻ	↑	7	7	↑	7
Traffic Volume (veh/h)	30	190	90	160	70	30	110	230	130	50	535	40
Future Volume (veh/h)	30	190	90	160	70	30	110	230	130	50	535	40
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	4000	No	4000	4770	No	4770	4770	No	4770	4750	No	4750
Adj Sat Flow, veh/h/ln	1800	1800	1800	1772	1772	1772	1772	1772	1772	1758	1758	1758
Adj Flow Rate, veh/h	32	200	95	168	74	32	116	242	137	53	563	42
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	2	2	2	2	2	2	3	3	504
Cap, veh/h	429	238	113	317	327	141	294	748	631	494	704	594 0.40
Arrive On Green	0.03	0.21	0.21	0.10	0.28	0.28	0.06	0.42	0.42	0.04	0.40	
Sat Flow, veh/h	1714	1152	547	1688	1173	507	1688	1772	1495	1674	1758	1482
Grp Volume(v), veh/h	32	0	295	168	0	106	116	242	137	53	563	42
Grp Sat Flow(s),veh/h/ln	1714	0	1700	1688	0	1680	1688	1772	1495	1674	1758	1482
Q Serve(g_s), s	1.0	0.0	11.3	5.0	0.0	3.3	2.8	6.2	4.0	1.3	19.2	1.2
Cycle Q Clear(g_c), s	1.0	0.0	11.3	5.0	0.0	3.3	2.8	6.2	4.0	1.3	19.2	1.2
Prop In Lane	1.00	0	0.32	1.00	0	0.30	1.00	740	1.00	1.00	704	1.00 594
Lane Grp Cap(c), veh/h	429 0.07	0.00	351 0.84	317 0.53	0.00	468 0.23	294	748 0.32	631 0.22	494 0.11	704 0.80	0.07
V/C Ratio(X)	484	0.00	524	348	0.00	617	0.39 294	1067	900	530	1058	893
Avail Cap(c_a), veh/h HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.007	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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.4	0.00	25.9	18.3	0.00	18.9	14.3	13.2	12.5	11.8	18.0	12.6
Incr Delay (d2), s/veh	0.1	0.0	6.6	1.0	0.0	0.2	0.6	0.5	0.4	0.1	4.8	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	0.4	0.0	5.0	1.9	0.0	1.2	0.9	2.2	1.3	0.4	7.6	0.4
Unsig. Movement Delay, s/veh		0.0	5.0	1.0	0.0	1.2	0.5	۷.۷	1.0	0.4	1.0	0.4
LnGrp Delay(d),s/veh	20.5	0.0	32.5	19.3	0.0	19.1	14.9	13.7	12.9	11.8	22.8	12.7
LnGrp LOS	C	Α	C	В	Α	В	В	В	12.3 B	В	C	В
Approach Vol, veh/h		327			274			495			658	
Approach Delay, s/veh		31.4			19.2			13.8			21.3	
Approach LOS		C			В			В			C C	
							_				0	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.5	32.8	10.8	18.1	8.0	31.3	5.8	23.0				
Change Period (Y+Rc), s	4.0	4.8	4.0	4.0	4.0	4.8	4.0	4.0				
Max Green Setting (Gmax), s	4.0	40.2	8.0	21.0	4.0	40.2	4.0	25.0				
Max Q Clear Time (g_c+I1), s	3.3	8.2	7.0	13.3	4.8	21.2	3.0	5.3				
Green Ext Time (p_c), s	0.0	3.5	0.0	0.6	0.0	5.3	0.0	0.2				
Intersection Summary												
HCM 6th Ctrl Delay			20.7									
HCM 6th LOS			С									

Intersection						
Int Delay, s/veh	31					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	ĵ.		ች	↑	¥	
Traffic Vol, veh/h	400	120	230	570	105	80
Future Vol, veh/h	400	120	230	570	105	80
Conflicting Peds, #/hr	0	0	0	0	0	0
•	Free	Free	Free	Free	Stop	Stop
RT Channelized	-		-	None	_	None
Storage Length	_	_	150	_	0	-
Veh in Median Storage, #	# 0	-	_	0	0	_
Grade, %	0	_	_	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	1	1	1	1
Mymt Flow	421	126	242	600	111	84
IVIVIIIL I IOW	421	120	242	000	111	04
Major/Minor Ma	ajor1	N	Major2	ľ	Minor1	
Conflicting Flow All	0	0	547	0	1568	484
Stage 1	-	-	-	-	484	-
Stage 2	-	-	-	-	1084	-
Critical Hdwy	-	-	4.11	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	_	-	-	-	5.41	-
Follow-up Hdwy	_	_	2.209	_	3.509	3.309
Pot Cap-1 Maneuver	_	_	1027	_	123	585
Stage 1	_	_	-	_	622	-
Stage 2	_	_	_	-	326	_
Platoon blocked, %	_	_		_	020	
Mov Cap-1 Maneuver	_	_	1027	-	~ 94	585
Mov Cap-1 Maneuver	_	_	1021	_	~ 94	-
		_	-	-	622	
Stage 1	-	-	-	-	249	-
Stage 2	-	-	-	-	249	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		2.8		239.8	
HCM LOS					F	
Minor Lane/Major Mvmt	1	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)		148	-		1027	-
HCM Lane V/C Ratio		1.316	-	-	0.236	-
HCM Control Delay (s)		239.8	-	-	9.6	-
HCM Lane LOS		F	-	-	Α	-
HCM 95th %tile Q(veh)		12	-	-	0.9	-
Notes						
	.,			1 0	00	
~: Volume exceeds capa	icity	\$: De	elay exc	eeds 3	UUS	+: Com

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ		7	ሻ	^	7		4			4	
Traffic Volume (veh/h)	250	2205	15	10	1435	165	70	50	10	165	10	90
Future Volume (veh/h)	250	2205	15	10	1435	165	70	50	10	165	10	90
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	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	263	2321	16	11	1511	0	74	53	11	174	11	95
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	182	1735	774	73	1496	0.00	65	46	10	207	13	113
Arrive On Green	0.11	0.52	0.52	0.04	0.45	0.00	0.08	0.08	0.08	0.21	0.21	0.21
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	826	591	123	1008	64	550
Grp Volume(v), veh/h	263	2321	16	11	1511	0	138	0	0	280	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1540	0	0	1622	0	0
Q Serve(g_s), s	11.0	52.5	0.5	0.6	46.0	0.0	8.0	0.0	0.0	16.9	0.0	0.0
Cycle Q Clear(g_c), s	11.0	52.5	0.5	0.6	46.0	0.0	8.0	0.0	0.0	16.9	0.0	0.0
Prop In Lane	1.00	4705	1.00	1.00	4.400	1.00	0.54	•	0.08	0.62	•	0.34
Lane Grp Cap(c), veh/h	182	1735	774	73	1496		121	0	0	333	0	0
V/C Ratio(X)	1.44	1.34	0.02	0.15	1.01		1.14	0.00	0.00	0.84	0.00	0.00
Avail Cap(c_a), veh/h	182	1735	774	73	1496	4.00	121	0	0	541	0	0
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	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	45.4	24.7	12.1	46.9	27.9	0.0	46.8	0.0	0.0	38.9	0.0	0.0
Incr Delay (d2), s/veh	227.8	156.2	0.0	0.6	25.8	0.0	124.9	0.0	0.0	6.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0 7.3	0.0	0.0	0.0 7.3	0.0	0.0
%ile BackOfQ(50%),veh/ln Unsig. Movement Delay, s/veh	15.9	55.0	0.2	0.3	21.0	0.0	1.3	0.0	0.0	1.3	0.0	0.0
LnGrp Delay(d),s/veh	273.3	180.9	12.1	47.4	53.8	0.0	171.7	0.0	0.0	45.3	0.0	0.0
LnGrp LOS	213.3 F	100.9 F	12.1 B	47.4 D	55.6 F	0.0	171.7 F	0.0 A	0.0 A	45.5 D	0.0 A	0.0 A
· ·	Г	2600	В	U	1522	A	Г	138	^	<u> </u>	280	
Approach Vol, veh/h		189.2			53.7	А		171.7			45.3	
Approach LOS		109.Z			55.1 D			171.7 F			45.5 D	
Approach LOS		l l									D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.0	50.0		24.9	8.5	56.5		12.0				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	10.5	43.0		33.0	4.0	49.5		7.5				
Max Q Clear Time (g_c+l1), s		48.0		18.9	2.6	54.5		10.0				
Green Ext Time (p_c), s	0.0	0.0		1.0	0.0	0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			134.3									
HCM 6th LOS			F									

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ሻ	^	7	ሻሻ	^	7	ሻሻ	<u> </u>	7	<u> </u>	<u> </u>	7	
Traffic Volume (veh/h)	200	1355	450	225	1415	250	185	260	300	50	150	65	
Future Volume (veh/h)	200	1355	450	225	1415	250	185	260	300	50	150	65	
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 Approac		No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772	
Adj Flow Rate, veh/h	211	1426	474	237	1489	263	195	274	316	53	158	68	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2	
Cap, veh/h	261	1450	1003	463	1725	851	745	393	336	104	109	92	
Arrive On Green	0.07	0.43	0.43	0.29	1.00	1.00	0.23	0.22	0.22	0.06	0.06	0.06	
Sat Flow, veh/h	1688	3367	1502	3222	3313	1502	3300	1772	1511	1688	1772	1502	
Grp Volume(v), veh/h	211	1426	474	237	1489	263	195	274	316	53	158	68	
Grp Sat Flow(s), veh/h/h		1683	1502	1611	1657	1502	1650	1772	1511	1688	1772	1502	
Q Serve(g_s), s	9.0	54.4	19.9	8.0	0.0	0.0	6.3	18.5	26.7	4.0	8.0	5.8	
Cycle Q Clear(g_c), s	9.0	54.4	19.9	8.0	0.0	0.0	6.3	18.5	26.7	4.0	8.0	5.8	
Prop In Lane	1.00	07.7	1.00	1.00	0.0	1.00	1.00	10.0	1.00	1.00	0.0	1.00	
Lane Grp Cap(c), veh/h		1450	1003	463	1725	851	745	393	336	104	109	92	
V/C Ratio(X)	0.81	0.98	0.47	0.51	0.86	0.31	0.26	0.70	0.94	0.51	1.45	0.74	
Avail Cap(c_a), veh/h	261	1450	1003	463	1725	851	761	402	343	234	245	208	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	0.51	0.51	0.51	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/vel		36.5	10.5	42.5	0.0	0.0	41.4	46.5	49.7	59.1	61.0	60.0	
Incr Delay (d2), s/veh	16.5	20.0	1.6	0.3	3.2	0.5	0.1	4.5	33.1		223.6	8.3	
Initial Q Delay(d3),s/vel		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%),vel		24.5	11.9	2.8	0.8	0.1	2.6	8.6	13.1	1.8	10.3	2.4	
Unsig. Movement Delay					3.0	J. 1	0	3.0		1.0	. 5.0		
LnGrp Delay(d),s/veh	46.5	56.5	12.1	42.8	3.2	0.5	41.5	51.1	82.9	62.0	284.6	68.2	
LnGrp LOS	D	E	В	D	A	A	D	D	F	E	F	E	
Approach Vol, veh/h		2111			1989	- '		785	•	_	279	_	
Approach Delay, s/veh		45.5			7.6			61.5			189.6		
Approach LOS		43.3 D			Α.			61.5 E			F		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc) 24 7	60.0		12.0	13.0	71.7		33.4					
Change Period (Y+Rc),		* 6		4.0	4.0	6.0		4.5					
Max Green Setting (Gr		* 54		18.0	9.0	55.0		29.5					
Max Q Clear Time (g c		56.4		7.8	11.0	2.0		28.7					
Green Ext Time (p_c),	, ,	0.0		0.2	0.0	51.5		0.1					
u = 7:	5 0.0	0.0		U.Z	0.0	31.3		0.1					
Intersection Summary													
HCM 6th Ctrl Delay			41.1										
HCM 6th LOS			D										

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	↑ ↑		ሻ	^	7	ሻ	∱		1,1	1>	•
Traffic Volume (vph)	50	1645	10	40	1595	50	170	25	100	220	45	135
Future Volume (vph)	50	1645	10	40	1595	50	170	25	100	220	45	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0	3.0	4.0		4.0	4.0	
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.88		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1676	3315		1644	3358	1471	1693	1569		3317	1580	
Flt Permitted	0.08	1.00		0.06	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	140	3315		102	3358	1471	1693	1569		3317	1580	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	51	1679	10	41	1628	51	173	26	102	224	46	138
RTOR Reduction (vph)	0	0	0	0	0	20	0	91	0	0	71	0
Lane Group Flow (vph)	51	1689	0	41	1628	31	173	37	0	224	113	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						
Actuated Green, G (s)	82.0	78.8		82.0	78.8	78.8	13.5	13.5		17.1	17.1	
Effective Green, g (s)	83.0	80.2		82.0	80.2	80.2	14.5	13.5		17.1	17.1	
Actuated g/C Ratio	0.64	0.62		0.63	0.62	0.62	0.11	0.10		0.13	0.13	
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4	3.0	3.0		2.3	2.3	
Lane Grp Cap (vph)	133	2045		102	2071	907	188	162		436	207	
v/s Ratio Prot	c0.01	c0.51		0.01	0.48		c0.10	0.02		0.07	c0.07	
v/s Ratio Perm	0.23			0.24		0.02						
v/c Ratio	0.38	0.83		0.40	0.79	0.03	0.92	0.23		0.51	0.54	
Uniform Delay, d1	35.2	19.4		40.6	18.5	9.7	57.2	53.5		52.6	52.8	
Progression Factor	0.38	0.21		0.47	0.46	0.50	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	2.4		1.0	2.1	0.0	43.5	0.7		0.6	2.0	
Delay (s)	14.1	6.4		20.1	10.6	4.9	100.7	54.2		53.2	54.8	
Level of Service	В	Α		С	В	Α	F	D		D	D	
Approach Delay (s)		6.6			10.7			80.9			53.9	
Approach LOS		Α			В			F			D	
Intersection Summary												
•			40.0		ON 4 0000	l accel af	O a m si a a					
HCM 2000 Control Delay	!		18.3	Н	CIVI 2000	Level of	Service		В			
HCM 2000 Volume to Cap	acity ratio		0.79		uma afla	1 1 line 5 (-)			10.0			
Actuated Cycle Length (s)			130.0		um of lost				16.0			
Intersection Capacity Utiliz	ation		80.8%	IC	U Level	of Service	! 		D			
Analysis Period (min)			15									

Analysis Period (min) c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ሻ	^	7	ሻ	^	7	ሻ	f)		1/1	ĵ.		
Traffic Volume (veh/h)	125	1625	210	55	1450	95	115	80	35	210	55	165	
Future Volume (veh/h)	125	1625	210	55	1450	95	115	80	35	210	55	165	
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		0.99	1.00		0.98	
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 Approac	ch	No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1758	1758	1758	1800	1800	1800	
Adj Flow Rate, veh/h	126	1641	0	56	1465	96	116	81	35	212	56	167	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
Percent Heavy Veh, %	2	2	2	4	4	4	3	3	3	0	0	0	
Cap, veh/h	420	2226		232	1638	713	184	118	51	256	30	90	
Arrive On Green	0.41	1.00	0.00	0.03	0.48	0.48	0.11	0.10	0.10	0.08	0.08	0.08	
Sat Flow, veh/h	1688	3331	1502	1661	3383	1473	1674	1160	501	3326	393	1173	
Grp Volume(v), veh/h	126	1641	0	56	1465	96	116	0	116	212	0	223	
Grp Sat Flow(s),veh/h/li		1666	1502	1661	1692	1473	1674	0	1661	1663	0	1567	
Q Serve(g_s), s	0.0	0.0	0.0	2.5	51.2	4.7	8.6	0.0	8.8	8.2	0.0	10.0	
Cycle Q Clear(g_c), s	0.0	0.0	0.0	2.5	51.2	4.7	8.6	0.0	8.8	8.2	0.0	10.0	
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.30	1.00		0.75	
Lane Grp Cap(c), veh/h		2226		232	1638	713	184	0	169	256	0	121	
V/C Ratio(X)	0.30	0.74		0.24	0.89	0.13	0.63	0.00	0.69	0.83	0.00	1.85	
Avail Cap(c_a), veh/h	420	2226		234	1639	714	476	0	460	256	0	121	
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	0.53	0.53	0.00	0.46	0.46	0.46	1.00	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/vel		0.0	0.0	19.8	30.5	18.5	55.4	0.0	56.4	59.2	0.0	60.0	
Incr Delay (d2), s/veh	0.1	1.2	0.0	0.1	4.0	0.2	2.2	0.0	3.0	19.2	0.0	412.7	
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	
%ile BackOfQ(50%),vel		0.4	0.0	0.9	20.7	1.6	3.8	0.0	3.9	4.2	0.0	17.8	
Unsig. Movement Delay					•								
LnGrp Delay(d),s/veh	30.2	1.2	0.0	19.9	34.5	18.7	57.6	0.0	59.3	78.3	0.0	472.7	
LnGrp LOS	С	Α		В	С	В	E	A	E	E	A	F	
Approach Vol, veh/h		1767	Α		1617			232			435		
Approach Delay, s/veh		3.3			33.0			58.5			280.5		
Approach LOS		Α			С			Е			F		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc)) s7 0	90.9		14.0	31.8	66.9		17.3					
Change Period (Y+Rc),		* 5.4		4.0	* 5.4	* 5.4		4.0					
Max Green Setting (Gm		* 63		10.0	* 5	* 62		36.0					
Max Q Clear Time (g_c		2.0		12.0	2.0	53.2		10.8					
Green Ext Time (p_c), s		59.0		0.0	0.1	8.3		0.8					
	3 0.0	33.0		0.0	0.1	0.0		0.0					
Intersection Summary													
HCM 6th Ctrl Delay			48.1										
HCM 6th LOS			D										

Notes

^{*} HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ች	^	7		^	7	*	₽		*	f.		
Traffic Volume (veh/h)	80	1640	180	70	1370	295	90	5	25	265	145	85	
Future Volume (veh/h)	80	1640	180	70	1370	295	90	5	25	265	145	85	
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		0.98	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 Approac		No	1.00	1.00	No	1.00	1.00	No	1.00	1.00	No	1.00	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786	
Adj Flow Rate, veh/h	82	1673	184	71	1398	301	92	5	26	270	148	87	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1	
Cap, veh/h	127	1408	626	375	1675	834	115	30	155	216	191	112	
Arrive On Green	0.04	0.42	0.42	0.19	0.57	0.57	0.07	0.12	0.13	0.13	0.18	0.19	
							1701		1275			619	
Sat Flow, veh/h	1688	3367	1498	1647	2941	1465		245		1701	1053		
Grp Volume(v), veh/h	82	1673	184	71	1398	301	92	0	31	270	0	235	
Grp Sat Flow(s),veh/h/li		1683	1498	1647	1470	1465	1701	0	1520	1701	0	1672	
Q Serve(g_s), s	3.4	46.0	6.6	0.0	42.9	12.3	5.9	0.0	2.0	14.0	0.0	14.7	
Cycle Q Clear(g_c), s	3.4	46.0	6.6	0.0	42.9	12.3	5.9	0.0	2.0	14.0	0.0	14.7	
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.84	1.00		0.37	
Lane Grp Cap(c), veh/h		1408	626	375	1675	834	115	0	185	216	0	303	
V/C Ratio(X)	0.65	1.19	0.29	0.19	0.83	0.36	0.80	0.00	0.17	1.25	0.00	0.78	
Avail Cap(c_a), veh/h	127	1408	626	375	1675	834	186	0	414	216	0	486	
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)	0.55	0.55	0.55	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/vel	h 28.3	32.0	11.4	36.3	19.4	12.8	50.6	0.0	43.1	48.0	0.0	42.8	
Incr Delay (d2), s/veh	5.3	89.0	0.7	0.1	5.1	1.2	7.7	0.0	0.3	143.7	0.0	2.6	
Initial Q Delay(d3),s/veh	n 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%),vel	h/ln1.5	34.9	2.3	1.6	15.2	4.2	2.8	0.0	0.8	14.6	0.0	6.3	
Unsig. Movement Delay	y, s/veh	1											
LnGrp Delay(d),s/veh	33.6	121.0	12.1	36.4	24.5	14.0	58.2	0.0	43.4	191.7	0.0	45.4	
LnGrp LOS	С	F	В	D	С	В	Е	Α	D	F	Α	D	
Approach Vol, veh/h		1939			1770			123			505		
Approach Delay, s/veh		106.9			23.2			54.5			123.7		
Approach LOS		F			C			D			F		
Timer - Assigned Phs	1	2	3	4	5	6	7	8					
Phs Duration (G+Y+Rc)), 24.6	50.0	11.4	23.9	8.0	66.6	18.0	17.4					
Change Period (Y+Rc),		4.8	4.0	4.5	4.0	4.0	4.0	4.5					
Max Green Setting (Gm		45.2	12.0	31.5	4.0	46.0	14.0	29.5					
Max Q Clear Time (g_c		48.0	7.9	16.7	5.4	44.9	16.0	4.0					
Green Ext Time (p_c), s		0.0	0.0	0.7	0.0	1.1	0.0	0.1					
Intersection Summary													
HCM 6th Ctrl Delay			73.2										
HCM 6th LOS			Е										
Notes													

User approved pedestrian interval to be less than phase max green.

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	ሻ	7	Ť	4	\$	ODIN
Traffic Vol, veh/h	5	60	15	395	380	5
Future Vol, veh/h	5	60	15	395	380	5
Conflicting Peds, #/hr	1	1	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	180	0	150	-	_	-
Veh in Median Storage		_	-	0	0	_
Grade, %	0	_	_	0	0	_
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	1	1	3	3
Mvmt Flow	5	63	16	416	400	5
	Minor2		Major1		Major2	
Conflicting Flow All	854	406	407	0	-	0
Stage 1	405	-	-	-	-	-
Stage 2	449	-	-	-	-	-
Critical Hdwy	6.44	6.24	4.11	-	-	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy		3.336		-	-	-
Pot Cap-1 Maneuver	326	641	1157	-	-	-
Stage 1	669	-	-	-	-	-
Stage 2	639	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	320	639	1155	-	-	-
Mov Cap-2 Maneuver	320	-	-	-	-	-
Stage 1	658	-	-	-	-	-
Stage 2	638	-	-	-	-	-
Approach	EB		NB		SB	
	11.7		0.3		0	
HCM Control Delay, s HCM LOS	11.7 B		0.5		U	
HCWI LOS	D					
Minor Lane/Major Mvn	nt	NBL	NBT	EBLn1 E	EBLn2	SBT
Capacity (veh/h)		1155	-	320	639	-
HCM Lane V/C Ratio		0.014	-	0.016	0.099	-
HCM Control Delay (s)		8.2	0	16.4	11.3	-
HCM Lane LOS		Α	Α	С	В	-
HCM 95th %tile Q(veh)	0	-	0.1	0.3	-

Intersection						
Int Delay, s/veh	17					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	₩.	וטוי	1\D1	HOIL	JDL Š	↑ ↑
Traffic Vol, veh/h	185	85	505	245	15	670
Future Vol, veh/h	185	85	505	245	15	670
Conflicting Peds, #/hr	0	2	0	0	0	0/0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-		-	None
Storage Length	0	-	_	-	125	-
Veh in Median Storage			0	_	123	0
Grade, %	, # 0 0	<u>-</u>	0	_	_	0
Peak Hour Factor	95	95	95	95	95	95
	4	4			3	3
Heavy Vehicles, %			1	1		
Mvmt Flow	195	89	532	258	16	705
Major/Minor I	Minor1	N	Major1	ı	Major2	
Conflicting Flow All	1046	663	0	0	790	0
Stage 1	661	-	_	-	-	_
Stage 2	385	_	_	_	_	_
Critical Hdwy	6.66	6.26	_	_	4.145	_
Critical Hdwy Stg 1	5.46	-	_	_	-	<u>-</u>
Critical Hdwy Stg 2	5.86	_	_	_	_	_
Follow-up Hdwy	3.538		_		2.2285	_
Pot Cap-1 Maneuver	235	456	_	- 2	822	_
Stage 1	508	430	_	_	022	_
Stage 2	653		-	_		-
	000	-	-	-	-	-
Platoon blocked, %	004	455	-	-	000	-
Mov Cap-1 Maneuver	231	455	-	-	822	-
Mov Cap-2 Maneuver	231	-	-	-	-	-
Stage 1	508	-	-	-	-	-
Stage 2	641	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s			0		0.2	
HCM LOS	F		U		0.2	
HCIVI LOS	Г					
Minor Lane/Major Mvm	nt	NBT	NBRV	VBLn1	SBL	SBT
Capacity (veh/h)		_	_	273	822	_
HCM Lane V/C Ratio		-	_	1.041		-
HCM Control Delay (s)		_		106.6	9.5	_
HCM Lane LOS		-	-	F	Α	_
HCM 95th %tile Q(veh))	-	_	11	0.1	-

Intersection						
Intersection Delay, s/veh	221.9					
Intersection LOS	F					
Movement	EBL	EDD	NIDI	NDT	CDT	CDD
Movement		EBR *	NBL	NBT	SBT	SBR
Lane Configurations	100		GE.	4	950	7
Traffic Vol, veh/h	100	255	65	650	850	5
Future Vol, veh/h Peak Hour Factor	100	255	65	650	850	5
	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	105	268	68	684	895	5
Number of Lanes	1	1	0	1	1	1
Approach	EB		NB		SB	
Opposing Approach			SB		NB	
Opposing Lanes	0		2		1	
Conflicting Approach Left	SB		EB			
Conflicting Lanes Left	2		2		0	
Conflicting Approach Right	NB				EB	
Conflicting Lanes Right	1		0		2	
HCM Control Delay	18.1		203.4		322	
HCM LOS	С		F		F	
Lane		NBLn1	EBLn1	EBLn2	SBLn1	SBLn2
Lane Vol Left, %		NBLn1	EBLn1 100%	EBLn2	SBLn1	SBLn2
Vol Left, % Vol Thru, %		9%	100%	0%	0%	0%
Vol Left, % Vol Thru, % Vol Right, %		9% 91% 0%	100% 0% 0%	0% 0% 100%	0% 100% 0%	0% 0% 100%
Vol Left, % Vol Thru, %		9% 91%	100% 0%	0% 0%	0% 100%	0% 0%
Vol Left, % Vol Thru, % Vol Right, % Sign Control		9% 91% 0% Stop	100% 0% 0% Stop	0% 0% 100% Stop	0% 100% 0% Stop	0% 0% 100% Stop
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane		9% 91% 0% Stop 715	100% 0% 0% Stop 100	0% 0% 100% Stop 255	0% 100% 0% Stop 850	0% 0% 100% Stop 5
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol		9% 91% 0% Stop 715 65	100% 0% 0% Stop 100	0% 0% 100% Stop 255 0	0% 100% 0% Stop 850	0% 0% 100% Stop 5
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol		9% 91% 0% Stop 715 65 650	100% 0% 0% Stop 100 100 0	0% 0% 100% Stop 255 0 0	0% 100% 0% Stop 850 0 850	0% 0% 100% Stop 5 0
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate		9% 91% 0% Stop 715 65	100% 0% 0% Stop 100 100	0% 0% 100% Stop 255 0	0% 100% 0% Stop 850 0	0% 0% 100% Stop 5 0
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp		9% 91% 0% Stop 715 65 650 0 753	100% 0% 0% Stop 100 100 0 0 105	0% 0% 100% Stop 255 0 0 255 268 7	0% 100% 0% Stop 850 0 850 0 895	0% 0% 100% Stop 5 0 0 5 5
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X)		9% 91% 0% Stop 715 65 650 0 753 4	100% 0% 0% Stop 100 100 0 0 105 7	0% 0% 100% Stop 255 0 0 255 268 7 0.514	0% 100% 0% Stop 850 0 850 0 895 7	0% 0% 100% Stop 5 0 0 5 5 7
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd)		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422	100% 0% 0% Stop 100 100 0 0 105 7 0.237 9.469	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203	0% 100% 0% Stop 850 0 850 0 895 7 1.66	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes	100% 0% 0% Stop 100 100 0 0 105 7 0.237 9.469 Yes	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes	0% 100% 0% Stop 850 0 850 0 895 7 1.66 7.144 Yes	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes 497	100% 0% 0% Stop 100 0 0 105 7 0.237 9.469 Yes 382	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes 443	0% 100% 0% Stop 850 0 850 0 895 7 1.66 7.144 Yes 519	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes 561
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes 497 5.422	100% 0% 0% Stop 100 0 0 105 7 0.237 9.469 Yes 382 7.169	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes 443 5.903	0% 100% 0% Stop 850 0 850 7 1.66 7.144 Yes 519 4.844	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes 561 4.123
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes 497 5.422 1.515	100% 0% 0% Stop 100 0 0 105 7 0.237 9.469 Yes 382 7.169 0.275	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes 443 5.903 0.605	0% 100% 0% Stop 850 0 850 7 1.66 7.144 Yes 519 4.844 1.724	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes 561 4.123 0.009
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio HCM Control Delay		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes 497 5.422	100% 0% 0% Stop 100 100 0 105 7 0.237 9.469 Yes 382 7.169 0.275 15.1	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes 443 5.903 0.605	0% 100% 0% Stop 850 0 850 7 1.66 7.144 Yes 519 4.844 1.724 323.8	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes 561 4.123 0.009 9.2
Vol Left, % Vol Thru, % Vol Right, % Sign Control Traffic Vol by Lane LT Vol Through Vol RT Vol Lane Flow Rate Geometry Grp Degree of Util (X) Departure Headway (Hd) Convergence, Y/N Cap Service Time HCM Lane V/C Ratio		9% 91% 0% Stop 715 65 650 0 753 4 1.376 7.422 Yes 497 5.422 1.515 203.4	100% 0% 0% Stop 100 0 0 105 7 0.237 9.469 Yes 382 7.169 0.275	0% 0% 100% Stop 255 0 0 255 268 7 0.514 8.203 Yes 443 5.903 0.605	0% 100% 0% Stop 850 0 850 7 1.66 7.144 Yes 519 4.844 1.724	0% 0% 100% Stop 5 0 0 5 5 7 0.009 6.423 Yes 561 4.123 0.009

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					4î∌		ሻ	†			f)		
Traffic Volume (veh/h)	0	0	0	55	1390	15	250	50	0	0	100	25	
Future Volume (veh/h)	0	0	0	55	1390	15	250	50	0	0	100	25	
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)				1.00		0.99	1.00		1.00	1.00		0.99	
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	h				No			No			No		
Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772	
Adj Flow Rate, veh/h				58	1463	16	263	53	0	0	105	26	
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2	
Cap, veh/h				68	1811	21	441	612	0	0	473	117	
Arrive On Green				0.55	0.55	0.55	0.58	0.58	0.00	0.00	0.35	0.35	
Sat Flow, veh/h				124	3284	38	1289	1772	0	0	1369	339	
Grp Volume(v), veh/h				805	0	732	263	53	0	0	0	131	
Grp Sat Flow(s), veh/h/ln	1			1724	0	1723	1289	1772	0	0	0	1708	
Q Serve(g_s), s				43.2	0.0	36.5	17.5	1.5	0.0	0.0	0.0	6.0	
Cycle Q Clear(g_c), s				43.2	0.0	36.5	23.5	1.5	0.0	0.0	0.0	6.0	
Prop In Lane				0.07	^	0.02	1.00	040	0.00	0.00	^	0.20	
Lane Grp Cap(c), veh/h				950	0	950	441	612	0	0	0	590	
V/C Ratio(X)				0.85	0.00	0.77	0.60	0.09	0.00	0.00	0.00	0.22	
Avail Cap(c_a), veh/h				1003	0	1002	441	612	0	0	0	590	
HCM Platoon Ratio				1.00	1.00	1.00	1.67	1.67	1.00	1.00	1.00	1.00	
Upstream Filter(I)				1.00	0.00	1.00	0.87 22.5	0.87 15.5	0.00	0.00	0.00	1.00 25.5	
Uniform Delay (d), s/veh Incr Delay (d2), s/veh	l			9.2	0.0	6.0	5.1	0.2	0.0	0.0	0.0	0.1	
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh				19.1	0.0	15.7	5.1	0.6	0.0	0.0	0.0	2.5	
Unsig. Movement Delay				13.1	0.0	10.7	J. I	0.0	0.0	0.0	0.0	2.0	
LnGrp Delay(d),s/veh	, 3/ (6)			30.0	0.0	25.3	27.6	15.8	0.0	0.0	0.0	25.7	
LnGrp LOS				C	Α	20.5 C	27.0 C	В	Α	Α	Α	C	
Approach Vol, veh/h					1537			316		- / \	131		
Approach Delay, s/veh					27.7			25.7			25.7		
Approach LOS					C			C			C		
Timer - Assigned Phs				4		6		8					
Phs Duration (G+Y+Rc)	•			42.0		64.7		42.0					
Change Period (Y+Rc),				42.0		4.0		42.0					
Max Green Setting (Gm				38.0		64.0		38.0					
Max Q Clear Time (g_c+	, .			8.0		45.2		25.5					
Green Ext Time (p_c), s				0.4		15.4		1.1					
u = 7:				U. T		10.7		1+1					
Intersection Summary			0= 0										
HCM 6th Ctrl Delay			27.3										
HCM 6th LOS			С										

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		41₽	7					†	7	ች	†		
Traffic Volume (veh/h)	80	1320	520	0	0	0	0	225	295	85	70	0	
Future Volume (veh/h)	80	1320	520	0	0	0	0	225	295	85	70	0	
Initial Q (Qb), veh	0	0	0_0		<u> </u>		0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	•	1.00				1.00		0.98	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	
Work Zone On Approach		No	1.00				1.00	No	1.00	1.00	No	1.00	
	1772	1772	1772				0	1772	1772	1730	1730	0	
Adj Flow Rate, veh/h	84	1389	0				0	237	311	89	74	0	
	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2				0.50	2	2	5	5	0.50	
Cap, veh/h	107	1853					0	451	375	111	620	0	
	0.57	0.57	0.00				0.00	0.25	0.25	0.02	0.12	0.00	
Sat Flow, veh/h	188	3258	1502				0.00	1772	1473	1647	1730	0.00	
	789	684	0				0	237	311	89	74	0	
Grp Volume(v), veh/h													
Grp Sat Flow(s), veh/h/ln		1683	1502				0	1772	1473	1647	1730	0.0	
(6-):	38.4	32.5	0.0				0.0	12.7	21.9	5.9	4.2		
(6_)	38.4	32.5	0.0				0.0	12.7	21.9	5.9	4.2	0.0	
	0.11	057	1.00				0.00	454	1.00	1.00	000	0.00	
Lane Grp Cap(c), veh/h		957					0	451	375	111	620	0	
` '	0.79	0.71					0.00	0.53	0.83	0.80	0.12	0.00	
	1002	957	4.00				0	451	375	165	676	0	
	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00	
Upstream Filter(I)	1.00	1.00	0.00				0.00	0.93	0.93	0.98	0.98	0.00	
Uniform Delay (d), s/veh		17.2	0.0				0.0	35.3	38.7	53.0	33.0	0.0	
Incr Delay (d2), s/veh	6.2	4.6	0.0				0.0	4.0	17.6	11.3	0.1	0.0	
Initial Q Delay(d3),s/veh		0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh		13.3	0.0				0.0	5.8	9.5	2.9	1.8	0.0	
Unsig. Movement Delay,													
1 3 ()	24.7	21.8	0.0				0.0	39.3	56.4	64.3	33.0	0.0	
LnGrp LOS	С	С					Α	D	E	E	С	Α	
Approach Vol, veh/h		1473	Α					548			163		
Approach Delay, s/veh		23.4						49.0			50.1		
Approach LOS		С						D			D		
Timer - Assigned Phs		2		4			7	8					
Phs Duration (G+Y+Rc),	. S	66.6		43.4			11.4	32.0					
Change Period (Y+Rc),		4.0		4.0			4.0	4.8					
Max Green Setting (Gma		59.0		43.0			11.0	27.2					
Max Q Clear Time (g_c+		40.4		6.2			7.9	23.9					
Green Ext Time (p_c), s		14.8		0.2			0.0	0.7					
Intersection Summary													
HCM 6th Ctrl Delay			31.8										
HCM 6th LOS			C C										
Notes													

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		^	- 7		^	- 7		Þ			ĵ.		
Traffic Volume (veh/h)	155	1365	130	10	1175	20	90	25	10	135	20	150	
Future Volume (veh/h)	155	1365	130	10	1175	20	90	25	10	135	20	150	
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 Approac		No	4770	4700	No	4700	1000	No	4000	4750	No	4750	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758	
Adj Flow Rate, veh/h	163	1437	137	11	1237	21	95	26	11	142	21	158	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	7	7	7	0	0	0	3	3	3	
Cap, veh/h	366	1887	841	192	1494	666	193	254	108	331	38	283	
Arrive On Green	0.22	0.56	0.56	0.12	0.46	0.46	0.21	0.21	0.20	0.21	0.21	0.20	
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	1259	1201	508	1399	178	1339	
Grp Volume(v), veh/h	163	1437	137	11	1237	21	95	0	37	142	0	179	
Grp Sat Flow(s),veh/h/li		1683	1500	1621	1617	1442	1259	0	1709	1399	0	1517	
Q Serve(g_s), s	9.2	36.0	4.9	0.7	36.7	0.9	8.1	0.0	1.9	10.1	0.0	11.7	
Cycle Q Clear(g_c), s	9.2	36.0	4.9	0.7	36.7	0.9	19.8	0.0	1.9	12.0	0.0	11.7	
Prop In Lane	1.00	4007	1.00	1.00	4.40.4	1.00	1.00	^	0.30	1.00	^	0.88	
Lane Grp Cap(c), veh/h		1887	841	192	1494	666	193	0	362	331	0	321	
V/C Ratio(X)	0.44	0.76	0.16	0.06	0.83	0.03	0.49	0.00	0.10	0.43	0.00	0.56	
Avail Cap(c_a), veh/h	366	2121	945	192	1640	732	203	0	376	342	0	334	
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 48.1	0.00	1.00 35.1	1.00	0.00	1.00 39.4	
Uniform Delay (d), s/vel	0.5	18.5 3.0	11.7	43.0 0.1	25.8 5.4	16.1 0.1	1.5	0.0	0.1	0.7	0.0	1.6	
Incr Delay (d2), s/veh Initial Q Delay(d3),s/veh		0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),vel		14.3	1.7	0.0	14.3	0.0	2.6	0.0	0.0	3.5	0.0	4.5	
Unsig. Movement Delay			1.7	0.5	14.5	0.5	2.0	0.0	0.0	3.5	0.0	4.5	
LnGrp Delay(d),s/veh	37.8	21.5	12.1	43.1	31.2	16.2	49.5	0.0	35.2	40.9	0.0	40.9	
LnGrp LOS	D	C C	12.1 B	73.1 D	C C	В	D	Α	D	D	Α	40.5 D	
Approach Vol, veh/h		1737			1269			132			321		
Approach Delay, s/veh		22.3			31.0			45.5			40.9		
Approach LOS		C C			C C			43.3 D			D		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc)		65.7		27.3	27.9	54.8		27.3					
Change Period (Y+Rc),		4.0		5.5	4.5	4.0		5.5					
Max Green Setting (Gm	, ,	69.3		22.7	17.5	55.8		22.7					
Max Q Clear Time (g_c		38.0		14.0	11.2	38.7		21.8					
Green Ext Time (p_c), s	8 0.0	23.7		0.7	0.2	12.2		0.0					
Intersection Summary													
HCM 6th Ctrl Delay			28.1										
HCM 6th LOS			С										

Intersection								
Int Delay, s/veh	5.3							
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations	^	7	ች	^	ሻ	7		
Traffic Vol, veh/h	1390	100	110	1220	25	85		
Future Vol, veh/h	1390	100	110	1220	25	85		
Conflicting Peds, #/hr	0	0	0	0	0	0		
Sign Control	Free	Free	Free	Free	Stop	Stop		
RT Channelized	-		-	None	-	None		
Storage Length	_	100	300	-	0	0		
Veh in Median Storage		-	-	0	0	-		
Grade, %	0	_	_	0	0	_		
Peak Hour Factor	95	95	95	95	95	95		
Heavy Vehicles, %	2	2	6	6	0	0		
Mvmt Flow	1463	105	116	1284	26	89		
WIVIIIL FIOW	1403	105	110	1204	20	09		
Major/Minor I	Major1	ı	Major2	N	Minor1			
Conflicting Flow All	0	0	1568	0	2337	732		
Stage 1	-	-	1000	-	1463	132		
Stage 2	-		•	-	874	-		
Critical Hdwy	-	-	4.22	-	6.8	6.9		
	_	_	4.22	_	5.8	0.9		
Critical Hdwy Stg 1		-	-		5.8			
Critical Hdwy Stg 2	-	-	-	-		-		
Follow-up Hdwy	-	-	2.26	-	3.5	3.3		
Pot Cap-1 Maneuver	-	-	398	-	32	368		
Stage 1	-	-	-	-	183	-		
Stage 2	-	-	-	-	373	-		
Platoon blocked, %	-	-	000	-		000		
Mov Cap-1 Maneuver	-	-	398	-	~ 23	368		
Mov Cap-2 Maneuver	-	-	-	-	~ 23	-		
Stage 1	-	-	-	-	183	-		
Stage 2	-	-	-	-	264	-		
Approach	EB		WB		NB			
HCM Control Delay, s	0		1.5		122.9			
HCM LOS					F			
Minor Lane/Major Mvm	nt 1	NBLn11	NBLn2	EBT	EBR	WBL	WBT	
Capacity (veh/h)		23	368	-	-	398	-	
HCM Lane V/C Ratio		1.144	0.243	-	-	0.291	-	
HCM Control Delay (s)	\$	479.7	17.9	-	-	17.7	-	
HCM Lane LOS		F	С	-	_	С	-	
HCM 95th %tile Q(veh))	3.4	0.9	-	-	1.2	-	
Notes								
~: Volume exceeds car	nacity	\$· De	lav evo	eeds 30	10s	+. Com	putation Not Defined	*: All major volume in platoon
. Volumo oxocous ca	Judity	ψ. υ	hay one		000	· · · · · · · ·	Patation Not Donned	. 7 iii major volume in piatoon

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		^	7	7	ħβ			4			4	
Traffic Volume (veh/h)	130	1350	5	100	1240	0	5	5	100	5	0	100
Future Volume (veh/h)	130	1350	5	100	1240	0	5	5	100	5	0	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	4.00	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	4750	No	4770	4770	No	4740	4770	No	4770	4000	No	4000
Adj Sat Flow, veh/h/ln	1758	1758	1772	1772	1716	1716	1772	1772	1772	1800	1723	1800
Adj Flow Rate, veh/h	137	1421	5	106	1305	0.05	5	5	105	5	0.05	105
Peak Hour Factor	0.95	0.95	0.94	0.94	0.95	0.95	0.95 2	0.95 2	0.95 2	0.95	0.95	0.95
Percent Heavy Veh, %	ა 177	2488	1119	136	6 2347	6 0	82	0	4	0 82	2	0
Cap, veh/h Arrive On Green	0.11	0.75	0.75	0.08	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	1674	3340	1502	1688	3346	0.00	77	77	1614	78	0.00	1641
·	137	1421	5	1066	1305	0	115	0	0	110	0	
Grp Volume(v), veh/h Grp Sat Flow(s),veh/h/ln	1674	1670	1502	1688	1630	0	1768	0	0	1719	0	0
Q Serve(g_s), s	3.7	8.7	0.0	2.8	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.7	8.7	0.0	2.8	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane	1.00	0.7	1.00	1.00	0.0	0.00	0.04	0.0	0.91	0.05	0.0	0.95
Lane Grp Cap(c), veh/h	177	2488	1119	136	2347	0.00	86	0	0.51	86	0	0.33
V/C Ratio(X)	0.77	0.57	0.00	0.78	0.56	0.00	1.34	0.00	0.00	1.28	0.00	0.00
Avail Cap(c_a), veh/h	656	5089	2288	551	4754	0.00	969	0.00	0.00	938	0.00	0.00
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	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	20.0	2.6	1.5	20.7	3.0	0.0	23.0	0.0	0.0	23.0	0.0	0.0
Incr Delay (d2), s/veh	5.3	0.4	0.0	6.9	0.4	0.0	166.7	0.0	0.0	141.6	0.0	0.0
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	1.4	0.2	0.0	1.1	0.1	0.0	4.8	0.0	0.0	4.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.3	3.0	1.5	27.6	3.4	0.0	189.7	0.0	0.0	164.6	0.0	0.0
LnGrp LOS	С	Α	Α	С	Α	Α	F	Α	Α	F	Α	Α
Approach Vol, veh/h		1563			1411			115			110	
Approach Delay, s/veh		5.0			5.3			189.7			164.6	
Approach LOS		Α			Α			F			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.9	37.1		0.0	7.7	38.2		0.0				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	18.0	67.0		23.0	15.0	70.0		23.0				
Max Q Clear Time (g_c+l1), s	5.7	10.6		0.0	4.8	10.7		0.0				
Green Ext Time (p_c), s	0.2	20.0		0.0	0.2	23.6		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			17.2									
HCM 6th LOS			В									

Intersection													
Int Delay, s/veh	21.3												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	*	^	7	*	↑ ↑			4					
Traffic Vol, veh/h	5	1450	5	100	1335	25	5	5	100	10	0	0	
Future Vol, veh/h	5	1450	5	100	1335	25	5	5	100	10	0	0	
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	
RT Channelized	-	_	None	_	_	None	_	_	None	_	_	None	
Storage Length	150	_	100	150	_	-	_	_	-	0	_	-	
√eh in Median Storage,		0	-	_	0	_	_	0	_	_	0	_	
Grade, %	_	0	_	_	0	_	_	0	_	_	0	_	
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95	
leavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	
Nymt Flow	5	1526	5	105	1405	26	5	5	105	11	0	0	
VIVIIIL FIOW	J	1320	5	103	1405	20	3	5	105	- 11	U	U	
Major/Minor N	/lajor1		ı	Major2		N	/linor1		N	Minor2			
Conflicting Flow All	1431	0	0	1531	0	0	2449	3177	763	2404	_	_	
Stage 1	1431	-		1001	-	-	1536	1536	703	1628		-	
•	_		-	-		-	913	1641	-	776			
Stage 2		-	-	4 4 4	-	-					-	-	
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	-	-	
Critical Hdwy Stg 1	-	-	-		-	-	6.54	5.54	-	6.54	-	-	
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	-	-	
ollow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	-	-	
ot Cap-1 Maneuver	471	-	-	431	-	-	16	10	347	17	0	0	
Stage 1	-	-	-	-	-	-	121	176	-	106	0	0	
Stage 2	-	-	-	-	-	-	294	156	-	356	0	0	
Platoon blocked, %		-	-		-	-						-	
Mov Cap-1 Maneuver	471	-	-	431	-	-	13	7	347	~ 4	-	-	
Mov Cap-2 Maneuver	-	-	-	-	-	-	13	7	-	~ 4	-	-	
Stage 1	-	-	-	-	-	-	120	174	-	105	-	-	
Stage 2	-	-	-	-	-	-	222	118	-	238	-	-	
Approach	EB			WB			NB			SB			
HCM Control Delay, s	0			1.1		\$	357.9		\$ 2	2367.8			
HCM LOS						·	F		•	F			
Minor Lane/Major Mvmt	t N	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)		79	471	_	-	431	-	-	4				
HCM Lane V/C Ratio		1.466		-	_	0.244	_	_	2.632				
HCM Control Delay (s)	\$	357.9	12.7	_	_	16	_		2367.8				
HCM Lane LOS	Ψ	F	В	_	_	C	_	Ψ 2 -	F				
HCM 95th %tile Q(veh)		9.3	0	-	_	0.9	_	_	2.4				
Notes													
	a alle i	ф. D	alasz	d - 0/	20-	0 - :-	andell.	Net D	مانم د دا	*. A !!		alues s	n nlata
~: Volume exceeds cap	acity	\$: D6	elay exc	eeas 30	JUS	+: Com	putation	ו אסנ ט	etinea	": All	major v	/oiume i	in platoon

	۶	→	•	•	←	•	4	†	~	>	ļ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	₽		ሻ	1>		ሻ	↑	7	7	↑	7
Traffic Volume (veh/h)	40	30	135	240	105	30	30	300	415	10	470	15
Future Volume (veh/h)	40	30	135	240	105	30	30	300	415	10	470	15
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		0.99
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	1800	1800	1800	1772	1772	1772	1772	1772	1772	1758	1758	1758
Adj Flow Rate, veh/h	42	32	142	253	111	32	32	316	437	11	495	16
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	2	2	2	2	2	2	3	3	3
Cap, veh/h	378	43	193	436	355	102	302	728	614	337	693	584
Arrive On Green	0.03	0.15	0.15	0.15	0.27	0.27	0.03	0.41	0.41	0.01	0.39	0.39
Sat Flow, veh/h	1714	288	1277	1688	1322	381	1688	1772	1494	1674	1758	1482
Grp Volume(v), veh/h	42	0	174	253	0	143	32	316	437	11	495	16
Grp Sat Flow(s),veh/h/ln	1714	0	1565	1688	0	1703	1688	1772	1494	1674	1758	1482
Q Serve(g_s), s	1.2	0.0	6.2	6.8	0.0	3.9	0.7	7.4	14.2	0.2	13.8	0.4
Cycle Q Clear(g_c), s	1.2	0.0	6.2	6.8	0.0	3.9	0.7	7.4	14.2	0.2	13.8	0.4
Prop In Lane	1.00		0.82	1.00		0.22	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	378	0	236	436	0	458	302	728	614	337	693	584
V/C Ratio(X)	0.11	0.00	0.74	0.58	0.00	0.31	0.11	0.43	0.71	0.03	0.71	0.03
Avail Cap(c_a), veh/h	438	0	565	499	0	820	371	1158	977	434	1149	969
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.8	0.0	23.6	15.7	0.0	17.0	12.1	12.3	14.3	11.2	14.8	10.8
Incr Delay (d2), s/veh	0.1	0.0	3.3	1.0	0.0	0.3	0.1	0.9	3.3	0.0	2.9	0.0
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	0.0	2.3	2.4	0.0	1.4	0.2	2.5	4.6	0.1	5.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.9	0.0	26.9	16.7	0.0	17.3	12.2	13.1	17.5	11.2	17.8	10.8
LnGrp LOS	В	A	С	В	A	В	В	В	В	В	В	<u>B</u>
Approach Vol, veh/h		216			396			785			522	
Approach Delay, s/veh		25.5			16.9			15.5			17.4	
Approach LOS		С			В			В			В	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	4.7	27.9	12.8	12.8	5.6	26.9	6.0	19.6				
Change Period (Y+Rc), s	4.0	4.8	4.0	4.0	4.0	4.8	4.0	4.0				
Max Green Setting (Gmax), s	4.0	37.2	11.0	21.0	4.0	37.2	4.0	28.0				
Max Q Clear Time (g_c+l1), s	2.2	16.2	8.8	8.2	2.7	15.8	3.2	5.9				
Green Ext Time (p_c), s	0.0	6.9	0.2	0.4	0.0	4.5	0.0	0.4				
Intersection Summary												
HCM 6th Ctrl Delay			17.5									
HCM 6th LOS			В									

Intersection						
Int Delay, s/veh	1.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	\$	LDI	ሻ	<u>₩</u>	HUL	T T
Traffic Vol. veh/h	740	60	210	615	0	15
Future Vol, veh/h	740	60	210	615	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	_	-	150	-	_	0
Veh in Median Storage,		_	-	0	0	_
Grade, %	0	_	_	0	0	_
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	1	1	1	1
Mymt Flow	779	63	221	647	0	16
WWW.CT IOW	110	00		011		10
	/lajor1		Major2		Minor1	
Conflicting Flow All	0	0	842	0	-	811
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.11	-	-	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.209	-	-	3.309
Pot Cap-1 Maneuver	-	-	798	-	0	381
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	798	-	-	381
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Annragah	EB		WB		NB	
Approach						
HCM Control Delay, s	0		2.9		14.9	
HCM LOS					В	
Minor Lane/Major Mvm	t l	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)		381	_	-	798	_
HCM Lane V/C Ratio		0.041	-	-	0.277	-
HCM Control Delay (s)		14.9	-	-	11.2	-
HCM Lane LOS		В	-	-	В	-
HCM 95th %tile Q(veh)		0.1	-	-	1.1	-

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	^	7	ሻ	44	7		4			4	
Traffic Volume (veh/h)	100	1525	5	5	745	165	25	40	10	245	20	30
Future Volume (veh/h)	100	1525	5	5	745	165	25	40	10	245	20	30
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	4	No	4		No		4000	No	1000	4==0	No	4==0
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1744	1603	1603	1603	1772	1772	1772
Adj Flow Rate, veh/h	105	1605	5	5	784	0	26	42	11	258	21	32
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	4	4	4	14	14	14	2	2	2
Cap, veh/h	145	1750	780	73	1583	0.00	32	52	14	303	25	38
Arrive On Green	0.09	0.52	0.52	0.04	0.48	0.00	0.07	0.06	0.07	0.22	0.22	0.22
Sat Flow, veh/h	1688	3367	1502	1661	3313	1478	507	818	214	1387	113	172
Grp Volume(v), veh/h	105	1605	5	5	784	0	79	0	0	311	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1502	1661	1657	1478	1540	0	0	1672	0	0
Q Serve(g_s), s	6.2	45.1	0.2	0.3	16.7	0.0	5.2	0.0	0.0	18.4	0.0	0.0
Cycle Q Clear(g_c), s	6.2	45.1	0.2	0.3	16.7	0.0	5.2	0.0	0.0	18.4	0.0	0.0
Prop In Lane	1.00	4750	1.00	1.00	4500	1.00	0.33	•	0.14	0.83	^	0.10
Lane Grp Cap(c), veh/h	145	1750	780	73	1583		97	0	0	365	0	0
V/C Ratio(X)	0.73	0.92	0.01	0.07	0.50		0.81	0.00	0.00	0.85	0.00	0.00
Avail Cap(c_a), veh/h	229	1765	787	73	1583	4.00	97	0	0	552	0	0
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	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	45.9 4.2	22.7 8.4	11.9 0.0	47.2 0.2	18.4 0.5	0.0	47.5 36.8	0.0	0.0	38.7 8.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh %ile BackOfQ(50%),veh/ln	2.6	17.0	0.0	0.0	5.7	0.0	3.0	0.0	0.0	8.3	0.0	0.0
Unsig. Movement Delay, s/veh		17.0	0.1	0.1	5.7	0.0	3.0	0.0	0.0	0.3	0.0	0.0
LnGrp Delay(d),s/veh	50.1	31.1	11.9	47.5	18.9	0.0	84.3	0.0	0.0	46.7	0.0	0.0
LnGrp LOS	D	01.1 C	11.3 B	47.3 D	10.9 B	0.0	04.5 F	Α	Α	40.7 D	Α	Α
Approach Vol, veh/h	<u> </u>	1715	D	ט	789	А	ı	79		ט	311	
Approach Delay, s/veh		32.2			19.1	A		84.3			46.7	
Approach LOS		32.2 C			19.1 B			04.3 F			40.7 D	
Approach LOS		C			D			Г			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.8	53.2		26.5	8.5	57.5		10.5				
Change Period (Y+Rc), s	4.5	7.0		5.0	4.5	7.0		4.5				
Max Green Setting (Gmax), s	13.5	41.5		33.0	4.0	51.0		6.0				
Max Q Clear Time (g_c+l1), s	8.2	18.7		20.4	2.3	47.1		7.2				
Green Ext Time (p_c), s	0.1	7.3		1.1	0.0	3.5		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			31.6									
HCM 6th LOS			С									

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ሻ	^	7	ሻሻ	^	7	ሻሻ	†	7	ሻ	†	7	
Traffic Volume (veh/h)	300	670	450	235	635	365	185	250	315	40	145	150	
Future Volume (veh/h)	300	670	450	235	635	365	185	250	315	40	145	150	
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 Approac		No			No		1100	No		,,,,,	No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1744	1744	1772	1786	1772	1786	1772	1772	1772	
Adj Flow Rate, veh/h	316	705	474	247	668	384	195	263	332	42	153	158	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	4	4	2	1	2	1	2	2	2	
Cap, veh/h	447	1461	1015	296	1306	750	761	402	343	203	214	181	
Arrive On Green	0.13	0.43	0.43	0.18	0.79	0.76	0.23	0.23	0.23	0.12	0.12	0.12	
Sat Flow, veh/h	1688	3367	1502	3222	3313	1502	3300	1772	1512	1688	1772	1502	
Grp Volume(v), veh/h	316	705	474	247	668	384	195	263	332	42	153	158	
Grp Sat Flow(s), veh/h/l		1683	1502	1611	1657	1502	1650	1772	1512	1688	1772	1502	
Q Serve(g_s), s	14.2	19.5	19.4	9.6	9.3	13.3	6.3	17.5	28.3	2.9	10.8	13.4	
Cycle Q Clear(g_c), s	14.2	19.5	19.4	9.6	9.3	13.3	6.3	17.5	28.3	2.9	10.8	13.4	
Prop In Lane	1.00	10.0	1.00	1.00	0.0	1.00	1.00	17.5	1.00	1.00	10.0	1.00	
Lane Grp Cap(c), veh/h		1461	1015	296	1306	750	761	402	343	203	214	181	
V/C Ratio(X)	0.71	0.48	0.47	0.83	0.51	0.51	0.26	0.65	0.97	0.21	0.72	0.87	
Avail Cap(c_a), veh/h	614	1461	1015	397	1306	750	761	402	343	234	245	208	
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	
	1.00	1.00	1.00	0.83	0.83	0.83	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I) Uniform Delay (d), s/ve		26.4	10.0	52.1	9.3	7.7	40.9	45.6	49.8	51.6	55.0	56.2	
• • • •	1.8	1.1	1.5	8.0	1.2	2.1	0.1	3.3	39.8	0.4	7.4	27.6	
Incr Delay (d2), s/veh Initial Q Delay(d3),s/vel		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	
• • • • • • • • • • • • • • • • • • • •		7.6	11.8	3.8	2.5	3.5	2.6	8.0	14.3	1.3	5.3	6.4	
%ile BackOfQ(50%),ve			11.0	3.0	2.3	3.3	2.0	0.0	14.3	1.3	ე.ა	0.4	
Unsig. Movement Delay	•	27.5	11.5	60.1	10.5	9.7	41.0	48.9	89.6	51.9	62.4	83.7	
LnGrp Delay(d),s/veh	20.9												
LnGrp LOS	С	C 1405	В	<u>E</u>	1200	A	D	700	F	D	E 252	<u> </u>	
Approach Vol, veh/h		1495			1299			790			353		
Approach Delay, s/veh		21.0			19.7			64.1			70.7		
Approach LOS		С			В			Е			Е		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc), \$5.9	60.4		19.7	21.1	55.2		34.0					
Change Period (Y+Rc),		6.0		4.0	4.0	6.0		4.5					
Max Green Setting (Gr		48.0		18.0	30.0	34.0		29.5					
Max Q Clear Time (g_c		21.5		15.4	16.2	15.3		30.3					
Green Ext Time (p_c),		15.5		0.2	0.9	15.8		0.0					
Intersection Summary				,									
HCM 6th Ctrl Delay			33.7										
HCM 6th LOS			C										
Notes													
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User approved pedestrian interval to be less than phase max green.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	∱ ∱		Ť	^	7	7	4î		ሻሻ	f)	
Traffic Volume (vph)	50	965	10	55	920	50	190	25	145	220	45	135
Future Volume (vph)	50	965	10	55	920	50	190	25	145	220	45	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	3.5	4.0		4.0	4.0	4.0	3.0	4.0		4.0	4.0	
Lane Util. Factor	*1.00	*0.94		1.00	*0.97	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.87		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1676	3313		1644	3358	1471	1693	1555		3317	1580	
Flt Permitted	0.24	1.00		0.21	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	422	3313		361	3358	1471	1693	1555		3317	1580	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	51	985	10	56	939	51	194	26	148	224	46	138
RTOR Reduction (vph)	0	0	0	0	0	22	0	126	0	0	98	0
Lane Group Flow (vph)	51	995	0	56	939	29	194	48	0	224	86	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2			6		6						
Actuated Green, G (s)	77.3	72.6		76.1	72.0	72.0	19.2	19.2		16.7	16.7	
Effective Green, g (s)	78.3	74.0		76.1	73.4	73.4	20.2	19.2		16.7	16.7	
Actuated g/C Ratio	0.60	0.57		0.59	0.56	0.56	0.16	0.15		0.13	0.13	
Clearance Time (s)	4.0	5.4		4.0	5.4	5.4	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4	3.0	3.0		2.3	2.3	
Lane Grp Cap (vph)	304	1885		251	1895	830	263	229		426	202	
v/s Ratio Prot	0.01	c0.30		c0.01	0.28		c0.11	0.03		c0.07	0.05	
v/s Ratio Perm	0.09			0.12		0.02						
v/c Ratio	0.17	0.53		0.22	0.50	0.03	0.74	0.21		0.53	0.43	
Uniform Delay, d1	19.9	17.2		23.3	17.1	12.6	52.4	48.7		52.9	52.2	
Progression Factor	0.58	0.61		0.40	0.46	0.06	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.9		0.2	0.8	0.1	10.3	0.5		8.0	8.0	
Delay (s)	11.7	11.5		9.4	8.6	0.8	62.7	49.2		53.7	53.1	
Level of Service	В	В		Α	Α	Α	Е	D		D	D	
Approach Delay (s)		11.5			8.3			56.3			53.4	
Approach LOS		В			Α			Е			D	
Intersection Summary												
HCM 2000 Control Delay			22.0	H	CM 2000	Level of	Service		С			
HCM 2000 Volume to Capa	city ratio		0.56									
Actuated Cycle Length (s)			130.0	Sı	um of lost	t time (s)			16.0			
Intersection Capacity Utiliza	ation		68.8%			of Service			С			
Analysis Period (min)			15									

c Critical Lane Group

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	*	^	7	*	^	1	*	\$		ሻሻ	ĵ.		
Traffic Volume (veh/h)	130	1105	90	85	775	105	90	70	25	220	50	150	
Future Volume (veh/h)	130	1105	90	85	775	105	90	70	25	220	50	150	
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	_	0.99	1.00		0.99	
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		
	1772	1772	1772	1744	1744	1744	1758	1758	1758	1800	1800	1800	
Adj Flow Rate, veh/h	131	1116	0	86	783	106	91	71	25	222	51	152	
	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
Percent Heavy Veh, %	2	2	2	4	4	4	3	3	3	0	0	0	
Cap, veh/h	634	2049	_	279	1248	543	163	111	39	409	49	145	
	0.57	1.00	0.00	0.05	0.37	0.37	0.10	0.09	0.09	0.12	0.12	0.12	
	1688	3331	1502	1661	3383	1472	1674	1237	436	3326	395	1179	
Grp Volume(v), veh/h	131	1116	0	86	783	106	91	0	96	222	0	203	
Grp Sat Flow(s),veh/h/ln		1666	1502	1661	1692	1472	1674	0	1673	1663	0	1574	
Q Serve(g_s), s	0.0	0.0	0.0	4.7	24.7	6.4	6.7	0.0	7.2	8.2	0.0	16.0	
Cycle Q Clear(g_c), s	0.0	0.0	0.0	4.7	24.7	6.4	6.7	0.0	7.2	8.2	0.0	16.0	
Prop In Lane	1.00	0.0	1.00	1.00	27.1	1.00	1.00	0.0	0.26	1.00	0.0	0.75	
ane Grp Cap(c), veh/h	634	2049	1.00	279	1248	543	163	0	150	409	0	194	
	0.21	0.54		0.31	0.63	0.20	0.56	0.00	0.64	0.54	0.00	1.05	
Avail Cap(c_a), veh/h	634	2049		300	1379	600	476	0.00	463	409	0.00	194	
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
	0.84	0.84	0.00	0.87	0.87	0.87	1.00	0.00	1.00	1.00	0.00	1.00	
Jostiean Filter(I) Jniform Delay (d), s/veh		0.04	0.0	29.6	33.7	27.9	56.0	0.00	57.2	53.6	0.00	57.0	
ncr Delay (d2), s/veh	0.1	0.0	0.0	0.3	2.1	0.7	1.8	0.0	2.8	1.1	0.0	77.8	
nitial 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	
%ile BackOfQ(50%),veh		0.0	0.0	1.9	10.3	2.3	3.0	0.0	3.2	3.5	0.0	10.6	
Jnsig. Movement Delay,			0.0	1.3	10.0	2.0	3.0	0.0	J.Z	0.0	0.0	10.0	
	14.2	0.9	0.0	30.0	35.8	28.6	57.8	0.0	59.9	54.6	0.0	134.8	
LnGrp LOS	В	0.9 A	0.0	30.0 C	55.0 D	20.0 C	57.0 E	Α	59.9 E	D D	Α	F	
Approach Vol, veh/h	U	1247	А	<u> </u>	975			187		U	425	1	
Approach Delay, s/veh		2.3	A		34.5			58.9			92.9		
Approach LOS		2.3 A			34.5 C			50.9 E			92.9 F		
	4			4		^							
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc),		84.0		20.0	42.4	52.0		15.7					
Change Period (Y+Rc),		* 5.4		4.0	* 5.4	* 5.4		4.0					
Max Green Setting (Gma		* 53		16.0	* 9	* 52		36.0					
Max Q Clear Time (g_c+		2.0		18.0	2.0	26.7		9.2					
Green Ext Time (p_c), s	0.0	43.3		0.0	0.2	19.8		0.6					
Intersection Summary													
HCM 6th Ctrl Delay			30.7										
HCM 6th LOS			С										
Notos													

Notes

^{*} HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	ች	^	7	ች	^	1	*	4		*	1		
Traffic Volume (veh/h)	75	1175	90	45	790	210	60	5	15	255	60	90	
Future Volume (veh/h)	75	1175	90	45	790	210	60	5	15	255	60	90	
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	•	0.97	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 Approac		No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1730	1730	1730	1786	1786	1786	1786	1786	1786	
Adj Flow Rate, veh/h	77	1199	92	46	806	214	61	5	15	260	61	92	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Percent Heavy Veh, %	2	2	2	5	5	5	1	1	1	1	1	1	
Cap, veh/h	536	1282	570	425	1037	516	77	36	109	278	137	206	
Arrive On Green	0.24	0.38	0.38	0.22	0.35	0.35	0.05	0.09	0.10	0.16	0.21	0.22	
Sat Flow, veh/h	1688	3367	1498	1647	2941	1464	1701	384	1152	1701	641	967	
Grp Volume(v), veh/h	77	1199	92	46	806	214	61	0	20	260	0	153	
Grp Volume(v), ven/m Grp Sat Flow(s),veh/h/l		1683	1498	1647	1470	1464	1701	0	1536	1701	0	1609	
Q Serve(g_s), s	0.0	37.7	3.5	0.0	26.9	7.7	3.9	0.0	1.3	16.6	0.0	9.1	
Cycle Q Clear(g_c), s	0.0	37.7	3.5	0.0	26.9	7.7	3.9	0.0	1.3	16.6	0.0	9.1	
Prop In Lane	1.00	31.1	1.00	1.00	20.9	1.00	1.00	0.0	0.75	1.00	0.0	0.60	
•		1282	570	425	1037	516	77	0	146	278	0	342	
Lane Grp Cap(c), veh/h	0.14	0.94	0.16	0.11	0.78	0.41	0.79	0.00	0.14	0.93	0.00	0.45	
V/C Ratio(X)	536			425	1123				419	278		570	
Avail Cap(c_a), veh/h		1285	572			559	139	0			1.00		
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)	0.79	0.79	0.79	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/ve		32.7	13.9	33.8	31.7	10.9	52.0	0.0	45.5	45.4	0.0	37.5	
Incr Delay (d2), s/veh	0.1	11.5	0.5	0.1	5.7	2.4	10.3	0.0	0.3	36.4	0.0	0.6	
Initial Q Delay(d3),s/vel		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%),ve		16.6	1.6	1.0	10.3	2.8	1.9	0.0	0.5	9.8	0.0	3.7	
Unsig. Movement Delay	•		440	00.0	07.5	40.0	00.0	0.0	45.0	04.0	0.0	00.4	
LnGrp Delay(d),s/veh	27.0	44.2	14.3	33.9	37.5	13.3	62.3	0.0	45.8	81.9	0.0	38.1	
LnGrp LOS	С	D	В	С	D	В	<u>E</u>	<u>A</u>	D	F	A	D	
Approach Vol, veh/h		1368			1066			81			413		
Approach Delay, s/veh		41.3			32.5			58.2			65.6		
Approach LOS		D			С			Е			Е		
Timer - Assigned Phs	1	2	3	4	5	6	7	8					
Phs Duration (G+Y+Rc) 27 7	45.9	9.0	27.4	30.8	42.8	22.0	14.4					
Change Period (Y+Rc)		4.8	4.0	4.5	4.0	4.0	4.0	4.5					
Max Green Setting (Gn	•	41.2	9.0	38.5	4.0	42.0	18.0	29.5					
Max Q Clear Time (g_c		39.7	5.9	11.1	2.0	28.9	18.6	3.3					
Green Ext Time (p_c),		1.4	0.0	0.6	0.0	9.9	0.0	0.0					
Intersection Summary	0.0	1.7	0.0	0.0	0.0	3.3	0.0	0.0					
			40.0										
HCM 6th Ctrl Delay			42.0										
HCM 6th LOS			D										
Notes													

User approved pedestrian interval to be less than phase max green.

Lane Configurations Traffic Volume (velvh) 0 0 0 280 705 15 395 50 0 0 35 5 Traffic Volume (velvh) 0 0 0 280 705 15 395 50 0 0 35 5 Traffic Volume (velvh) 0 0 0 280 705 15 395 50 0 0 35 5 Traffic Volume (velvh) 0 0 0 280 705 15 395 50 0 0 35 5 Traffic Volume (velvh) 0 0 0 280 705 15 395 50 0 0 35 5 Traffic Volume (velvh) 0 0 0 280 705 15 395 50 0 0 35 5 Traffic Volume (velvh) 0 0 0 0 0 0 0 0 0 0 0 Traffic Volume (velvh) 0 0 0 0 0 0 0 0 0 0 0 0 0 Traffic Volume (velvh) 0 0 0 0 0 0 0 0 0 0 0 0 Traffic Volume (velvh) 0 0 0 0 0 0 0 0 0 0 0 0 Traffic Volume (velvh) 0 0 0 0 0 0 0 0 0 0 0 0 0 Traffic Volume (velvh) 0 0 0 0 0 0 0 0 0 0 0 0 0 Traffic Volume (velvh) 0 0 0 0 0 0 0 0 0 0 0 0 0 Traffic Volume (velvh) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Traffic Volume (velvh) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		۶	→	•	•	←	•	4	†	/	>	ţ	✓	
Traffic Volume (veh/h) 0 0 0 280 705 15 395 50 0 0 35 5 Feature Volume (veh/h) 0 0 0 280 705 15 395 50 0 0 35 5 Feature Volume (veh/h) 0 0 0 280 705 15 395 50 0 0 35 5 Feature Volume (veh/h) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Traffic Volume (veh/h) 0 0 0 280 705 15 395 50 0 0 35 5 Feature Volume (veh/h) 0 0 0 280 705 15 395 50 0 0 35 5 Feature Volume (veh/h) 0 0 0 280 705 15 395 50 0 0 35 5 Feature Volume (veh/h) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Lane Configurations					413		*	^			ĵ.		
Future Volume (veh/h) 0 0 0 280 705 15 395 50 0 0 35 5 Initial Q (Qb), veh 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Traffic Volume (veh/h)	0	0	0	280		15			0	0		5	
Ped-Bike Adj(A_pbT)	Future Volume (veh/h)	0	0	0	280	705	15	395	50	0	0	35	5	
Parking Bus, Adj	Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0	
Work Zone On Ápproach	Ped-Bike Adj(A_pbT)				1.00		0.98	1.00		1.00	1.00		1.00	
Adj Sat Flow, veh/h/In 1730 1730 1730 1730 1730 1772 1772 0 0 1772	Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Flow Rate, veh/h Peak Hour Factor Peak Hour Factor Peak Hour Factor Peak Hour Factor 0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95	Work Zone On Approac	ch				No			No			No		
Peak Hour Factor	Adj Sat Flow, veh/h/ln				1730	1730	1730	1772	1772	0	0	1772	1772	
Percent Heavy Veh, % 5 5 5 2 2 2 0 0 2 2 Cap, veh/h 357 956 21 734 870 0 0 750 101 Arrive On Green 0.39 0.39 0.39 0.39 0.39 0.82 0.82 0.00 0.00 0.49 0.49 Sat Flow, veh/h 910 2439 54 1398 1772 0 0 1527 206 Grp Volume(v), veh/h 546 0 507 416 53 0 0 0 0.00 1734 0 2 Serve(g. s), s 32.1 0.0 28.0 13.1 0.6 0.0 0.0 0.0 1.4 Cycle Q Clear(g. c), s 32.1 0.0 28.0 14.5 0.6 0.0 0.0 0.0 1.4 Cycle Q Clear(g. c), s 32.1 0.0 28.0 14.5 0.6 0.0 0.0 0.0 1.4 Cycle Q Clear(g. c), veh/h 660 0 674 734 870 0 0 0 851 V/C Ratio(X) 0.83 0.00 0.75 0.57 0.06 0.00 0.00 0.00 0.05 Avail Cap(c. a), veh/h 735 0 750 734 870 0 0 0 851 V/C Ratio(X) 0.83 0.00 0.75 0.57 0.06 0.00 0.00 0.00 0.05 Avail Cap(c. a), veh/h 735 0 750 734 870 0 0 0 851 V/C Ratio(X) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Adj Flow Rate, veh/h				295	742	16	416	53	0	0	37	5	
Cap, veh/h Arrive On Green 0.39 0.39 0.39 0.39 0.30 0.30 0.82 0.82 0.00 0.00 0.49 0.49 Sat Flow, veh/h 910 2439 54 1398 1772 0 0 1527 206 Grp Volume(v), veh/h 546 0 507 416 53 0 0 0 42 Grp Sat Flow(s), veh/h/lin 1684 0 1719 1398 1772 0 0 0 1734 2 Serve(g_s), s 32.1 0.0 28.0 13.1 0.6 0.0 0.0 0.0 0.0 1.4 Cycle Q Clear(g_c), s 32.1 0.0 28.0 13.1 0.6 0.0 0.0 0.0 0.0 1.4 Cycle Q Clear(g_c), s 32.1 0.0 28.0 13.1 0.6 0.0 0.0 0.0 0.0 0.0 1.4 Cycle Q Clear(g_c), s 32.1 0.0 28.0 13.1 0.6 0.0 0.0 0.0 0.0 0.0 0.0 1.4 Cycle Q Clear(g_c), s 32.1 0.0 28.0 13.1 0.6 0.0 0.0 0.0 0.0 0.0 0.0 0	Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Arrive On Green	Percent Heavy Veh, %				5	5	5	2	2	0	0	2	2	
Sat Flow, veh/h Grp Volume(v), veh/h 546 0 507 416 53 0 0 0 42 Grp Sat Flow(s), veh/h/h 1684 0 1719 1398 1772 0 0 0 1527 206 Grp Sat Flow(s), veh/h/h 1684 0 1719 1398 1772 0 0 0 0 734 0 2 Serve(g_s), s 32.1 0.0 28.0 13.1 0.0 28.0 13.1 0.0 0.0 0.0 0.0 0.0 1.4 Cycle Q Clear(g_c), s 32.1 0.0 28.0 14.5 0.6 0.0 0.0 0.0 0.0 0.1 4 Cycle Q Clear(g_c), eh/h 660 0 674 734 870 0 0 0 851 V/C Ratio(X) 0.83 0.00 0.75 0.57 0.66 0.00 0.00 0.00 0.05 Avail Cap(c_a), veh/h 735 0 750 734 870 0 0 0 851 V/C Ratio(X) 0.83 0.00 0.75 0.75 0.76 0.76 0.76 0.70 0.0 0.00 0.00 0.00	Cap, veh/h				357	956	21	734	870	0	0	750	101	
Gry Volume(v), veh/h 546 0 507 416 53 0 0 42 Grg Sat Flow(s), veh/h/ln 1684 0 1719 1398 1772 0 0 0 1734 Q Serve(g.s), s 32.1 0.0 28.0 13.1 0.6 0.0 0.0 0.0 1.4 Cycle Q Clear(g.c), s 32.1 0.0 28.0 13.1 0.6 0.0 0.0 0.0 1.4 Prop In Lane 0.54 0.03 1.00 0.00 0.00 0.0 0.12 Lane Grp Cap(c), veh/h 660 0 674 734 870 0 0 851 V/C Ratio(X) 0.83 0.00 0.75 0.57 0.06 0.00 0.00 0.05 Avail Cap(c_a), veh/h 735 0 750 734 870 0 0 851 HCM Platon Ratio 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 <td>Arrive On Green</td> <td></td> <td></td> <td></td> <td>0.39</td> <td>0.39</td> <td>0.39</td> <td>0.82</td> <td>0.82</td> <td>0.00</td> <td>0.00</td> <td>0.49</td> <td>0.49</td> <td></td>	Arrive On Green				0.39	0.39	0.39	0.82	0.82	0.00	0.00	0.49	0.49	
Gry Volume(v), veh/h 546 0 507 416 53 0 0 42 Grp Sat Flow(s), veh/h/ln 1684 0 1719 1398 1772 0 0 0 1734 Q Serve(g_s), s 32.1 0.0 28.0 13.1 0.6 0.0 0.0 0.0 1.4 Cycle Q Clear(g_c), s 32.1 0.0 28.0 14.5 0.6 0.0 0.0 0.0 1.4 Prop In Lane 0.54 0.03 1.00 0.00 0.00 0.0 0.1 V/C Ratio(X) 0.83 0.00 0.75 0.57 0.06 0.00 0.00 0.05 Avail Cap(c_a), veh/h 735 0 750 734 870 0 0 851 HCM Platon 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 1.00 1.00 1.00 1.00 1.00 1.00	Sat Flow, veh/h				910	2439	54	1398	1772	0	0	1527	206	
Grp Sat Flow(s),veh/h/ln Q Serve(g_s), s Q Ser	Grp Volume(v), veh/h				546	0	507	416	53	0	0	0	42	
Q Serve(g_s), s 32.1 0.0 28.0 13.1 0.6 0.0 0.0 0.0 1.4 Cycle Q Clear(g_c), s 32.1 0.0 28.0 14.5 0.6 0.0 0.0 0.0 1.4 Prop In Lane 0.54 0.03 1.00 0.00 0.00 0.00 0.1 Lane Grp Cap(c), veh/h 660 0 674 734 870 0 0 0 851 V/C Ratio(X) 0.83 0.00 0.75 0.57 0.06 0.00 0.00 0.00 0.05 Avail Cap(c_a), veh/h 735 0 750 734 870 0 0 0 851 HCM Platoon Ratio 1.00 1.00 1.00 1.67 1.67 1.00 1.00 1.00 1.00 Upstream Filter(I) 1.00 0.00 1.00 8.66 0.86 0.00 0.00 0.00 0.00 Upstream Filter(I) 1.00 0.00 1.00 8.66 0.86 0.00 0.00 0.00 1.00 Upstream Filter(I) 1.00 0.00 1.00 8.66 0.86 0.00 0.00 0.00 1.00 Upstream Filter(I) 1.00 0.00 1.00 0.86 0.86 0.00 0.00 0.00 1.00 Upstream Filter(I) 1.00 0.00 1.00 0.86 0.86 0.00 0.00 0.00 0.00 1.00 Upstream Filter(I) 1.00 0.00 1.00 0.86 0.86 0.00 0.00 0.00 0.00 0.00 Upstream Filter(I) 1.00 0.00 0.0 0.0 0.00 0.00 0.00 0.00		n												
Cycle Q Clear(g_c), s	Q Serve(g_s), s													
Prop In Lane														
Lane Grp Cap(c), veh/h 660 0 674 734 870 0 0 0 0 851 V/C Ratio(X) 0.83 0.00 0.75 0.57 0.06 0.00 0.00 0.00 0.05 Avail Cap(c_a), veh/h 735 0 750 734 870 0 0 0 0 851 HCM Platoon Ratio 1.00 1.	Prop In Lane													
V/C Ratio(X) 0.83 0.00 0.75 0.57 0.06 0.00 0.00 0.00 0.05 Avail Cap(c_a), veh/h 735 0 750 734 870 0 0 0 851 HCM Platoon Ratio 1.00 1.00 1.00 1.67 1.67 1.00 1.00 1.00 1.00 Upstream Filter(I) 1.00 0.00 1.00 0.86 0.86 0.00 0.00 0.00 1.00 Uniform Delay (d), s/veh 30.1 0.0 28.8 6.6 5.1 0.0 0.0 0.0 1.00 Incr Delay (d2), s/veh 11.4 0.0 7.6 2.7 0.1 0.0)				0			870			0		
Avail Cap(c_a), veh/h Avail Cap(c_a), veh/h HCM Platoon Ratio 1.00 1	V/C Ratio(X)													
HCM Platoon Ratio	. ,													
Upstream Filter(I) 1.00 0.00 1.00 0.86 0.86 0.00 0.00 1.00 Uniform Delay (d), s/veh 30.1 0.0 28.8 6.6 5.1 0.0 0.0 0.0 14.6 Incr Delay (d2), s/veh 11.4 0.0 7.6 2.7 0.1 0.0 0.0 0.0 0.0 Mile BackOfQ(50%), veh/ln 14.9 0.0 12.9 2.7 0.3 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0<														
Uniform Delay (d), s/veh 30.1 0.0 28.8 6.6 5.1 0.0 0.0 14.6 Incr Delay (d2), s/veh 11.4 0.0 7.6 2.7 0.1 0.0 0.0 0.0 0.0 0.0 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.														
Incr Delay (d2), s/veh		h												
Initial Q Delay(d3),s/veh														
%ile BackOfQ(50%),veh/ln 14.9 0.0 12.9 2.7 0.3 0.0 0.0 0.0 0.0 0.0 0.6 Unsig. Movement Delay, s/veh LnGrp Delay(d),s/veh 41.5 0.0 36.4 9.4 5.2 0.0 0.0 0.0 14.6 LnGrp LOS D A D A A A A A B A B Approach Vol, veh/h 1053 469 42 Approach Delay, s/veh 39.0 8.9 14.6 Approach LOS D A B Timer - Assigned Phs 4 6 8 Phs Duration (G+Y+Rc), s 58.0 Change Period (Y+Rc), s 4.0 4.0 4.0 Max Green Setting (Gmax), s 54.0 48.0 54.0 Max Q Clear Time (g_c+I1), s 3.4 34.1 16.5 Green Ext Time (p_c), s 0.1 9.0 29.3		า												
Unsig. Movement Delay, s/veh LnGrp Delay(d),s/veh LnGrp Delay(d),s/veh LnGrp LOS D D A D A D A A A A A B A B Approach Vol, veh/h Approach Delay, s/veh Approach LOS D A A B Timer - Assigned Phs Phs Duration (G+Y+Rc), s Change Period (Y+Rc), s Max Green Setting (Gmax), s Max Green Setting (Gmax), s Green Ext Time (p_c), s 0.1 9.0 29.3														
LnGrp Delay(d),s/veh 41.5 0.0 36.4 9.4 5.2 0.0 0.0 0.0 14.6 LnGrp LOS D A D A A A A A B Approach Vol, veh/h 1053 469 42 42 42 42 42 42 42 42 42 44 44 A B A														
D		, ,			41.5	0.0	36.4	9.4	5.2	0.0	0.0	0.0	14.6	
Approach Vol, veh/h 1053 469 42 Approach Delay, s/veh 39.0 8.9 14.6 Approach LOS D A B Timer - Assigned Phs 4 6 8 Phs Duration (G+Y+Rc), s 58.0 47.1 58.0 Change Period (Y+Rc), s 4.0 4.0 4.0 Max Green Setting (Gmax), s 54.0 48.0 54.0 Max Q Clear Time (g_c+l1), s 3.4 34.1 16.5 Green Ext Time (p_c), s 0.1 9.0 2.2 Intersection Summary HCM 6th Ctrl Delay 29.3														
Approach Delay, s/veh Approach LOS D A B Timer - Assigned Phs 4 6 8 Phs Duration (G+Y+Rc), s Change Period (Y+Rc), s 4.0 4.0 Max Green Setting (Gmax), s 54.0 Max Q Clear Time (g_c+l1), s Green Ext Time (p_c), s 0.1 9.0 29.3														
Approach LOS D A B Timer - Assigned Phs 4 6 8 Phs Duration (G+Y+Rc), s 58.0 47.1 58.0 Change Period (Y+Rc), s 4.0 4.0 4.0 Max Green Setting (Gmax), s 54.0 48.0 54.0 Max Q Clear Time (g_c+l1), s 3.4 34.1 16.5 Green Ext Time (p_c), s 0.1 9.0 2.2 Intersection Summary HCM 6th Ctrl Delay 29.3														
Timer - Assigned Phs 4 6 8 Phs Duration (G+Y+Rc), s 58.0 47.1 58.0 Change Period (Y+Rc), s 4.0 4.0 4.0 Max Green Setting (Gmax), s 54.0 48.0 54.0 Max Q Clear Time (g_c+l1), s 3.4 34.1 16.5 Green Ext Time (p_c), s 0.1 9.0 2.2 Intersection Summary HCM 6th Ctrl Delay 29.3														
Phs Duration (G+Y+Rc), s 58.0 47.1 58.0 Change Period (Y+Rc), s 4.0 4.0 Max Green Setting (Gmax), s 54.0 48.0 54.0 Max Q Clear Time (g_c+l1), s 3.4 34.1 16.5 Green Ext Time (p_c), s 0.1 9.0 2.2 Intersection Summary HCM 6th Ctrl Delay 29.3														
Change Period (Y+Rc), s 4.0 4.0 Max Green Setting (Gmax), s 54.0 48.0 54.0 Max Q Clear Time (g_c+l1), s 3.4 34.1 16.5 Green Ext Time (p_c), s 0.1 9.0 2.2 Intersection Summary HCM 6th Ctrl Delay 29.3														
Max Green Setting (Gmax), s 54.0 48.0 54.0 Max Q Clear Time (g_c+l1), s 3.4 34.1 16.5 Green Ext Time (p_c), s 0.1 9.0 2.2 Intersection Summary HCM 6th Ctrl Delay 29.3	,													
Max Q Clear Time (g_c+l1), s 3.4 34.1 16.5 Green Ext Time (p_c), s 0.1 9.0 2.2 Intersection Summary HCM 6th Ctrl Delay 29.3														
Green Ext Time (p_c), s 0.1 9.0 2.2 Intersection Summary HCM 6th Ctrl Delay 29.3														
Intersection Summary HCM 6th Ctrl Delay 29.3														
HCM 6th Ctrl Delay 29.3	Green Ext Time (p_c), s	3			0.1		9.0		2.2					
HCM 6th Ctrl Delay 29.3	Intersection Summary													
	HCM 6th Ctrl Delay			29.3										
	HCM 6th LOS			C										

,	۶	→	•	•	←	•	1	†	<i>></i>	>	↓	✓	
Movement E	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		414	7					^	7	*	^		
Traffic Volume (veh/h)	85	850	520	0	0	0	0	360	270	15	300	0	
Future Volume (veh/h)	85	850	520	0	0	0	0	360	270	15	300	0	
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0	
	1.00	*	1.00				1.00	•	0.99	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		
	772	1772	1772				0	1772	1772	1730	1730	0	
Adj Flow Rate, veh/h	89	895	0				0	379	284	16	316	0	
	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2				0	2	2	5	5	0	
	153	1613	_				0	644	539	23	716	0	
• •	0.51	0.51	0.00				0.00	0.36	0.36	0.00	0.14	0.00	
	297	3143	1502				0.00	1772	1482	1647	1730	0.00	
	526	458	0				0	379	284	16	316	0	
Grp Sat Flow(s),veh/h/ln1		1683	1502				0	1772	1482	1647	1730	0	
. ,	22.9	20.0	0.0				0.0	19.0	16.6	1.1	18.5	0.0	
	22.9	20.0	0.0				0.0	19.0	16.6	1.1	18.5	0.0	
, (S=):).17	20.0	1.00				0.00	13.0	1.00	1.00	10.5	0.00	
•	902	864	1.00				0.00	644	539	23	716	0.00	
1 1 1 //).58	0.53					0.00	0.59	0.53	0.69	0.44	0.00	
. ,	902	864					0.00	644	539	60	755	0.00	
1 \ - /-	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00	
	1.00	1.00	0.00				0.00	1.00	1.00	1.00	1.00	0.00	
Uniform Delay (d), s/veh 1		17.9	0.00				0.00	28.3	27.6	54.5	35.8	0.00	
, , , , , , , , , , , , , , , , , , , ,	2.8	2.3	0.0				0.0	3.9	3.7	20.0	0.3	0.0	
Incr Delay (d2), s/veh		0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
Initial Q Delay(d3),s/veh		8.2	0.0				0.0	8.4	6.2	0.6	8.6		
%ile BackOfQ(50%),veh/l			0.0				0.0	0.4	0.2	0.0	0.0	0.0	
Unsig. Movement Delay,			0.0				0.0	20.0	24.0	715	26.4	0.0	
• • • • • • • • • • • • • • • • • • • •	21.3	20.2	0.0				0.0	32.2	31.2	74.5	36.1	0.0	
LnGrp LOS	С	С	Δ.				<u> </u>	С	С	E	D	A	
Approach Vol, veh/h		984	Α					663			332		
Approach Delay, s/veh		20.8						31.8			37.9		
Approach LOS		С						С			D		
Timer - Assigned Phs		2		4			7	8					
Phs Duration (G+Y+Rc), s	S	60.5		49.5			5.5	44.0					
Change Period (Y+Rc), s		4.0		4.0			4.0	4.8					
Max Green Setting (Gmax		54.0		48.0			4.0	39.2					
Max Q Clear Time (g_c+l		24.9		20.5			3.1	21.0					
Green Ext Time (p_c), s	٠,, ٥	13.6		0.9			0.0	2.0					
Intersection Summary													
HCM 6th Ctrl Delay			27.4										
HCM 6th LOS			С										
Notes													

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Mayamant				-			,		-	-	•	•	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		^	7	- 1	^	7	*	1		*	ĵ.		
Traffic Volume (veh/h)	190	850	150	10	750	20	100	25	10	50	20	150	
Future Volume (veh/h)	190	850	150	10	750	20	100	25	10	50	20	150	
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	
Nork Zone On Approac		No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1702	1702	1702	1800	1800	1800	1758	1758	1758	
Adj Flow Rate, veh/h	200	895	158	11	789	21	105	26	11	53	21	158	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Percent Heavy Veh, %	2	2	2	7	7	7	0.00	0.00	0.00	3	3	3	
Cap, veh/h	599	2196	979	24	1025	457	203	263	111	341	39	293	
Arrive On Green	0.35	0.65	0.65	0.01	0.32	0.32	0.21	0.22	0.21	0.21	0.22	0.21	
Sat Flow, veh/h	1688	3367	1500	1621	3233	1442	1259	1201	508	1399	178	1339	
Grp Volume(v), veh/h	200	895	158	11	789	21	105	0	37	53	0	179	
Grp Sat Flow(s), veh/h/li		1683	1500	1621	1617	1442	1259	0	1709	1399	0	1517	
. ,	9.5	13.8	4.5	0.7	24.3	1.1	8.9	0.0	1.9	3.5	0.0	11.6	
Q Serve(g_s), s	9.5	13.8	4.5	0.7	24.3	1.1	20.5	0.0	1.9	5.4	0.0	11.6	
Cycle Q Clear(g_c), s		13.0			24.3			0.0			0.0		
Prop In Lane	1.00	0406	1.00	1.00	1005	1.00	1.00	Λ	0.30	1.00	٥	0.88	
_ane Grp Cap(c), veh/h		2196	979	24	1025	457	203	0	374	341	0	332	
V/C Ratio(X)	0.33	0.41	0.16	0.45	0.77	0.05	0.52	0.00	0.10	0.16	0.00	0.54	
Avail Cap(c_a), veh/h	599	2196	979	74	1323	590	236	0	419	378	0	372	
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	0.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/vel		9.1	7.4	53.7	33.9	26.0	47.6	0.0	34.5	36.8	0.0	38.6	
ncr Delay (d2), s/veh	0.2	0.6	0.4	7.9	5.6	0.2	1.5	0.0	0.1	0.2	0.0	1.0	
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	
%ile BackOfQ(50%),vel		5.0	1.5	0.3	10.0	0.4	2.9	0.0	0.8	1.2	0.0	4.4	
Unsig. Movement Delay													
LnGrp Delay(d),s/veh	26.2	9.6	7.8	61.7	39.5	26.2	49.1	0.0	34.5	37.0	0.0	39.7	
LnGrp LOS	С	Α	Α	E	D	С	D	A	С	D	Α	D	
Approach Vol, veh/h		1253			821			142			232		
Approach Delay, s/veh		12.0			39.5			45.3			39.0		
Approach LOS		В			D			D			D		
Timer - Assigned Phs	1	2		4	5	6		8					
Phs Duration (G+Y+Rc)), s5 6	76.3		28.1	43.0	38.9		28.1					
Change Period (Y+Rc),		* 4.5		5.5	4.5	4.0		5.5					
Max Green Setting (Gm		* 66		25.5	25.5	45.0		25.5					
Max Q Clear Time (g_c		15.8		13.6	11.5	26.3		22.5					
Green Ext Time (p_c), s		19.2		0.6	0.4	8.6		0.1					
ntersection Summary													
HCM 6th Ctrl Delay			25.7										
HCM 6th LOS			23.7 C										
Notes													

^{*} HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	0.9					
	EBT	EBR	WBL	WBT	NBL	NBR
		EDR 7	VVDL		INDL T	NDK
Lane Configurations Traffic Vol, veh/h	†† 740	150	1 35	↑↑ 800	1 25	r 40
Future Vol, veh/h	740	150	35	800	25	40
•	0	0	0	000	0	0
Conflicting Peds, #/hr Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	riee -	None	riee -	None	Stop -	None
Storage Length	_	100	300	NOHE -	0	0
Veh in Median Storage, #						
	<i>+</i> 0	- -	-	0	0	-
Grade, %			-			
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	6	6	0	0
Mvmt Flow	779	158	37	842	26	42
Major/Minor Ma	ajor1	N	Major2	N	/linor1	
Conflicting Flow All	0	0	937	0	1274	390
Stage 1	-	-	-	-	779	-
Stage 2	_	_	_	_	495	_
Critical Hdwy	_	_	4.22	_	6.8	6.9
Critical Hdwy Stg 1	_	_	-	_	5.8	-
Critical Hdwy Stg 2	_	_	_	_	5.8	_
Follow-up Hdwy	_	_	2.26	_	3.5	3.3
Pot Cap-1 Maneuver	_	_	703	_	162	614
Stage 1	_	<u>-</u>	-	_	418	-
Stage 2	_	_	_	_	584	_
Platoon blocked, %	_	_		_	JUT	
Mov Cap-1 Maneuver	_	_	703	_	153	614
Mov Cap-1 Maneuver		_		_	153	014
	-	_	-		418	
Stage 1	-	-		-		-
Stage 2	-	-	-	-	553	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.4		19.8	
HCM LOS					С	
Minor Lane/Major Mvmt	N	NBLn11	JRI n2	EBT	EBR	WBL
	T			LDI	LDK	
Capacity (veh/h)		153	614	-	-	703
HCM Cartes Dalay (a)		0.172		-		0.052
HCM Control Delay (s)		33.4	11.3	-	-	10.4
HCM Lane LOS		D	В	-	-	В
HCM 95th %tile Q(veh)		0.6	0.2	-	-	0.2

	۶	→	•	•	←	•	1	†	/	/	+	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		^	7	7	ħβ			4			4	
Traffic Volume (veh/h)	145	630	5	100	745	5	5	5	5	25	0	110
Future Volume (veh/h)	145	630	5	100	745	5	5	5	5	25	0	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	4.00	1.00	1.00	4.00	1.00	1.00	4.00	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	4750	No	4770	4770	No	4740	4770	No	4770	4000	No	4000
Adj Sat Flow, veh/h/ln	1758	1758	1772	1772	1716	1716	1772	1772	1772	1800	1723	1800
Adj Flow Rate, veh/h	153	663	5	106	784	5	5	5	5	26	0.05	116
Peak Hour Factor	0.95	0.95	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	679	3 1754	2 789	704	6 1662	6 11	2	2	2	0 207	2	0 7
Cap, veh/h Arrive On Green	678 0.11	0.53	0.53	0.09	0.50	0.36	235 0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	1674	3340	1502	1688	3321	21	581	581	581	313	0.00	1395
						404				142		
Grp Volume(v), veh/h	153	663	5 1502	106	385		15	0	0	1707	0	0
Grp Sat Flow(s),veh/h/ln	1674 1.1	1670 2.4	0.0	1688 0.8	1630 3.2	1712 3.2	1743 0.0	0.0	0.0	0.0	0.0	0.0
Q Serve(g_s), s	1.1	2.4	0.0	0.8	3.2	3.2	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s Prop In Lane	1.00	2.4	1.00	1.00	3.2	0.01	0.33	0.0	0.0	0.18	0.0	0.82
Lane Grp Cap(c), veh/h	678	1754	789	704	816	857	240	0	0.55	214	0	0.62
V/C Ratio(X)	0.23	0.38	0.01	0.15	0.47	0.47	0.06	0.00	0.00	0.66	0.00	0.00
Avail Cap(c_a), veh/h	2187	10812	4861	1697	4725	4963	2496	0.00	0.00	2385	0.00	0.00
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	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	3.5	2.9	2.3	3.5	3.4	3.4	10.4	0.0	0.0	10.4	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.1	0.0	0.1	0.3	0.3	0.1	0.0	0.0	2.6	0.0	0.0
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	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.6	0.0	0.0
Unsig. Movement Delay, s/veh		0.0	0.0	0.0	•	•	0.0	0.0	0.0	0.0	0.0	0.0
LnGrp Delay(d),s/veh	3.7	3.0	2.3	3.6	3.7	3.7	10.5	0.0	0.0	13.0	0.0	0.0
LnGrp LOS	Α	A	A	Α	Α	Α	В	Α	Α	В	Α	Α
Approach Vol, veh/h		821			895			15			142	
Approach Delay, s/veh		3.1			3.7			10.5			13.0	
Approach LOS		Α			Α			В			В	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	14.4		0.0	5.8	14.9		0.0				
Change Period (Y+Rc), s	4.0	7.0		4.0	4.0	7.0		4.0				
Max Green Setting (Gmax), s	21.0	57.0		27.0	14.0	64.0		27.0				
Max Q Clear Time (g_c+l1), s	3.1	5.2		0.0	2.8	4.4		0.0				
Green Ext Time (p_c), s	0.3	2.2		0.0	0.2	2.2		0.0				
$u = \gamma$	0.0	۷.۷		0.0	0.2	۷.۲		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			4.2									
HCM 6th LOS			Α									

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	^	7	ሻ	↑ ↑			4		ሻ		
Traffic Vol, veh/h	5	650	5	100	840	50	5	5	5	10	0	0
Future Vol, veh/h	5	650	5	100	840	50	5	5	5	10	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	100	150	-	-	-	-	-	0	-	-
Veh in Median Storage,	# -	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	684	5	105	884	53	5	5	5	11	0	0
Major/Minor N	1ajor1		ľ	Major2		N	Minor1		N	Minor2		
Conflicting Flow All	937	0	0	689	0	0	1346	1841	342	1476	-	-
Stage 1	-	-	-	-	-	-	694	694	-	1121	-	-
Stage 2	-	-	-	-	-	-	652	1147	-	355	-	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	-	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	-	-
Pot Cap-1 Maneuver	727	-	-	901	-	-	110	74	654	88	0	0
Stage 1	-	-	-	-	-	-	399	442	-	220	0	0
Stage 2	-	-	-	-	-	-	423	272	-	635	0	0
Platoon blocked, %		-	-		-	-						-
Mov Cap-1 Maneuver	727	-	-	901	-	-	100	65	654	74	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	100	65	-	74	-	-
Stage 1	-	-	-	-	-	-	396	439	-	218	-	-
Stage 2	-	-	-	-	-	-	374	240	-	618	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			1			42.7			61.6		
HCM LOS				•			E			F		
							_					
Minor Lane/Major Mvmt		NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SRI n1			
Capacity (veh/h)		111	727		LDIX	901	-	- VVDIX	74			
HCM Lane V/C Ratio		0.142		-		0.117	-		0.142			
		42.7	10		-	9.5		-	61.6			
HCM Control Delay (s) HCM Lane LOS		42.7 E	A	-		9.5 A	-	-	61.6 F			
HCM 95th %tile Q(veh)		0.5	0	-	-	0.4	-	_	0.5			
HOW SOUT WHILE Q(Ven)		0.5	U	-	-	0.4	-	-	0.5			

SECTION 4. VALUE OF TRAVEL TIME SAVINGS ASSUMPTIONS AND CALCULATIONS

TRAVEL TIME SAVINGS

The memorandum on Benefit Cost Analysis Guidance¹⁸ uses the following value of travel time savings (VTTS) categories:

- Business travel Estimated at \$27.90 for the United States.
- Personal travel Estimated at \$16.50 for the United States.

These categories are averaged using a weight of 88.2% for Personal travel and 11.8% for Business travel resulting in a VTTS for All Purposes of \$17.90.

A comparison of median household income and median employee compensation indicates that the City of Sandy and the Portland-Vancouver-Hillsboro metropolitan area exceed the national level for both categories.

- Business travel Estimated at \$29.64.¹⁹
- Personal travel Estimated at \$17.81.²⁰

These categories were averaged using the same splits for Personal and Business travel resulting in a VTTS of \$19.21.

For truck drivers the recommended rate of \$30.80 (2019 dollars) was used resulted in a 2021 value of \$32.19.

Vehicle occupancy information was averaged from two sources:

- NHTS²¹ 5 p.m. weekday average vehicle occupancy for the Portland-Vancouver-Hillsboro: 1.44
- 2019 American Community Survey²² 5-year estimates workers per car, truck or van for the City of Sandy: 1.07

This results in an estimated average vehicle occupancy of 1.26 for the weekday p.m. peak hour.

²² US Census Bureau, Commuting Characteristics by Sex, S0801



¹⁸ United States Department of Transportation, 2021

¹⁹ Calculated using \$19.83 (2019 dollars) from the Bureau of Labor Statistics median compensation for the State of Oregon and scaled based on the methodology outlined in the Revised Value of Travel Time Guidance (2016). Then finally increased to 2021 dollars.

²⁰ Calculated based on the weighted average of 60% 2019 Sandy household median income and 40% 2019 Oregon household median income. This is based on the assumption that up to 40% of trips using the bypass will not be local. This average was scaled using the methodology outlined in the Revised Value of Travel Time Guidance (2016). Then finally increased to 2021 dollars.

²¹ National Household Travel Survey, 2017

Approximately 1,500 vehicles are estimated to use the proposed bypass during the peak hour with 1,200 through trips and 300 local trips. The individual origin-destination of these local trips is unknown so only the 1,200 through trips were used to evaluate the value of travel time savings (VTTS). Of these 1,200, 720 are eastbound trips and 480 are westbound trips. The percentage of truck drivers is estimated to be 3 percent in the eastbound direction (22 truck drivers) and 4 percent in the westbound direction (19 truck drivers). The final estimated traveler characteristics are shown in Table 1.

TABLE 1: TRAVELER CHARACTERISTICS OF BYPASS USERS

	General Travel	Commercial Drivers
Eastbound	879	22
Westbound	581	19

The bi-directional travel time on the proposed bypass is estimated to be 7 minutes 56 seconds with interchanges at either end of the bypass and a traffic signal at the intersection with OR 211. The eastbound travel time with Alternative #1 is estimated at 13 minutes 20 seconds; the westbound travel time is estimated at 10 minutes 15 seconds.

In the eastbound direction, the estimated travel time savings is 80 person-hours (40%) and in the westbound direction the travel time savings is estimated at 53 person-hours (40%). Using a weighted VTTS of \$19.53 for the eastbound direction and \$19.62 for the westbound direction (to account for commercial drivers) the total travel time savings value is \$2,600 (2021 dollars). Extending this to an annual weekday p.m. total, the value is approximately \$675,000 per year. If weekday p.m. peak hour conditions exist daily (including weekends) then the value of the travel time savings is approximately \$950,000 per year.

SECTION 4. POLICY AND REGULATORY CONSIDERATION MEMO



MEMORANDUM

Task 4.1 Final Policy and Regulatory Considerations Memo

City of Sandy Bypass Feasibility Reevaluation

DATE May 7, 2021

TO Reah Flisakowski, DKS

FROM Darci Rudzinski and Emma Porricolo, APG
CC Kevin Chewuk, and Dock Rosenthal, DKS

INTRODUCTION

This memorandum provides a detailed evaluation of the policy and regulatory considerations associated with a potential bypass of the existing US 26 around the south side of the city of Sandy. A potential US 26 bypass was one of three concepts developed and evaluated during the 2011 Sandy Transportation System Plan (TSP) update to enhance connectivity, provide access to developing lands, and address congestion in the existing US 26 corridor. The bypass option is being reexamined in preparation for the current TSP update as a two-lane facility (one lane in each direction) around the south side of the City with an interchange at the west terminus (a point west of Orient Drive) and an interchange at the east terminus (near Firwood Road). As was the case in the analysis that led to the adoption of the 2011 TSP, a bypass would be part of a package of improvements that would include local system enhancements and highway improvements. The state and local policy and regulatory framework for updating the TSP is reviewed in Technical Memorandum 1: Policy Framework and Code Review. This memorandum is focused only on the additional considerations related to a bypass; the evaluation herein references both the January 2021 Policy Framework and Code Review as well as work developed as part of the 2011 TSP.¹

As noted in the 2011 transportation analysis, the construction of a US 26 bypass around the city of Sandy represents a significant investment in public infrastructure with the potential to impact transportation, urban and rural lands, Goal 5 resources, and the local and regional economy. Demonstration of compliance with several related policies and regulations will need to be addressed if this alternative is pursued and further developed.

ANGELO PLANNING GROUP

¹ Technical Memorandum #3, Transportation Alternatives and Improvement Strategies, February 25, 2011, City of Sandy TSP Update.

The applicable state and local policy documents are:

- Oregon Highway Plan (OHP)
- Oregon Statewide Planning Goals
- Transportation Planning Rule (TPR)

POLICY AND REGULATORY REVIEW

Oregon Highway Plan

Planning for a bypass would be undertaken as a new facility plan² project, developed in partnership with ODOT, the City of Sandy, and Clackamas County consistent with Oregon Highway Plan (OHP) Policy 2A: Partnerships. Ultimately, a facility plan for a new bypass would be adopted by the Oregon Transportation Commission (OTC) as an amendment to the OHP. Planning for new bypasses is governed by OHP Policy 1G: Major Improvements and Policy 1H: Bypasses.

Policy 1G: Major Improvements

Policy 1G states that existing facilities should be maintained and enhanced to improve performance and safety before adding capacity. When developing transportation solutions, the priority is to maintain the existing system first by improving functionality through means such as access management, transportation demand management, and improved traffic operations. Where this strategy is unable to meet the project objectives, the focus should then shift to improvements to efficiency and capacity of existing facilities, followed by adding capacity to existing facilities, and lastly to constructing new facilities.

The construction of a new facility such as a bypass is categorized under the lowest level of priority under this policy. Therefore, the planning process must demonstrate that alternatives that do not include a bypass cannot adequately support safety, growth management, and other livability and economic objectives. As identified in a previous analysis,³ this would include demonstrating that:

- The improvement is needed to satisfy a state transportation objective or objectives.
- The scope of the project is reasonably identified, considering the long-range projection of need.
- The improvement is identified through a planning process that includes:
 - A robust public involvement process;
 - An evaluation of reasonable transportation and land use alternatives including measures for managing the existing transportation system and for reducing demands for highway capacity; and
 - o Sufficient environmental analysis at the fatal flaw analysis level.

² Facility plans are defined as plans developed by ODOT for state highway facilities and include corridor facility plans and transportation refinement plans.

³ The list is from OHP Action 1G.2 and has been modified slightly, both from the OHP source document and from items originally included in Technical Memorandum #3, Transportation Alternatives and Improvement Strategies.

- The plan includes measures to manage the transportation system, and demonstrates that these measures will not satisfy identified highway needs during the planning period or there is a need to preserve a future transportation corridor for future needs beyond the planning period.
- The improvement would be a cost-effective means to achieve the objective(s).
- The proposed timing of the improvement is consistent with priorities established in corridor plans and regional transportation plans.
- Funding for the project can reasonably be expected at the time the project is ready for development and construction.
- Local street improvements proposed as part of the major improvement would be funded through the local transportation financing program.
- The plan includes policies and implementing measures that protect the corridor and its intended function.

Also, Policy 1G: Major Improvements calls for the implementation of a cost-sharing agreement where major improvements benefit the local system.

Policy 1H: Bypasses

Bypasses are highways designed to maintain or increase statewide or regional mobility and they generally divert pass through vehicle trips around a downtown, or an urban or metropolitan area. If a bypass were constructed around Sandy, it is likely to be designed as a limited access facility to protect its functional life as an alternate route around Sandy.

The objectives of the Bypass Policy are:

- To maintain and enhance the utility of the state highway investment,
- To assure land uses that are consistent and compatible with Oregon statewide land use goals,
- To identify the appropriate function of bypasses in the transportation system, and
- To guide the long-term operation of bypasses through agreement on land use and transportation management actions.

In addition, there are actions included in the policy which require:

- ODOT and the affected local governments to identify the need for a bypass in a Transportation System Plan and/or Corridor Plan in a manner consistent with Oregon Highway Plan Policy 1G.
- ODOT and the affected local governments to use a refinement plan and/or a NEPA process to consider alternatives and assess potential impacts.
- Establishment of management agreements between ODOT and the affected local governments to protect the facility investment.
- Design for moderate to high-speed travel, consistent with freeway or expressway facilities.
- Prohibition of direct private property access and a limited number of public access points.
- Development of management plans for new interchanges and other bypass elements.

- Adoption of an acknowledged TSP that incorporates the Oregon Highway Plan Bypass policies.
- Adoption of local ordinances that provide for adequate connectivity to complement the bypass.
- Consideration of re-zoning properties that could adversely impact the facility.
- Consideration of potential local participation in financing.
- Consideration of a jurisdictional transfer of the bypassed highway.

The first bullet in the list above dictates that ODOT, Sandy, and Clackamas County would identify the need for a bypass in a facility plan and/or adopted local transportation system plans (see *Steps to Adoption* in this memorandum). Subsequent steps move into the National Environmental Policy Act (NEPA) process, with decisions becoming more refined as the facility's location and design become more specific. A demonstration of the purpose and need for a US 26 bypass around Sandy would not only provide a basis for studying such an improvement, it is a critical first step in the decision-making process of evaluating alternatives in a manner that complies with NEPA requirements.

As the last bullet in the list implies, a possible outcome of a future bypass would be jurisdictional transfer of the existing US 26 corridor that runs through Sandy from ODOT control to the City. This would shift maintenance responsibilities to the City and future improvements and access would be consistent with a local street functional classification and its associated standards.

Oregon Statewide Planning Goals

Goal 3 and Goal 4

Findings of consistency with the Statewide Planning Goals would need to support the adoption of a bypass facility plan and associated recommended changes to local plans. At least portions of a proposed bypass would be located in the rural lands of Clackamas County. Land south of the City of Sandy, outside the City's urban growth boundary (UGB), would likely include parcels zoned for exclusive farm use (EFU) and forest use (Timber District, TBR). EFU is a state regulated designation that is intended to preserve land for farm- and forest-related uses.

Statewide Planning Goal 3, to preserve and maintain agricultural lands, is implemented by the Oregon Administrative Rule (OAR) 660-033. OAR 660-033-0012, Table 1, identifies transportation facilities and improvements that are permitted on Agricultural lands. Included in the Uses Authorized on Agricultural Lands are transportation improvements on rural lands allowed by OAR 660-012-0065. This is a subsection of the Oregon Transportation Planning Rule (TPR) that identifies transportation improvements that may be allow on rural lands, consistent with Goal 3 and Goal 4, Forest Lands.

Forest lands are also considered a resource land designation and have specific state protections that are implemented through local ordinances. Pursuant to OAR chapter 660, Division 6, the County may allow transportation-related uses in the TBR zone designated lands, including road widening within existing

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rights-of-way in conformance with the transportation element of acknowledged comprehensive plans and public road and highway projects as described in ORS 215.213(1) and 215.283(1).⁴

A new four-lane bypass alignment that impacted EFU or Forest (Timber) lands would require a goal exception. The goal exception would be a reasons exception with findings pursuant to ORS 197.732.⁵ Clackamas County would be the approving body for a goal exception, which would need to be supported by findings of fact and "reasons" statements documenting why state policy – in this case Goal 3 Agricultural Lands and/or Goal 4 Forest Lands, depending on the parcel's zoning – should not apply.

A reasons exception needs to document that there is no alternative area that could reasonably accommodate the improvement and that the long term environmental, economic, social and energy (ESEE) consequences have been evaluated and the proposed roadway and its interchanges have been designed to reduce adverse impacts and, to the extent possible, is compatible with adjacent uses. That analysis must include showing that the solutions to the defined problem cannot be accommodated in any areas that wouldn't require a goal exception, that the proposed improvements' impact on the subject goal exception area are not any worse than those associated with other alternatives, and that the improvements can be designed to minimize adverse impacts. In other words, the proposed transportation improvement must be shown to be compatible with other adjacent uses or will be made so through specified measures to reduce adverse impacts. The County and City may need to show how the adoption of a facility design and associated land use measures minimize the accessibility of rural lands from the proposed bypass and that adoption also supports the continued use of surrounding rural lands.

Goal 5

Goal 5, Natural Resources, Scenic and Historic Areas, and Open Spaces, states that local governments shall "adopt programs that will protect natural resources and conserve scenic, historic, and open space resources for present and future generations." Cities and counties are to maintain inventories for the following:

- Riparian corridors (including water and riparian areas and fish habitat)
- Wetlands
- Wildlife habitat
- Federal wild and scenic rivers
- State scenic waterways
- Groundwater resources
- Approved Oregon recreation trails
- Natural areas
- Wilderness areas

⁴ ORS 215.213(1) and 215.283(1) address uses permitted in exclusive farm use zones; transportation improvements are basically limited on EFU lands to modification, improvement, or realignment of existing roadways and highways.

⁵ https://www.oregonlaws.org/ors/197.732

- Mineral and aggregate
- Energy sources
- Cultural areas

Analysis supporting the 2011 TSP identified constraints to land and public infrastructure development related to Sandy's location at the base of Mt. Hood and the foothills terrain. Environmental and topographic constraints limit options to provide an effective transportation network in specific areas. Constraints include, but are not limited to:

- steep slopes in the northeast that severely limit the feasible expansion of transportation facilities to provide alternate routes to US 26 east of Bluff Road and Tickle Creek; and
- salmon-bearing streams and wetlands running parallel to US 26 along the southern end of the City.

In addition to required Goal 5 inventories, local governments are encouraged to inventory:

- Historic resources
- Open spaces
- Scenic views and sites

The City's TSP supports environmental resource protection through the following adopted Environmental Goal: "Avoid or mitigate transportation project impacts to environmental resources including creeks and wetlands, cultural resources, and wildlife corridors." The TSP also includes protection of scenic resources and the City's historic character under "Community Goals."

Impacts to Goal 5 resources, in particular to those that are mapped and associated with specific County or City protection or mitigation requirements, would be a criterion by which to evaluate proposed bypass alignments. Where mapped Goal 5 lands are impacted, a goal exception may be needed to support the bypass "preferred alternative" - the selected bypass alignment and associated project improvements. The preferred alternative would then be further studied for refinements that could mitigate or minimize any potential impact to Goal 5 resources.

Goal 12, Transportation

Goal 12, Transportation, is implemented by OAR 660 Division 12, known as the Transportation Planning Rule or "TPR." The Clackamas County TSP and the Sandy TSP must be consistent with each other, and both have to be consistent with adopted elements of the state TSP, including the OHP. Cities and counties adopt regional and local TSPs required by the TPR as part of their comprehensive plans.

Transportation Planning Rule (OAR 660-012)

The Transportation Planning Rule (TPR) identifies transportation facilities, services, and improvements that may be permitted on rural lands consistent with Goals 3, 4, 11, and 14 without a goal exception (Transportation Improvements on Rural Lands 660-012-0065). As described in the Goal 3 and Goal 4 section of this memorandum, transportation improvements on rural resource lands are largely limited to modifications, improvements, or realignments of existing roadways and highways. In order to plan for and adopt elements of a bypass facility plan, in the case that the preferred alignment impacts EFU or Forest lands, Clackamas County will need to support adoption with goal exception findings.

STEPS TO ADOPTION

As discussed earlier in this memorandum, a preferred bypass alternative would be documented in a facility plan. Pursuant to OAR 734-051-7010, the OTC ultimately adopts facility plans, thereby amending the OHP. Prior to adoption by the OTC, ODOT, the City of Sandy, and Clackamas County would work collaboratively on developing any amendments to local comprehensive plans and TSPs and local land use and subdivision codes that are necessary to support the plan for the proposed bypass and to ensure that its recommendations are consistent with local plans and codes. While both the state and the local governments adopt the facility plan, or elements thereof, the adoption processes are different and the roles and responsibilities of the different levels of government are not the same.

Both the City of Sandy and Clackamas County would amend their respective TSPs to incorporate elements of the facility plan. In addition to adopting planned improvements on the local systems associated with the bypass and interchanges, local approval may require the adoption of new transportation-related policies, consistent with the findings and supportive of the recommendations of the facility plan. In addition, new ordinances or amendments to existing ordinances, resolutions, and Inter-Governmental Agreements (IGA) may be necessary to ensure that access management, land use management, and coordination elements of the facility plan are achieved. The approval process would include Planning Commission/City Council hearings with the City of Sandy and Planning Commission/County Commission hearings with Clackamas County. As discussed in the previous section, if the preferred bypass alignment impacts County land designated for EFU or Forest use, the County would need to support adoption with goal exception findings. Following successful local adoption by the City and County, the facility plan can be presented to the OTC for its review and approval.

⁶ Note that the adoption action is an amendment to the TSP, the transportation element of the local Comprehensive Plan. The comprehensive plan amendment becomes acknowledged after the 21-day appeal period and no appeals have been filed (see https://www.oregonlaws.org/ors/197.625.)