Transportation Impact Analysis

REDMOND PORCH & PARK

Prepared for:
Main Street Property Group

February 2020

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Introduction

This transportation impact analysis (TIA) identifies potential transportation-related impacts associated with the construction of a mixed-use project located on the triangular parcel of land bounded by Redmond Way, Cleveland Street, and 161st Avenue NE. As necessary, mitigation measures are identified that would reduce or offset significant transportation related impacts that the project may have on the surrounding transportation system.

Project Description

The proposed project is located at 16005 Redmond Way and would include development of up to 86 apartment units, 18,750 square feet of office space, 5,500 square feet of restaurant, and 4,050 square feet of retail. Figure 1 illustrates the site vicinity and surrounding streets. Access to the site is proposed via Cleveland Street. Figure 2 illustrates the preliminary site plan. It is anticipated the development would be constructed and occupied by 2023.

With development of the proposed project, the existing approximate 5,000 square foot retail building and 1,600 square foot restaurant would be demolished. The project is proposing to provide 93 parking stalls within an onsite parking garage. Of the proposed supply, 55 stalls are car stacker stalls and would be reserved for residential or office use, while the remaining 38 are shared between all uses. Additionally, based on agreements with the City 31 stalls would be accessible by the public.

Study Scope

As directed by City of Redmond staff and based on the anticipated vehicular impacts of the proposed project, the following intersections were selected for analysis:

1. Cleveland Street/Redmond Way
2. 161st Avenue NE/Redmond Way
3. 161st Avenue NE/Cleveland Street

In addition, the site access driveway along Cleveland Street was evaluated under with-project conditions.

The scope of the analysis included a review of existing and future without-project conditions in the vicinity of the project site under weekday PM peak hour conditions. This report includes a review of the surrounding street system, transit service, non-motorized facilities, existing and future without-project weekday PM peak hour traffic volumes, traffic operations, and traffic safety. Future (2023) with-project conditions were estimated by adding site-generated traffic to future without-project volumes. The project's impacts on the surrounding transportation system were identified by comparing the future with-project conditions to the future without-project conditions.

Site Vicinity & Study Intersections

Redmond Porch & Park

FIGURE 1

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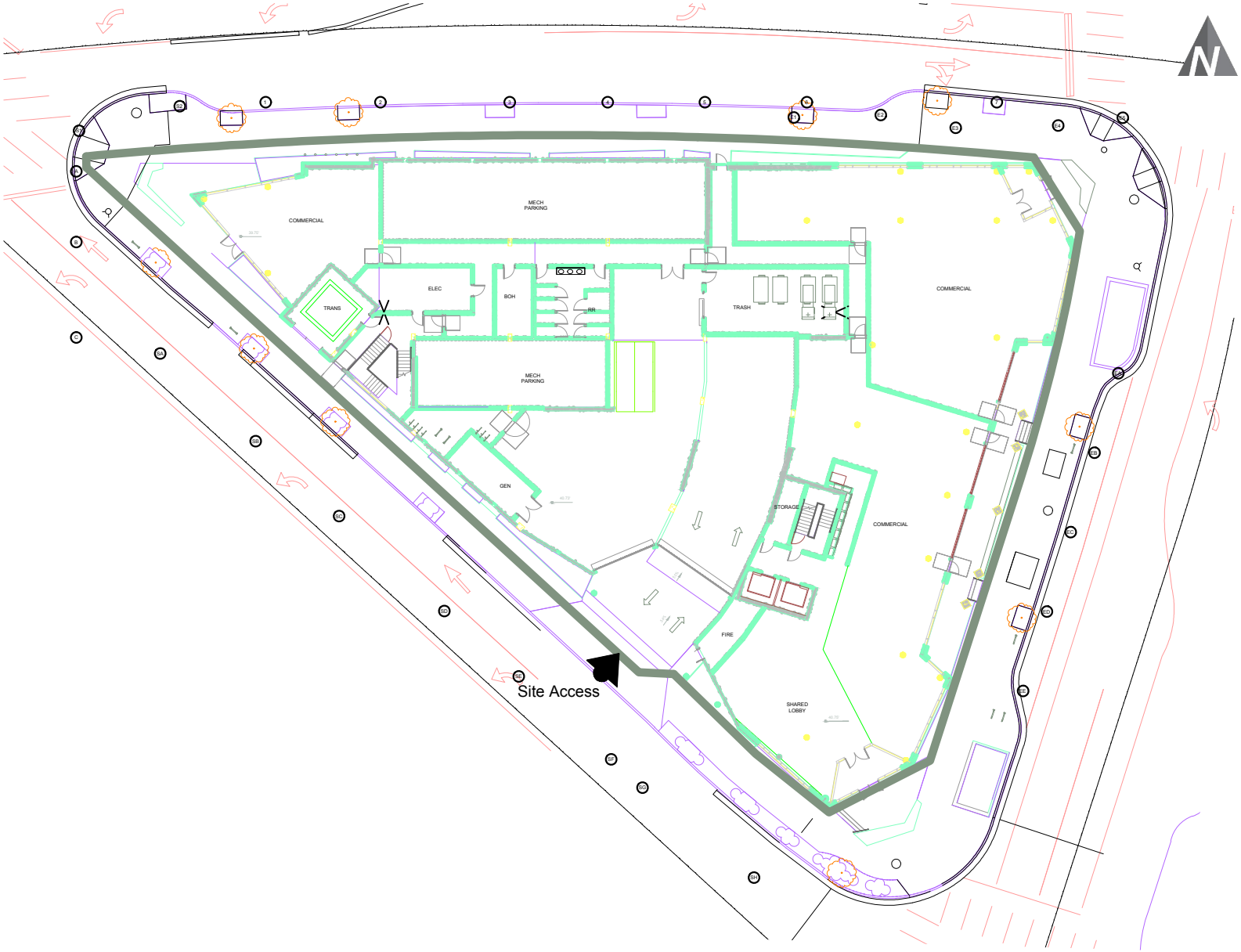

Preliminary Site Plan

Redmond Porch & Park

FIGURE
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Existing & Future Without-Project Conditions

This section describes both existing and future (2023) without-project conditions within the vicinity of the proposed project. Study area characteristics are summarized for the surrounding street system, transit service, non-motorized facilities, existing and future without-project weekday PM peak hour traffic volumes, traffic operations, and traffic safety.

Street System

The following sections describe the existing street network within the vicinity of the proposed project and anticipated changes resulting from planned improvements.

Existing

Characteristics of the existing street system in the project vicinity are described below.

Redmond Way is classified as a principal arterial by the city of Redmond. It is a three to five-lane road in the vicinity of the project with turn-lanes or a two-way left-turn lane provided along much of the roadway. Sidewalks provided along both sides of the roadway with no bicycle facilities. Parking is available along portions of the roadway.

161st Avenue NE is classified as a collector arterial by the city of Redmond. It is a three-lane road with a two-way center left-turn lane in the vicinity of the project. Sidewalks, parking, and bicycle lanes provided along both sides of the roadway.

Cleveland Street is classified as a collector arterial by the city of Redmond. It is a two to three-lane road in the vicinity of the project, with sidewalks provided along both sides of the roadway. Parking is available along the southwest side of the roadway, but no bicycle facilities are provided.

Planned Improvements

Based on a review of the City of Redmond *2019 – 2024 Transportation Improvement Plan (TIP)*, no planned improvements are anticipated to take place in the project area.

Transit Service

The nearest bus stops to the proposed development are located on the east and west side of 161st Avenue NE, less than 500 feet, or a 2 to 3-minute walk, south of the site. Bus transit service in the study area is provided by King County Metro Transit and Sound Transit. In addition, the Redmond Transit Center is located approximately a ¼ mile northeast of the site. Table 1 shows the transit routes that operate within the project vicinity.

Table 1. Existing Transit Service

Route	Times	Weekday Peak Hour Headway (mins)
221 – Redmond Transit Center to Crossroads to Eastgate Park & Ride	Mon – Fri: 4:55 a.m. to 11:55 p.m. Sat: 6:35 a.m. to 9:40 p.m. Sun: 7:45 a.m. to 10:35 p.m.	30
224 – Duvall to Redmond Transit Center	Mon – Fri: 4:55 a.m. to 8:30 p.m.	90
232 – Duvall to Redmond Transit Center to Overlake Transit Center to Bellevue Transit Center	Mon – Fri: 5:20 a.m. to 8:50 a.m. and 3:50 p.m. to 6:15 p.m.	30
243 – Overlake Transit Center to Kenmore Park & Ride	Mon – Fri: 5:30 a.m. to 7:40 a.m. and 5:35 p.m. to 8:00 p.m.	30
248 – Avondale to Redmond Transit Center to Kirkland Transit Center	Mon – Fri: 4:55 a.m. to 11:35 p.m. Sat: 6:05 a.m. to 10:35 p.m. Sun: 6:05 a.m. to 10:35 p.m.	30
542 – Redmond to University District	Mon – Fri: 6:05 a.m. to 10:10 p.m. Sat: 6:35 a.m. to 10:35 p.m. Sun: 6:35 a.m. to 10:35 p.m.	15
545 – Redmond to Downtown Seattle	Mon – Fri: 5:05 a.m. to 12:35 a.m. Sat: 6:20 a.m. to 12:00 a.m. Sun: 6:20 a.m. to 12:00 a.m.	8
930 – Kingsgate Park & Ride to Redmond Town Center	Mon – Fri: 6:00 a.m. to 10:05 a.m. and 2:20 p.m. to 5:50 p.m.	30
931 – UW Bothell to Redmond Transit Center to Downtown Seattle	Mon – Fri: 6:15 a.m. to 10:50 a.m. and 3:15 p.m. to 8:40 p.m.	15 to 30
B-Line – Bellevue Transit Center to Redmond Transit Center	Mon – Fri: 5:00 a.m. to 1:00 a.m. Sat: 6:15 a.m. to 1:00 a.m. Sun: 6:15 a.m. to 1:00 a.m.	10

Source: King County Metro, and Sound Transit, 2019

Planned Improvements

The Sound Transit Link Light Rail is planned to expand into Redmond, opening in 2024, with a station planned near the 166th Avenue NE/Cleveland Street intersection; approximately a 10-minute walk from the project site. Service has yet to be determined but the current Link Light Rail line runs from 5:45 a.m. to 12:15 a.m. with peak hour headways of approximately 6 minutes. It is anticipated that existing transit service will be redistributed to accommodate the development of the light rail.

Non-Motorized Facilities

The following sections summarize existing non-motorized facilities within the study area.

Pedestrian

The study area contains a sidewalk network with sidewalks provided along all of the study area roads in the project vicinity. All intersections in the project vicinity are controlled by traffic signals with full pedestrian crosswalks provided at all study intersections. Based on a review of the City of Redmond *2019 – 2024 Transportation Improvement Plan (TIP),* no specific pedestrian related improvements were identified within the study area.

Bicycle

The Redmond Central Connector is located within 500 feet of the site and provides connections to the nearby Bear Creek and Sammamish River Trails. Within the study area, bicycle lanes are provided along 161st Street NE. Based on a review of the City of Redmond *2019 – 2024 Transportation Improvement Plan (TIP)*, no specific bicycle related improvements were identified within the study area.

Traffic Volumes

The following sections summarize existing and 2023 without-project traffic volumes within the study area.

Existing

Traffic counts were collected at each study intersection in October 2019. Figure 3 illustrates the existing weekday PM peak hour traffic volumes at the study intersections. Volumes are rounded to the nearest 5 vehicles to account for the daily fluctuations in traffic volumes. Detail traffic counts are provided in Appendix A.

Future Without-Project

Future (2023) without-project weekday PM peak hour traffic volumes were estimated by growing existing traffic volumes by two percent per year to 2023 conditions. This growth rate is consistent with other projects completed in the City. In addition to background growth as directed by the City, traffic from 12 pipeline projects were also included in the future without-project volume forecasts. The pipeline projects identified include:

- **Alexan Central Park Apartments**: a mid-rise structure with 195 multifamily units including four live-work units, and 4,100 sq. ft. of retail space
- **Redmond Square:** a mixed-use site with up to 620 multifamily units and 30,375 square feet of commercial and food and beverage space
- **Anderson Park Hotel**: a hotel with 177 rooms and 1,812 sq. ft. of retail space
- **Redmond Way Flats:** a residential development with approximately 102 apartments and 2,100 square feet of retail.
- **Redmond Town Center Apartments**: 6-story multiuse building with approximately 286 residential apartments and 9,100 sq. ft. of ground-level retail
- **Archer Hotel**: a 160-room hotel
- **Bear Creek Mixed-Use**: 190 apartment units and 3 live/work units
- **Blackbird Multifamily**: 155 multifamily units and 3,000 sq. ft. retail space
- **The Osprey**: A six-story multi-use building with approximately 88 residential units and 1,050 square feet of retail.
- **Modera Redmond**: A development containing up to 305 apartment units
- **Modera River Trail**: A mixed-use development containing approximately 233 apartments and 5,020 square feet of ground floor commercial space.
- **Redmond City Center**: A mixed-use development constructing up to 249 apartment units, a 21,820 square foot supermarket, 2,485 square feet of retail, and 100,830 square feet of office.

Figure 4 illustrates the future (2023) without-project weekday PM peak hour traffic volumes.

Existing Weekday PM Peak Hour Traffic Volumes

Redmond Porch & Park

FIGURE
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Future (2023) Without-Project Weekday PM Peak Hour Traffic Volumes

FIGURE 4

Redmond Porch & Park

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Traffic Operations

The operational characteristics of an intersection are determined by calculating the intersection level of service (LOS). For signalized locations, LOS is measured in average delay per vehicle and is reported for the intersections as a whole. At side-street stop-controlled intersections, like the site access, LOS is measured in average delay per vehicle and is reported for the worst operating movement of the intersection. Traffic operations for an intersection can be described alphabetically with a range of levels of service (LOS A through F), with LOS A indicating free-flowing traffic and LOS F indicating extreme congestion and long vehicle delays. Appendix B contains a detailed explanation of LOS criteria and definitions.

Weekday PM peak hour traffic operations for existing and future (2023) without-project conditions were evaluated at the study intersections using the *Synchro 10* software program based on the procedures identified in the *Highway Capacity Manual*, *6th Edition* (HCM 6). Pedestrian and bicycle volumes were taken into account when evaluating the operations of the intersections. Existing signal timing settings were used for and future (2023) without-project conditions.

Existing and forecast (2023) without-project weekday PM peak hour intersection operations are summarized in Table 2. Detailed LOS worksheets for each intersection analysis are included in Appendix C.

Table 2. Existing and Future Weekday PM Peak Hour Intersection LOS Summary

		Existing			2023 Without-Project		
Intersection	**Traffic Control**	**LOS[1]**	**Delay[2]**	**WM[3]**	**LOS**	**Delay**	**WM**
1. Cleveland Street/Redmond Way	Signalized	C	21	-	C	27	-
2. 161st Avenue NE/Redmond Way	Signalized	B	11	-	B	12	-
3. 161st Avenue NE/Cleveland Street	Signalized	B	15	-	B	16	-

Note: TWSC = two-way stop control
1. Level of Service (A – F) as defined by the *Highway Capacity Manual* (TRB, 2010)
2. Average delay per vehicle in seconds.
3. Worst movement (WM) reported for unsignalized intersections only.

As shown in Table 2, all study intersections are anticipated to operate at LOS C or better under existing conditions. Under future (2023) without-project conditions, the study intersections are expected to continue to operate at LOS C or better.

Traffic Safety

Recent collision records were reviewed within the study area to identify if any existing traffic safety issues exist at the study intersections. Collision data for the three most recent calendar years were provided by the Washington State Department of Transportation (WSDOT) (January 1, 2016 and December 31, 2018). The collision history within the study area is summarized in Table 3.

Table 3. Three-Year Collision Summary – 2016 to 2018

Location	Number of Collisions 2015	2016	2017	Total	Annual Average	Collisions per MEV[1]
Intersection						
1. Cleveland Street/Redmond Way	5	3	2	10	3.33	0.37
2. 161st Avenue NE/Redmond Way	5	3	3	11	3.67	0.51
3. 161st Avenue NE/Cleveland Street	2	2	1	5	1.67	0.53
Roadway Segments						
Cleveland Street between Redmond Way and 161st Avenue NE	3	4	0	7	2.33	-
161st Avenue NE between Cleveland Street and Redmond Way	0	0	1	1	0.33	-
Redmond Way between 161st Avenue NE and Cleveland Street	0	1	3	4	1.33	-

Source: WSDOT October 2019
1. Million Entering Vehicles
Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

The collisions per million entering vehicles (MEV) is representative of the number of collisions per one million entering vehicles at each intersection. Intersections with a rate greater than 1.00 collision per MEV are typically considered for further investigation to determine whether an adverse condition exists. As shown in the table, all study intersections are below 1.00 collisions per MEV. The highest number of collisions at a study intersection occurred at 161st Avenue NE/Redmond Way intersection and was most frequently the result of approach turn collisions. The majority of collisions at study intersections resulted in property damage only. Two 2 pedestrians/bicycles collisions were reported, with no report fatalities.

The roadway segment with the highest number of collisions was Cleveland Street between Redmond Way and 161st Avenue NE and was most frequently the result of sidewipe collisions. The majority of collisions at study intersections resulted in property damage only, and no pedestrians or bicycles collisions were reported along roadway segments.

Project Impacts

The following sections summarize the proposed project's impacts on the surrounding street system. First, traffic volumes generated by the proposed project are estimated and then distributed and assigned to adjacent roadways within the study area. Next, project trips are added to future without-project traffic volumes and the potential impact to traffic operations, safety, transit, and non-motorized facilities are identified. Site-specific items are also discussed such as the traffic operations of the site's access driveway and estimated on-site parking demand.

Trip Generation

Trip generation for the proposed mixed-use development is summarized in Table 4. Estimates for the project-generated vehicle trips were calculated using the average rates for Mid-Rise Multifamily Housing (Land Use # 221), Office (LU #710), High-Turnover (Sit-Down) Restaurant (LU #932) and Retail (LU # 820) published by the Institute of Transportation Engineers (ITE) in *Trip Generation* (10th Edition, 2017). As described previously, the proposed project would demolish the existing restaurant (LU #933) and retail (LU #820) uses. Pass-by trips for the restaurant and retail land uses were taken from the *ITE Trip Generation Handbook, 3rd Edition (2014).*

Table 4. Estimated Weekday Vehicle Trip Generation[1]

Land Use	Size	Daily Trips	AM Peak-Hour Trips			PM Peak-Hour Trips		
			In	Out	Total	In	Out	Total
Proposed Use								
Multifamily Housing (Mid-Rise) (LU # 221)	86 DU	468	8	23	31	23	15	38
Office (LU #710)	18,700 sf	182	14	2	16	3	13	16
Restaurant (LU #932)	5,500 sf	617	30	25	55	33	21	54
Less Pass-by		-	-	-	-	*-12*	*-12*	*-24*
Retail (LU #820)	4,041 sf	153	2	2	4	7	8	15
Less Pass-by		-	-	-	-	*-3*	*-3*	*-6*
	Subtotal	*1,420*	*54*	*52*	*106*	*51*	*42*	*93*
Existing Use								
Restaurant (LU #933)	1,600 sf	554	24	16	40	23	22	45
Less Pass-by		-	-	-	-	*-10*	*-10*	*-20*
Retail (LU #820)	4,992 sf	188	3	2	5	9	10	19
Less Pass-by		-	-	-	-	*-3*	*-3*	*-6*
	Subtotal	*742*	*27*	*18*	*45*	*19*	*19*	*38*
Net New Vehicle Trips		**678**	**27**	**34**	**61**	**32**	**23**	**55**

Notes: DU= dwelling unit, sf = square feet
1. Trip generation based on ITE *Trip Generation* (10th Edition, 2017).

As shown in Table 4, after accounting for the existing use on site and pass-by trips, the proposed development is anticipated to generate approximately 678 net new weekday daily vehicle trips, with approximately 61 net new trips occurring during the AM peak hour and 55 during the PM peak hour.

Trip Distribution & Assignment

Weekday PM peak hour vehicular trips associated with the project were distributed to the roadway network based previously approved projects in the area, existing travel patterns, and was coordinated with City of Redmond staff. Trips generated by the project are assigned to the roadway network and are shown in Figure 5.

Traffic Volume Impact

Site generated weekday PM peak hour traffic volumes were added to future without-project volumes at study intersections. The resulting future (2023) with-project peak hour traffic volumes are illustrated in Figure 6. Table 5 summarizes the anticipated increase in total entering traffic at the study intersections as well as the percent of future with-project traffic volumes attributable to the proposed residential project.

Table 5. Traffic Volume Impacts at Study Intersections

Intersection	Weekday PM Peak Hour Total Entering Vehicles			Percent Project Share
	2023 Without-Project	New Project Trips	2023 With-Project	
1. Cleveland Street/Redmond Way	2,800	8	2,808	0.3%
2. 161st Avenue NE/Redmond Way	2,300	5	2,305	0.2%
3. 161st Avenue NE/Cleveland Street	975	47	1,022	4.6%

As shown in Table 5, the project generated traffic volumes are anticipated to be approximately 5 percent or less at each of the off-site intersections. The project would have the greatest impact at the 161st Avenue NE/Cleveland Street intersection.

Traffic Operations Impact

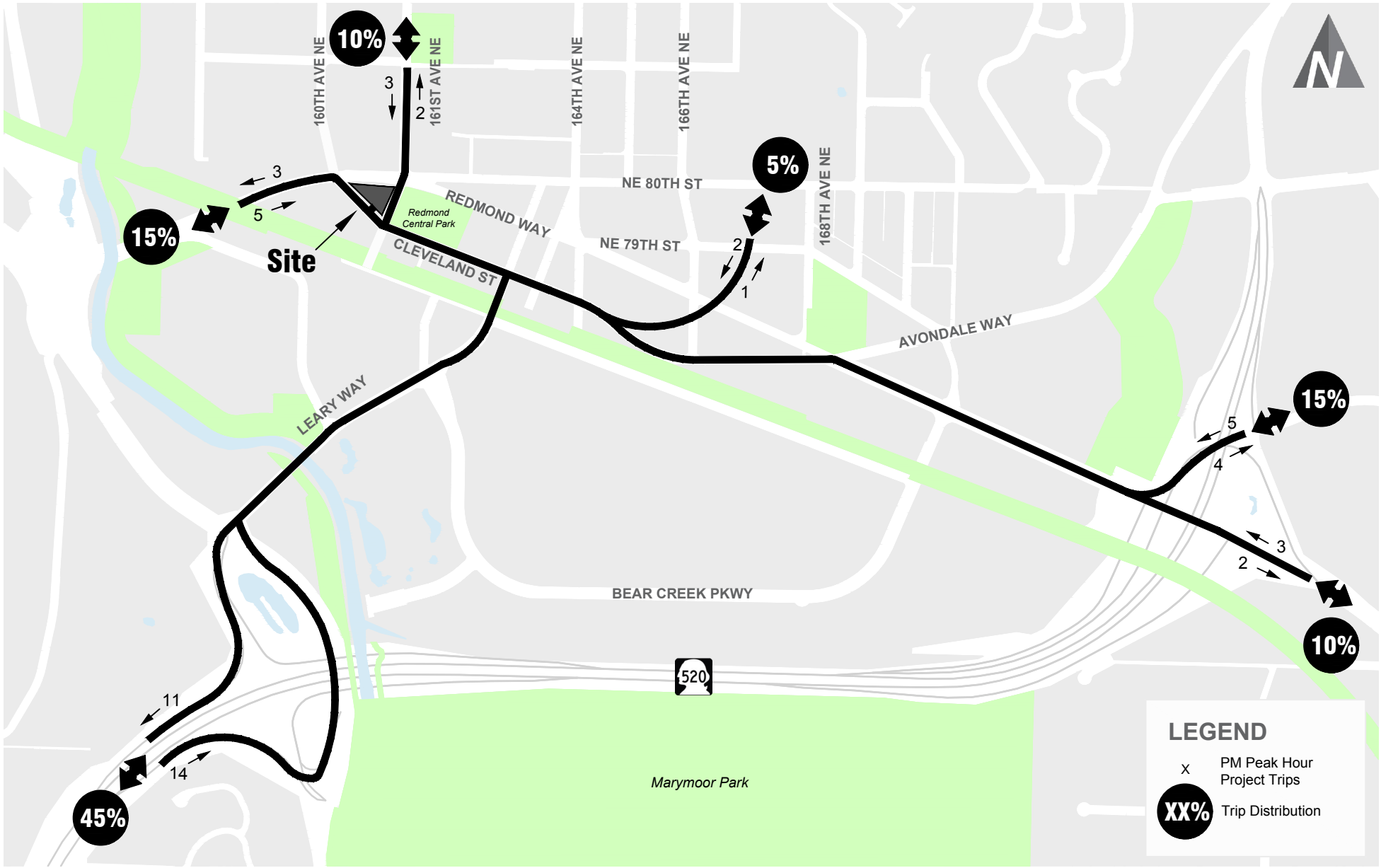
A future (2023) with-project level of service analysis was conducted for the weekday PM peak hour to analyze traffic impacts of the proposed project. The same methodologies were applied as described for existing and future without-project conditions. All intersection parameters such as channelization and intersection control were consistent with those used in the evaluation of future without-project conditions. A comparison of future (2023) without-project and with-project weekday PM peak hour traffic operations is summarized in Table 6. Detailed LOS worksheets are provided in Appendix C.

Table 6. Future Weekday PM Peak Hour Intersection LOS Summary

Intersection	Traffic Control	2023 Without-Project			2023 With-Project		
		LOS[1]	Delay[2]	WM[3]	LOS	Delay	WM
1. Cleveland Street/Redmond Way[4]	Signalized	C	27	-	C	26	-
2. 161st Avenue NE/Redmond Way	Signalized	B	12	-	B	13	-
3. 161st Avenue NE/Cleveland Street	Signalized	B	16	-	B	16	-
A. Site Access/Cleveland Street	TWSC	*With-Project Only*			B	15	SB

1. Level of Service (A – F) as defined by the *Highway Capacity Manual* (TRB, 2010)
2. Average delay per vehicle in seconds.
3. Worst movement (WM) reported for unsignalized intersections, SB = southbound
4. The slight decrease in delay is due to an increase in the right turning movements decreasing the overall weighted average delay.

As shown in Table 6, all study intersections are anticipated to operate the same level of service under future (2023) with and without-project conditions, with decreases or increases in delay of 1 second or less. All study intersections are anticipated to operate at LOS C or better under future (2023) with-project conditions. No impacts are anticipated at study intersections as a result of the proposed project.



Weekday PM Peak Hour Trip Distribution & Assignment

Redmond Porch & Park

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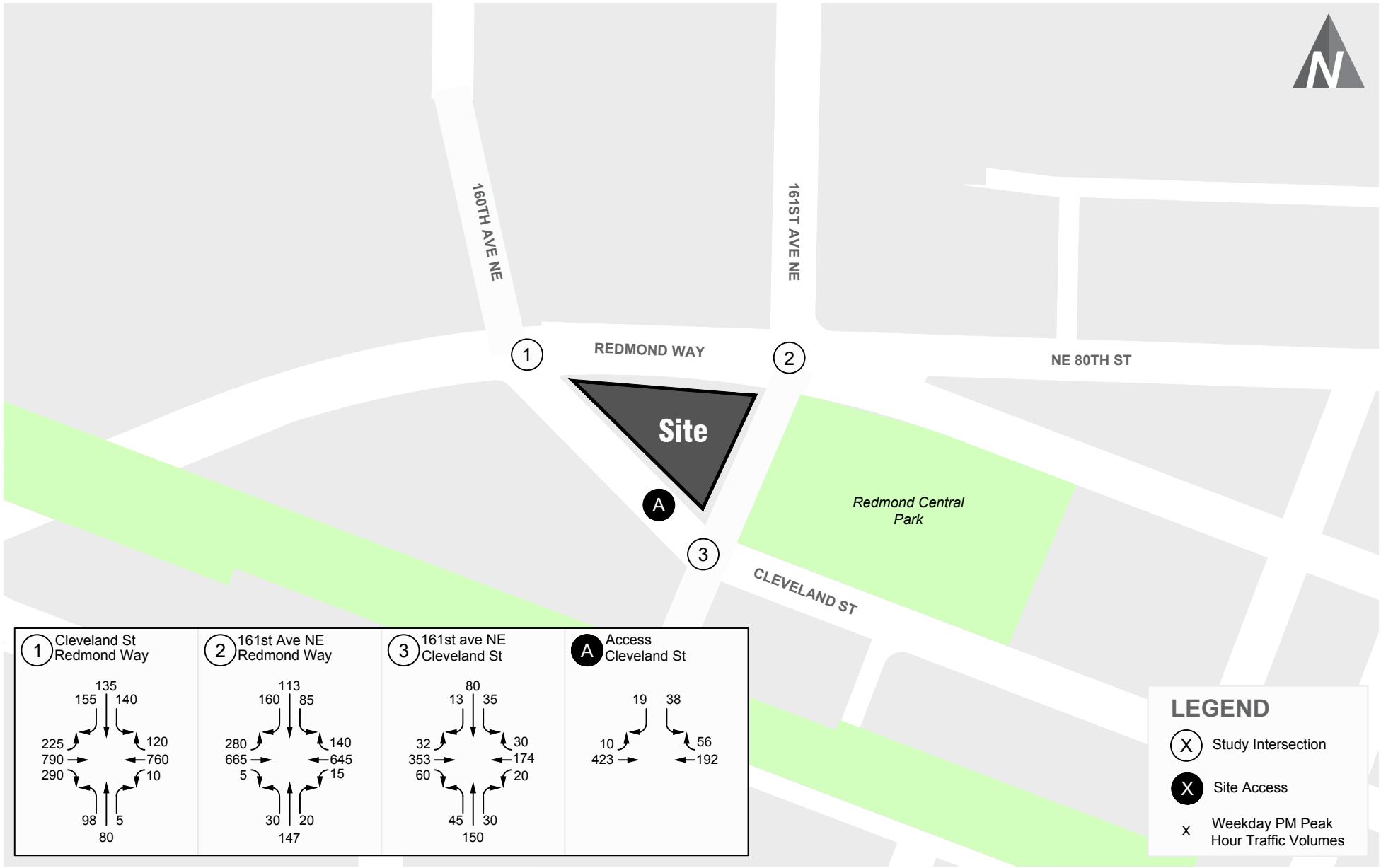

Future (2023) With-Project Weekday PM Peak Hour Traffic Volumes

FIGURE 6

Redmond Porch & Park

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Site Access Evaluation

The following sections describe the results of the traffic operations for the proposed site access driveways.

Driveway Operations

Vehicle access to the site is proposed via Cleveland Street along the southwest side of the building. Weekday PM peak hour traffic operations at this driveway with the addition of project generated traffic were evaluated and showed operations at LOS B with approximately 15 seconds of delay. Detailed LOS worksheets are provided in Appendix C. Additionally, AutoTurning movements were completed showing a SU-30 vehicle entering and exiting the loading bay from Cleveland Street and are provided in Appendix D.

Parking

The following sections summarize the proposed parking supply, City of Redmond parking code requirements, and estimated peak parking demand. A parking deviation request to reduce the parking supply was prepared and submitted to the City staff under separate cover.

Parking Supply

The project is proposing to provide 93 parking stalls, with 55 car stacker stalls reserved for the residential and/or office use, and the remaining 38 stalls would be shared between all of the uses. Additionally, based on agreements with the City 31 stalls would be accessible by the public.

Parking Code Requirements

The proposed project is required to provide a minimum and maximum number of vehicle parking stalls to meet the City of Redmond Zoning Code. The proposed project is located within the Old Town (OT) zone and requirements for parking are outlined RZC 21.10.030.[1] Minimum and maximum parking supply requirements summarized in Table 7. Note that no reduction for affordable housing units are referenced in the code calculations.

Table 7. Code Required Parking

Land Use	Size	Minimum Parking Rate[1]	Maximum Parking Rate[1]	Additional Requirements	Minimum Parking Required[2]	Maximum Parking Allowed[2]
Residential	86 DUs	1.00 stalls/DU[2]	2.25 stalls/DU[2]	1 guest space/4 DUs	108	216
Office	18,700 sf	2.00 stalls/1,000 sf	2.00 stalls/1,000 sf	-	37	37
Restaurant	5,500 sf	2.00 stalls/1,000 sf	9.00 stalls/1,000 sf	-	11	50
Retail	4,041 sf	2.00 stalls/1,000 sf	5.00 stalls/1,000 sf[3]	-	8	20
Total	**-**	**-**	**-**	**-**	**164**	**323**

Note: DU = dwelling unit; sf = square feet
1. Table 21.10.030C Redmond Zoning Code
2. Inclusive of the guest rate of 1 space for every 4 units.
3. Maximum parking rate increased from 2.0 to 5.0 because the retail competent is part of a mixed-use development.

As shown in Table 7, the proposed project is required to provide a minimum of 164 stalls and a maximum of 323 stalls. A deviation request to provide below the minimum of the designated range has been submitted under separate cover.

[1] Table 21.10.030C

Peak Parking Demand

A parking demand analysis for the proposed project was conducted to determine the peak parking demand for the project. The methodology utilized for the residential and commercial uses are described in the following.

Residential. The residential parking demand was based on information from the King County Residential Parking Calculator. The KC Multi-Family Residential Parking Calculator is a website program that calculates parking/unit rates for any parcels or areas in the county. The parking rate is a modeled value, which predicts parking rates per residential unit based on the unit mix, monthly parking costs, and projected rent, parking supply, and characteristics of the area.

Figure 7 shows the King County Right Size Calculator, unit breakdown, assumed rents per unit type, and the anticipated monthly parking rate per stall. For the proposed project the model identifies a parking rate 0.68 vehicles per unit.

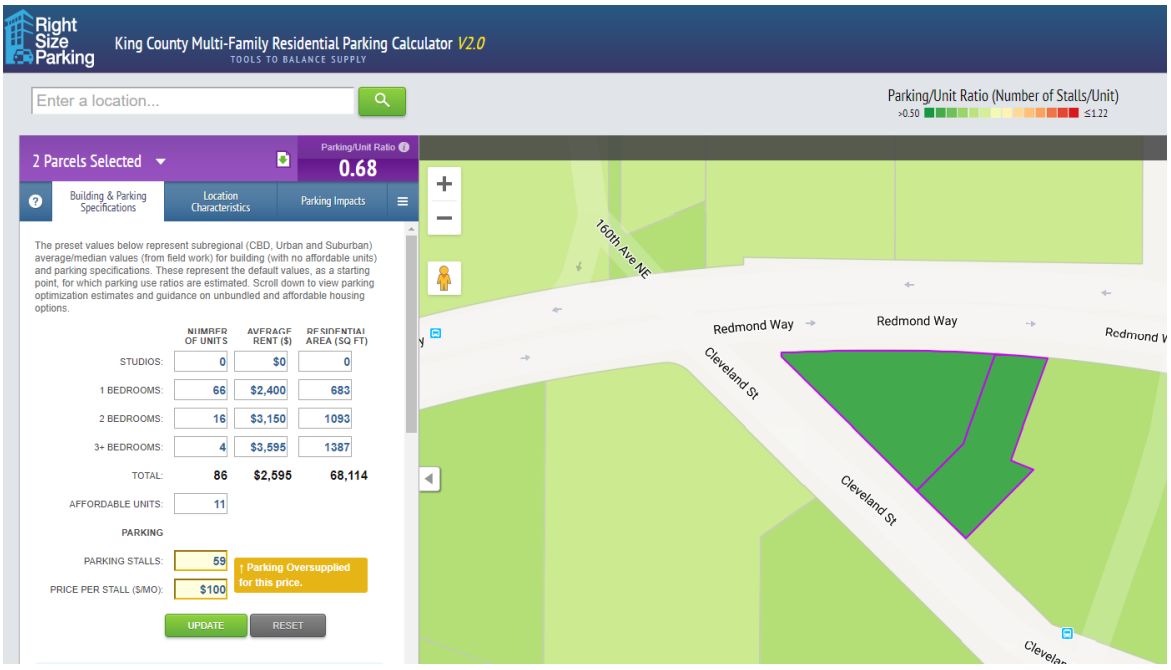


Figure 7. King Count Right Size Parking Calculator

This results in a residential weekday peak parking demand of 58 vehicles.

Commercial. Parking demand for the office, restaurant, and retail uses were based on the *ITE Parking Generation Manual, 5th Edition (2019)*. Restaurant and retail land use parking rates were reduced by 20 percent due to the projects proximity to the Downtown Park, proximity to the future Link Light Rail Station, and residential density in the area. Additionally, the project is located just north of the Redmond Central Connector, a multi-use path that connects the Bear Creek Trail and the Sammamish River Trail. Bike lanes are also provided along 161st Avenue NE, forming extensive non-motorized facilities in the area which would promote and support non-auto travel. Table 8 shows the commercial parking demand for the proposed project. Note, no reductions were applied to the proposed office use.

Table 8. Commercial Parking Demand

Land Use	Size	ITE Rate	Adjusted Demand
Office (LU #710)	18,700 sf	1.63 vehicles/1,000 sf	30
Restaurant (LU #932)	5,500 sf	6.47 vehicles/1,000 sf	28
Retail (LU #820)	4,041 sf	1.95 vehicles/1,000 sf	6
Total	**-**	**-**	**64**

sf = square feet

As shown in Table 8, the proposed commercial uses are anticipated to generate a peak parking demand of 64 vehicles; however, this does not account for the different peaking behavior of each use. Shared parking is described in a subsequent section.

Shared parking

As noted above the range of peak parking demand rates reflect both the King County Parking Calculator and ITE rates. For the proposed project, this results in a peak parking demand of 58 vehicles for the residential use and 64 vehicles for the commercial uses. However, the different uses peak at different times of day. Typically, retail uses peak midday whereas residential uses peak overnight. Figure 8 shows the anticipated hourly parking if shared parking were utilized among all uses.

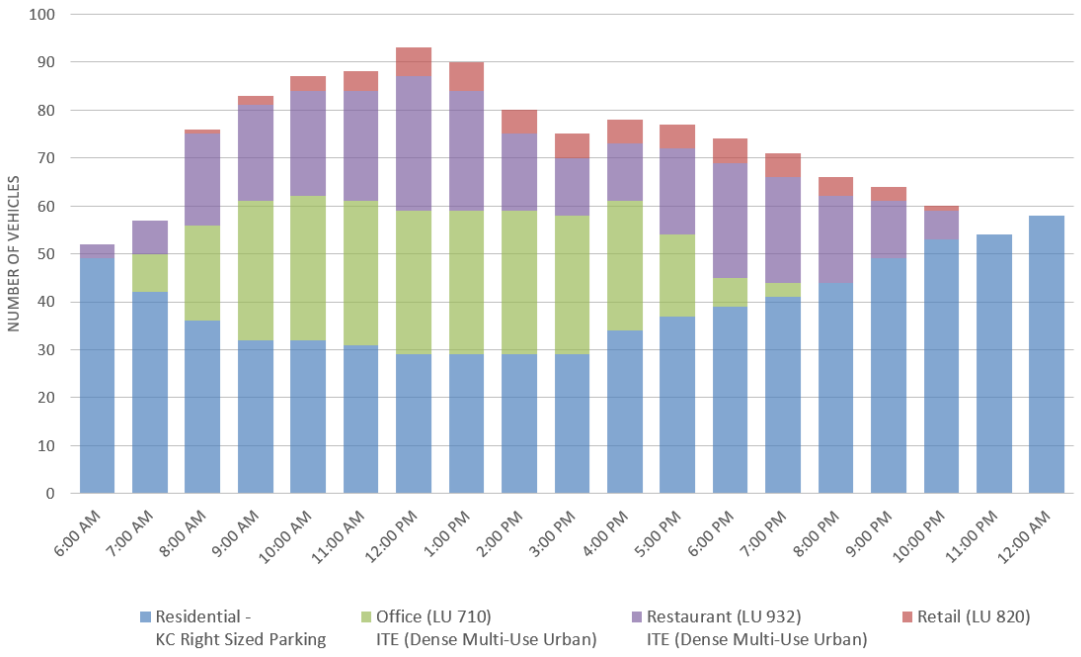


Figure 8. Shared Parking

As shown in Figure 8, the peak hourly parking demand is anticipated to be 93 vehicles at 12:00 p.m. and could be accommodated on-site. As discussed previously, the stackers require training to use, and it is anticipated that both residents and office tenants would be able to use the stackers with the proper training. In the event that a parking overspill is realized, additional measures such as transportation management plan (TMP) strategies could be implemented and are discussed in a subsequent section.

Safe-Walk Analysis

The nearest school to the site is Redmond Elementary School, located approximately four blocks east of the project site at the intersection of 168th Avenue NE and NE 80th Street. Along the primary walking routes to/from the site, sidewalks are provided along both sides of NE 80th Street. Marked crosswalks are provided on all four legs at the 161st Avenue NE/Redmond Way, 164th Avenue NE/NE 80th Street, 166th Avenue NE/NE 80th Street intersections, and partially provided at the Redmond Way/NE 80th Street, Leary Way/NE 80th Street, and 165th Avenue NE/NE 80th Street intersections.

Mitigation

Mitigation measures have been identified to reduce potential transportation-related impacts generated by the proposed project. As the study intersection and site access are forecast to operate at LOS C or better, the proposed project is not required to mitigate any intersection impact. However, parking contingency measures and traffic impact fees are summarized below.

Transportation Management Program

As noted above, the projected demand will be accommodated within the proposed supply; however, the applicant recognizes the need to manage the overall demand through shared parking and a transportation management program (TMP). The goal of the TMP is to ensure that parking demand does not exceed the on-site parking supply and to achieve and maintain a commute pattern whereby there is no resident, employee or patron parking spillover onto adjacent streets and parking lots. This will be achieved and maintained by creating lifestyle patterns so that residents are able to rely on alternate transportation options such as public transportation, carpooling, bicycling and walking, eliminating the need for a vehicle. Property owner will use proactive good faith efforts to ensure that the elements of the TMP are implemented via direct provision, contracted services, lease agreement, voluntary compliance of tenants, or any combination of these methods. “On-site”, by definition means that all on-site resident, employee, and patron vehicles are parked on-site and not in the surrounding neighborhood.

In the event that two consecutive TMP reports show that the target goal described above is not met, the property owner will add in no particular order the following elements one at a time until the goals are met:

- Provide 100 percent of a peak period two-zone bus pass or vanpool subsidy for up to 20 site employees and up to 86 residents of the proposed development. Residents who receive bus passes or vanpool subsidy from their employees are not eligible for this subsidy.
- Fund a Commuter Club for the site until the program goal has been met and maintained for two years. The club will require annual funding of $5,000 which will be used to provide incentives for non-SOV commuting.
- Become a member of a transportation management association (TMA) or similar type organization to facilitate the distribution of program services and coordinate trip reduction efforts.
- Secure parking proximate to the site to meet demand.

Traffic Impact Fees

The proposed project will be required to pay traffic impact fees which are summarized in Table 9.

Table 9. Estimate of Transportation Impact Fee

Intersection	Development Size	Impact Fee Rate[1]	Impact Fees
Proposed Uses			
Apartments	86 units	$4,021.34/unit	$345,835.24
Office	18,700 square feet	$19.05/square foot	$356,235.00
Restaurant	5,500 square feet	$33.35/square foot	$183,425.00
Retail	4,041 square feet	$18.34/square foot	$74,111.94
Total			**$959,607.18**
Existing Uses			
Restaurant (fast food)	1,600 square feet	-$90.85/square foot	-$145,360.00
Retail	4,992 square feet	-$18.34/square foot	-$91,553.28
Total			**$236,913.28**
Net			**$722,693.90**

1. Impact fees based on the *City of Redmond Impact Fee Schedule*, effective January 1, 2019

A shown in Table 9, the total transportation impact fee is estimated to be $722,693.90 based on the proposed land use and accounting for the existing use. This fee is a preliminary calculation and the final impact fee would be calculated by the City of Redmond.

Findings and Recommendations

This transportation impact study summarizes the project traffic impacts of the proposed Redmond Porch and Park project. General findings and recommendations include:

- The proposed project would include the development of approximately 86 apartment units, 18,700 square feet of office space, 5,500 square feet of restaurant, and 4,050 square feet of retail.
- The development is anticipated generate 678 net new weekday daily vehicle trips, with 61 occurring during the weekday AM peak hour and 55 in the PM peak hour.
- Project traffic would represent approximately five percent or less of the 2023 weekday PM peak hour traffic volumes at all off-site study intersections.
- All study intersections are anticipated to operate at LOS C or better during the weekday PM peak hour with the project.
- Access to the proposed parking garage would be provided along Cleveland Street. During the weekday PM peak hour, the site access driveway on Cleveland is anticipated to operate at LOS B.
- The proposed project would provide parking for up to 93 vehicles. Through the use of shared parking, the peak parking demand could be accommodated on-site.

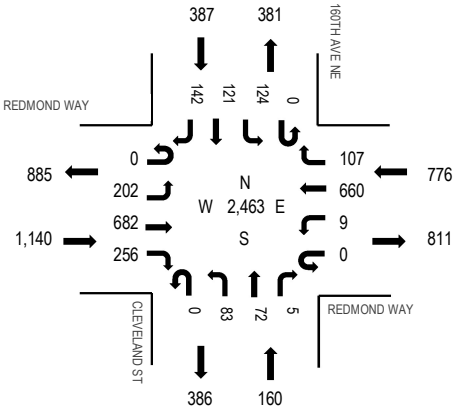
Appendix A: Traffic Counts

All Traffic Data Services Inc.
(303) 216-2439
www.alltrafficdata.net

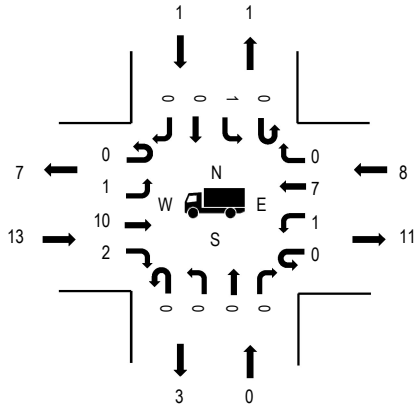
Location: 1 CLEVELAND ST & REDMOND WAY PM
Date: Tuesday, October 8, 2019
Peak Hour: 04:45 PM - 05:45 PM

Peak Hour

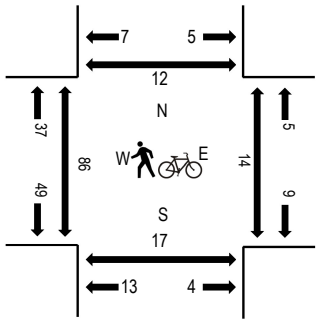
All Vehicles



Heavy Vehicles



Pedestrians/Bicycles in Crosswalk



	HV%	PHF
EB	1.1%	0.97
WB	1.0%	0.95
NB	0.0%	0.85
SB	0.3%	0.88
All	0.9%	0.97

Traffic Counts - All Vehicles

Interval Start Time	REDMOND WAY Eastbound				REDMOND WAY Westbound				CLEVELAND ST Northbound				160TH AVE NE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	50	154	56	0	9	188	29	0	27	14	0	0	17	24	20	588	2,288
4:15 PM	0	45	171	46	0	3	159	26	0	11	8	4	0	16	27	21	537	2,317
4:30 PM	0	46	163	65	0	1	130	25	0	15	9	1	0	38	20	33	546	2,413
4:45 PM	0	52	187	53	0	1	182	22	0	14	17	1	0	29	28	31	617	2,463
5:00 PM	0	47	167	79	0	2	161	30	0	22	18	1	0	29	27	34	617	2,407
5:15 PM	0	65	159	64	0	3	171	25	0	23	22	2	0	33	31	35	633	
5:30 PM	0	38	169	60	0	3	146	30	0	24	15	1	0	33	35	42	596	
5:45 PM	0	50	154	41	0	1	141	36	0	29	22	0	0	25	29	33	561	
Count Total	0	393	1,324	464	0	23	1,278	223	0	165	125	10	0	220	221	249	4,695	
Peak Hour	0	202	682	256	0	9	660	107	0	83	72	5	0	124	121	142	2,463	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles in Crosswalk

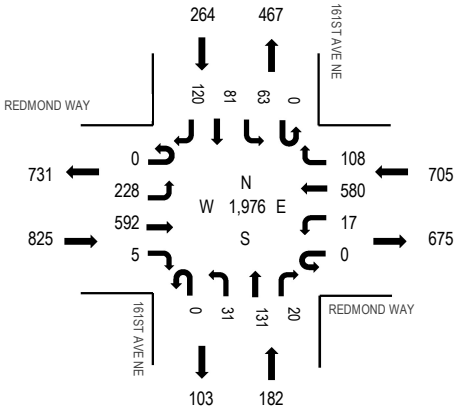
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	7	0	3	0	10	4:00 PM	0	0	0	1	1	4:00 PM	11	2	0	5	18
4:15 PM	4	0	4	1	9	4:15 PM	0	0	0	0	0	4:15 PM	14	3	1	4	22
4:30 PM	7	0	1	0	8	4:30 PM	0	0	0	0	0	4:30 PM	14	0	1	7	22
4:45 PM	6	0	4	1	11	4:45 PM	0	0	0	0	0	4:45 PM	14	2	1	5	22
5:00 PM	2	0	3	0	5	5:00 PM	0	0	0	0	0	5:00 PM	18	2	5	3	28
5:15 PM	2	0	0	0	2	5:15 PM	0	0	0	0	0	5:15 PM	36	7	5	2	50
5:30 PM	3	0	1	0	4	5:30 PM	0	0	0	0	0	5:30 PM	18	6	3	2	29
5:45 PM	1	0	0	0	1	5:45 PM	0	0	0	0	0	5:45 PM	20	2	2	6	30
Count Total	32	0	16	2	50	Count Total	0	0	0	1	1	Count Total	145	24	18	34	221
Peak Hour	13	0	8	1	22	Peak Hour	0	0	0	0	0	Peak Hour	86	17	14	12	129

All Traffic Data Services Inc.
(303) 216-2439
www.alltrafficdata.net

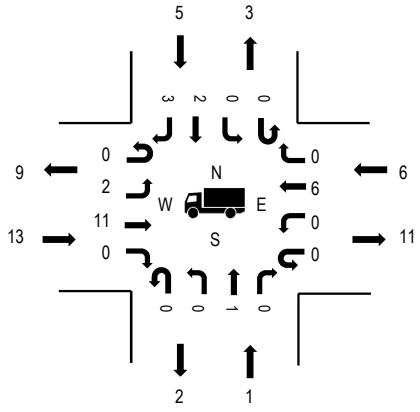
Location: 2 161ST AVE NE & REDMOND WAY PM
Date: Tuesday, October 8, 2019
Peak Hour: 04:45 PM - 05:45 PM

Peak Hour

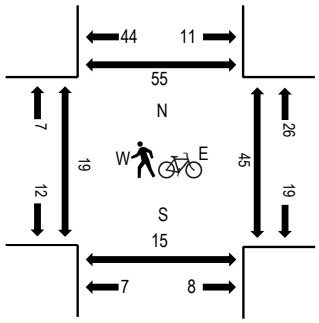
All Vehicles



Heavy Vehicles



Pedestrians/Bicycles in Crosswalk



	HV%	PHF
EB	1.6%	0.95
WB	0.9%	0.97
NB	0.5%	0.84
SB	1.9%	0.92
All	1.3%	0.98

Traffic Counts - All Vehicles

Interval Start Time	REDMOND WAY Eastbound				REDMOND WAY Westbound				161ST AVE NE Northbound				161ST AVE NE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	26	146	2	0	3	193	21	0	4	25	4	0	13	16	34	487	1,853
4:15 PM	0	53	139	0	0	3	138	18	0	5	23	3	0	16	12	22	432	1,858
4:30 PM	0	51	142	3	0	4	122	22	0	4	24	6	0	15	17	35	445	1,915
4:45 PM	0	56	159	2	0	5	151	19	0	11	23	5	0	15	15	28	489	1,976
5:00 PM	0	56	143	1	0	2	154	26	0	7	35	5	0	17	18	28	492	1,968
5:15 PM	0	51	144	1	0	5	138	24	0	8	39	7	0	13	30	29	489	
5:30 PM	0	65	146	1	0	5	137	39	0	5	34	3	0	18	18	35	506	
5:45 PM	0	63	120	0	0	9	157	37	0	3	30	8	0	17	18	19	481	
Count Total	0	421	1,139	10	0	36	1,190	206	0	47	233	41	0	124	144	230	3,821	
Peak Hour	0	228	592	5	0	17	580	108	0	31	131	20	0	63	81	120	1,976	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles in Crosswalk

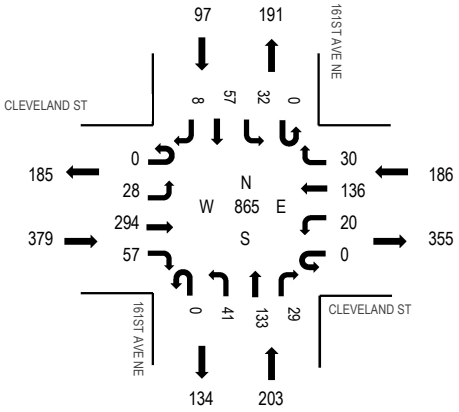
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	3	3	3	0	9	4:00 PM	0	0	0	0	0	4:00 PM	3	2	8	5	18
4:15 PM	5	0	4	3	12	4:15 PM	0	0	0	0	0	4:15 PM	5	2	5	11	23
4:30 PM	5	2	4	1	12	4:30 PM	0	0	0	0	0	4:30 PM	9	5	6	13	33
4:45 PM	6	0	5	3	14	4:45 PM	0	0	0	0	0	4:45 PM	3	5	8	25	41
5:00 PM	2	1	1	0	4	5:00 PM	0	1	0	0	1	5:00 PM	3	5	11	9	28
5:15 PM	3	0	0	1	4	5:15 PM	0	0	0	0	0	5:15 PM	8	1	16	15	40
5:30 PM	2	0	0	1	3	5:30 PM	0	0	0	0	0	5:30 PM	5	4	10	6	25
5:45 PM	2	0	0	1	3	5:45 PM	0	0	0	0	0	5:45 PM	7	3	12	9	31
Count Total	28	6	17	10	61	Count Total	0	1	0	0	1	Count Total	43	27	76	93	239
Peak Hour	13	1	6	5	25	Peak Hour	0	1	0	0	1	Peak Hour	19	15	45	55	134

All Traffic Data Services Inc.
(303) 216-2439
www.alltrafficdata.net

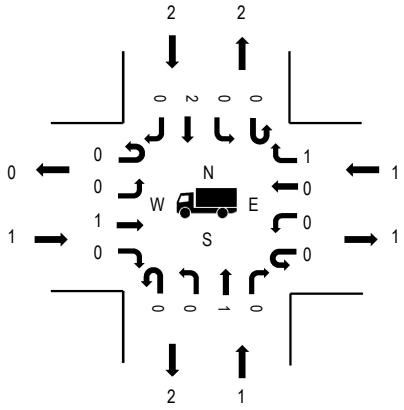
Location: 3 161ST AVE NE & CLEVELAND ST PM
Date: Tuesday, October 8, 2019
Peak Hour: 05:00 PM - 06:00 PM

Peak Hour

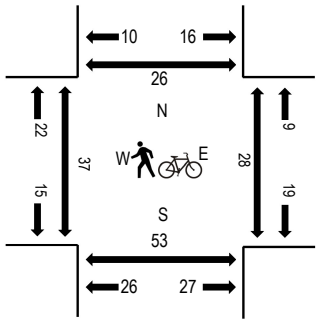
All Vehicles



Heavy Vehicles



Pedestrians/Bicycles in Crosswalk



	HV%	PHF
EB	0.3%	0.91
WB	0.5%	0.72
NB	0.5%	0.81
SB	2.1%	0.87
All	0.6%	0.96

Traffic Counts - All Vehicles

Interval Start Time	CLEVELAND ST Eastbound				CLEVELAND ST Westbound				161ST AVE NE Northbound				161ST AVE NE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	7	55	19	0	2	34	5	0	11	26	0	0	5	16	2	182	677
4:15 PM	0	1	61	15	0	1	16	3	0	10	31	4	0	5	11	2	160	707
4:30 PM	0	2	65	12	0	5	17	4	0	4	28	4	0	9	14	1	165	772
4:45 PM	0	7	57	12	0	2	26	4	0	9	24	8	0	7	13	1	170	821
5:00 PM	0	7	71	21	0	6	31	10	0	8	34	1	0	5	15	3	212	865
5:15 PM	0	9	72	15	0	5	29	9	0	11	39	13	0	9	13	1	225	
5:30 PM	0	6	89	9	0	3	25	3	0	14	33	9	0	7	14	2	214	
5:45 PM	0	6	62	12	0	6	51	8	0	8	27	6	0	11	15	2	214	
Count Total	0	45	532	115	0	30	229	46	0	75	242	45	0	58	111	14	1,542	
Peak Hour	0	28	294	57	0	20	136	30	0	41	133	29	0	32	57	8	865	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles in Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	1	2	0	0	3	4:00 PM	1	0	0	0	1	4:00 PM	7	12	4	6	29
4:15 PM	0	0	0	1	1	4:15 PM	0	0	0	0	0	4:15 PM	4	17	2	1	24
4:30 PM	0	2	0	1	3	4:30 PM	0	1	0	0	1	4:30 PM	14	19	6	5	44
4:45 PM	1	0	0	1	2	4:45 PM	0	0	0	0	0	4:45 PM	6	12	0	5	23
5:00 PM	0	1	1	0	2	5:00 PM	0	0	0	0	0	5:00 PM	6	9	5	6	26
5:15 PM	0	0	0	1	1	5:15 PM	0	2	0	0	2	5:15 PM	6	16	16	12	50
5:30 PM	1	0	0	0	1	5:30 PM	0	0	0	0	0	5:30 PM	5	13	2	7	27
5:45 PM	0	0	0	1	1	5:45 PM	0	0	0	0	0	5:45 PM	20	15	5	1	41
Count Total	3	5	1	5	14	Count Total	1	3	0	0	4	Count Total	68	113	40	43	264
Peak Hour	1	1	1	2	5	Peak Hour	0	2	0	0	2	Peak Hour	37	53	28	26	144

Appendix B: LOS Definitions

Highway Capacity Manual 2010/6th Edition

Signalized intersection level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table 1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual 2010* and 6th Edition (Transportation Research Board, 2010 and 2016, respectively).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	General Description
A	≤10	Free Flow
B	>10 – 20	Stable Flow (slight delays)
C	>20 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F[1]	>80	Forced flow (congested and queues fail to clear)

Source: *Highway Capacity Manual 2010 and 6th Edition*, Transportation Research Board, 2010 and 2016, respectively.

1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop and two-way stop control. All-way stop control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table 2 shows LOS criteria for unsignalized intersections.

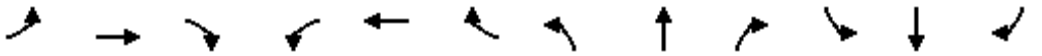
Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F[1]	>50

Source: *Highway Capacity Manual 2010 and 6th Edition*, Transportation Research Board, 2010 and 2016, respectively.

1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

Appendix C: LOS Worksheets



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	200	680	255	10	660	105	85	70	5	125	120	140
Future Volume (veh/h)	200	680	255	10	660	105	85	70	5	125	120	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	1.00		0.98	0.55		0.74	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	1691	1691	1691	1697	1697	1697	1710	1710	1710	1710	1710	1710
Adj Flow Rate, veh/h	206	701	263	10	680	108	88	72	5	129	124	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1	0	0	0	0	0	0
Cap, veh/h	465	825	846	237	1355	215	247	258	18	154	260	
Arrive On Green	0.06	0.49	0.49	0.13	0.98	0.98	0.11	0.17	0.17	0.09	0.15	0.00
Sat Flow, veh/h	1611	1691	1408	1616	2779	441	1629	1540	107	1629	1710	1449
Grp Volume(v), veh/h	206	701	263	10	394	394	88	0	77	129	124	0
Grp Sat Flow(s),veh/h/ln	1611	1691	1408	1616	1612	1608	1629	0	1647	1629	1710	1449
Q Serve(g_s), s	7.0	39.1	2.7	0.3	1.3	1.3	0.8	0.0	4.4	8.4	7.2	0.0
Cycle Q Clear(g_c), s	7.0	39.1	2.7	0.3	1.3	1.3	0.8	0.0	4.4	8.4	7.2	0.0
Prop In Lane	1.00		1.00	1.00		0.27	1.00		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	465	825	846	237	786	784	247	0	276	154	260	
V/C Ratio(X)	0.44	0.85	0.31	0.04	0.50	0.50	0.36	0.00	0.28	0.84	0.48	
Avail Cap(c_a), veh/h	465	825	846	328	786	784	293	0	351	166	301	
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)	0.51	0.51	0.51	0.91	0.91	0.91	0.94	0.00	0.94	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.4	24.2	3.4	16.9	0.7	0.7	42.8	0.0	39.2	48.1	41.9	0.0
Incr Delay (d2), s/veh	0.3	5.8	0.5	0.1	2.1	2.1	0.8	0.0	0.5	28.1	1.4	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	2.5	16.2	1.1	0.1	0.7	0.7	2.2	0.0	1.8	4.6	3.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.8	30.0	3.9	16.9	2.8	2.8	43.6	0.0	39.8	76.2	43.2	0.0
LnGrp LOS	B	C	A	B	A	A	D	A	D	E	D	
Approach Vol, veh/h		1170			798			165			253	A
Approach Delay, s/veh		21.1			3.0			41.8			60.1	
Approach LOS		C			A			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.2	23.1	12.0	57.7	16.9	21.4	12.0	57.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	11.0	23.0	13.0	41.0	15.0	19.0	7.0	47.0
Max Q Clear Time (g_c+I1), s	10.4	6.4	2.3	41.1	2.8	9.2	9.0	3.3
Green Ext Time (p_c), s	0.0	0.2	0.0	0.0	0.2	0.4	0.0	8.8

Intersection Summary	
HCM 6th Ctrl Delay	20.6
HCM 6th LOS	C

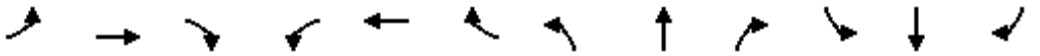
Notes

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	230	590	5	15	580	110	30	130	20	65	80	120
Future Volume (veh/h)	230	590	5	15	580	110	30	130	20	65	80	120
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.95	0.98		0.94	0.93		0.83	0.93		0.94
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	1683	1683	1683	1697	1697	1697	1649	1649	1649	1683	1683	1683
Adj Flow Rate, veh/h	235	602	5	15	592	112	31	133	20	66	82	122
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	1	1	1	1	1	1	2	2	2
Cap, veh/h	603	979	8	551	1289	243	206	196	30	199	398	318
Arrive On Green	0.29	1.00	1.00	0.07	0.96	0.96	0.29	0.29	0.29	0.05	0.24	0.24
Sat Flow, veh/h	1603	1666	14	1616	2677	505	966	1357	204	1603	1683	1345
Grp Volume(v), veh/h	235	0	607	15	356	348	31	0	153	66	82	122
Grp Sat Flow(s),veh/h/ln	1603	0	1680	1616	1612	1570	966	0	1561	1603	1683	1345
Q Serve(g_s), s	0.0	0.0	0.0	0.4	1.6	1.6	2.6	0.0	9.4	3.7	4.2	8.2
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.4	1.6	1.6	2.6	0.0	9.4	3.7	4.2	8.2
Prop In Lane	1.00		0.01	1.00		0.32	1.00		0.13	1.00		1.00
Lane Grp Cap(c), veh/h	603	0	987	551	776	756	206	0	226	199	398	318
V/C Ratio(X)	0.39	0.00	0.61	0.03	0.46	0.46	0.15	0.00	0.68	0.33	0.21	0.38
Avail Cap(c_a), veh/h	603	0	987	641	776	756	228	0	260	231	436	349
HCM Platoon Ratio	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.67	0.00	0.67	1.00	1.00	1.00	0.91	0.00	0.91	1.00	1.00	1.00
Uniform Delay (d), s/veh	9.8	0.0	0.0	7.4	1.1	1.1	33.7	0.0	36.1	35.9	33.1	34.6
Incr Delay (d2), s/veh	0.3	0.0	1.9	0.0	1.9	2.0	0.1	0.0	3.6	1.0	0.1	0.3
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	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.0	0.5	0.1	0.7	0.7	0.6	0.0	3.4	1.5	1.8	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.0	0.0	1.9	7.4	3.0	3.1	33.9	0.0	39.7	36.9	33.2	34.9
LnGrp LOS	B	A	A	A	A	A	C	A	D	D	C	C
Approach Vol, veh/h		842			719			184			270	
Approach Delay, s/veh		4.2			3.1			38.7			34.9	
Approach LOS		A			A			D			C	

Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	9.9	20.6	9.0	68.5		30.5	20.5	57.0				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s	7.0	18.0	10.0	53.0		28.0	11.0	52.0				
Max Q Clear Time (g_c+I1), s	5.7	11.4	2.4	2.0		10.2	2.0	3.6				
Green Ext Time (p_c), s	0.0	0.2	0.0	3.4		0.8	0.8	6.5				

Intersection Summary												
HCM 6th Ctrl Delay			11.1									
HCM 6th LOS			B									



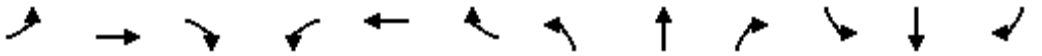
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	295	55	20	135	30	40	135	30	30	55	10
Future Volume (veh/h)	30	295	55	20	135	30	40	135	30	30	55	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.92	0.99		0.92	0.92		0.90	0.96		0.93
Parking Bus, Adj	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1710	1710	1710	1697	1697	1697	1697	1697	1697	1683	1683	1683
Adj Flow Rate, veh/h	31	307	57	21	141	31	42	141	31	31	57	10
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	1	1	1	1	1	1	2	2	2
Cap, veh/h	97	549	97	108	512	104	117	227	45	406	435	76
Arrive On Green	0.46	0.46	0.46	0.15	0.15	0.15	0.22	0.22	0.22	0.07	0.70	0.70
Sat Flow, veh/h	55	1185	209	73	1103	225	167	1011	200	1603	1239	217
Grp Volume(v), veh/h	395	0	0	193	0	0	214	0	0	31	0	67
Grp Sat Flow(s),veh/h/ln	1449	0	0	1401	0	0	1378	0	0	1603	0	1456
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.7	0.0	0.8
Cycle Q Clear(g_c), s	10.5	0.0	0.0	6.3	0.0	0.0	7.5	0.0	0.0	0.7	0.0	0.8
Prop In Lane	0.08		0.14	0.11		0.16	0.20		0.14	1.00		0.15
Lane Grp Cap(c), veh/h	744	0	0	724	0	0	389	0	0	406	0	511
V/C Ratio(X)	0.53	0.00	0.00	0.27	0.00	0.00	0.55	0.00	0.00	0.08	0.00	0.13
Avail Cap(c_a), veh/h	744	0	0	724	0	0	460	0	0	529	0	566
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	0.96	0.00	0.00	0.97	0.00	0.00	1.00	0.00	0.00	0.99	0.00	0.99
Uniform Delay (d), s/veh	10.6	0.0	0.0	14.9	0.0	0.0	19.1	0.0	0.0	13.2	0.0	5.3
Incr Delay (d2), s/veh	2.6	0.0	0.0	0.9	0.0	0.0	1.2	0.0	0.0	0.1	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	0.0	0.0	2.2	0.0	0.0	2.3	0.0	0.0	0.2	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.2	0.0	0.0	15.8	0.0	0.0	20.3	0.0	0.0	13.2	0.0	5.4
LnGrp LOS	B	A	A	B	A	A	C	A	A	B	A	A
Approach Vol, veh/h		395			193			214			98	
Approach Delay, s/veh		13.2			15.8			20.3			7.9	
Approach LOS		B			B			C			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	6.9	17.1		30.0		24.0		30.0				
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s	6.0	15.0		18.0		21.0		18.0				
Max Q Clear Time (g_c+I1), s	2.7	9.5		12.5		2.8		8.3				
Green Ext Time (p_c), s	0.0	0.5		1.2		0.2		0.7				

Intersection Summary												
HCM 6th Ctrl Delay			14.9									
HCM 6th LOS			B									

Notes

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



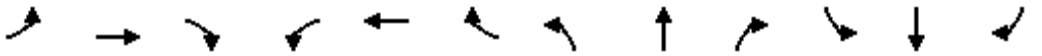
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	225	790	285	10	760	120	95	80	5	140	135	155
Future Volume (veh/h)	225	790	285	10	760	120	95	80	5	140	135	155
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	0.55		0.74	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	1691	1691	1691	1697	1697	1697	1710	1710	1710	1710	1710	1710
Adj Flow Rate, veh/h	232	814	294	10	784	124	98	82	5	144	139	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1	0	0	0	0	0	0
Cap, veh/h	422	825	853	165	1335	211	255	262	16	166	264	
Arrive On Green	0.06	0.49	0.49	0.11	0.96	0.96	0.12	0.17	0.17	0.10	0.15	0.00
Sat Flow, veh/h	1611	1691	1408	1616	2780	440	1629	1559	95	1629	1710	1449
Grp Volume(v), veh/h	232	814	294	10	454	454	98	0	87	144	139	0
Grp Sat Flow(s),veh/h/ln	1611	1691	1408	1616	1612	1608	1629	0	1654	1629	1710	1449
Q Serve(g_s), s	7.0	51.3	2.9	0.3	2.8	2.8	1.4	0.0	5.0	9.4	8.1	0.0
Cycle Q Clear(g_c), s	7.0	51.3	2.9	0.3	2.8	2.8	1.4	0.0	5.0	9.4	8.1	0.0
Prop In Lane	1.00		1.00	1.00		0.27	1.00		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	422	825	853	165	774	772	255	0	278	166	264	
V/C Ratio(X)	0.55	0.99	0.34	0.06	0.59	0.59	0.38	0.00	0.31	0.87	0.53	
Avail Cap(c_a), veh/h	422	825	853	267	774	772	293	0	352	166	301	
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)	0.51	0.51	0.51	0.87	0.87	0.87	0.92	0.00	0.92	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.6	27.3	3.5	22.2	1.2	1.2	42.4	0.0	39.4	47.8	42.0	0.0
Incr Delay (d2), s/veh	0.8	19.3	0.6	0.1	2.8	2.8	0.9	0.0	0.6	35.5	1.6	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	3.0	24.0	1.3	0.1	1.1	1.1	2.4	0.0	2.1	5.5	3.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.4	46.6	4.0	22.4	4.0	4.0	43.3	0.0	40.0	83.3	43.7	0.0
LnGrp LOS	B	D	A	C	A	A	D	A	D	F	D	
Approach Vol, veh/h		1340			918			185			283	A
Approach Delay, s/veh		31.7			4.2			41.7			63.8	
Approach LOS		C			A			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.0	23.2	11.1	57.7	17.5	21.7	12.0	56.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	11.0	23.0	13.0	41.0	15.0	19.0	7.0	47.0
Max Q Clear Time (g_c+I1), s	11.4	7.0	2.3	53.3	3.4	10.1	9.0	4.8
Green Ext Time (p_c), s	0.0	0.2	0.0	0.0	0.2	0.4	0.0	10.6

Intersection Summary	
HCM 6th Ctrl Delay	26.5
HCM 6th LOS	C

Notes

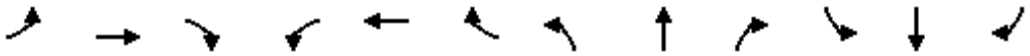
Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	280	665	5	15	645	140	30	145	20	85	110	160
Future Volume (veh/h)	280	665	5	15	645	140	30	145	20	85	110	160
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.95	0.98		0.94	0.94		0.83	0.94		0.95
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	1683	1683	1683	1697	1697	1697	1649	1649	1649	1683	1683	1683
Adj Flow Rate, veh/h	286	679	5	15	658	143	31	148	20	87	112	163
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	1	1	1	1	1	1	2	2	2
Cap, veh/h	550	954	7	512	1253	272	201	203	27	213	424	340
Arrive On Green	0.26	1.00	1.00	0.07	0.96	0.96	0.29	0.29	0.29	0.06	0.25	0.25
Sat Flow, veh/h	1603	1668	12	1616	2602	565	913	1383	187	1603	1683	1350
Grp Volume(v), veh/h	286	0	684	15	407	394	31	0	168	87	112	163
Grp Sat Flow(s),veh/h/ln	1603	0	1680	1616	1612	1555	913	0	1570	1603	1683	1350
Q Serve(g_s), s	0.0	0.0	0.0	0.4	2.0	2.1	2.8	0.0	10.4	4.8	5.8	11.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.4	2.0	2.1	2.8	0.0	10.4	4.8	5.8	11.1
Prop In Lane	1.00		0.01	1.00		0.36	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	550	0	961	512	776	749	201	0	231	213	424	340
V/C Ratio(X)	0.52	0.00	0.71	0.03	0.52	0.53	0.15	0.00	0.73	0.41	0.26	0.48
Avail Cap(c_a), veh/h	550	0	961	602	776	749	219	0	262	223	436	350
HCM Platoon Ratio	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.50	0.00	0.50	1.00	1.00	1.00	0.88	0.00	0.88	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.0	0.0	0.0	8.0	1.1	1.1	33.5	0.0	36.2	35.1	32.4	34.4
Incr Delay (d2), s/veh	0.4	0.0	2.3	0.0	2.5	2.6	0.1	0.0	6.0	1.3	0.1	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	0.0	0.6	0.1	0.9	0.9	0.6	0.0	3.9	2.0	2.4	3.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.5	0.0	2.3	8.0	3.6	3.7	33.6	0.0	42.1	36.4	32.5	34.8
LnGrp LOS	B	A	A	A	A	A	C	A	D	D	C	C
Approach Vol, veh/h		970			816			199			362	
Approach Delay, s/veh		5.6			3.7			40.8			34.5	
Approach LOS		A			A			D			C	

Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	11.3	20.9	9.0	66.8		32.2	18.8	57.0				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s	7.0	18.0	10.0	53.0		28.0	11.0	52.0				
Max Q Clear Time (g_c+I1), s	6.8	12.4	2.4	2.0		13.1	2.0	4.1				
Green Ext Time (p_c), s	0.0	0.2	0.0	4.1		1.0	1.0	7.7				

Intersection Summary			
HCM 6th Ctrl Delay		12.4	
HCM 6th LOS		B	



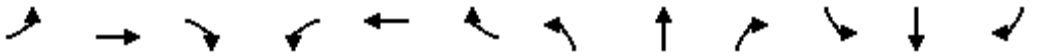
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	335	60	20	150	30	45	150	30	35	80	10
Future Volume (veh/h)	30	335	60	20	150	30	45	150	30	35	80	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.92	0.99		0.92	0.93		0.90	0.97		0.93
Parking Bus, Adj	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1710	1710	1710	1697	1697	1697	1697	1697	1697	1683	1683	1683
Adj Flow Rate, veh/h	31	349	62	21	156	31	47	156	31	36	83	10
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	1	1	1	1	1	1	2	2	2
Cap, veh/h	94	540	92	102	511	95	121	237	42	409	479	58
Arrive On Green	0.45	0.45	0.45	0.15	0.15	0.15	0.23	0.23	0.23	0.08	0.73	0.73
Sat Flow, veh/h	49	1199	204	64	1135	210	175	1018	182	1603	1314	158
Grp Volume(v), veh/h	442	0	0	208	0	0	234	0	0	36	0	93
Grp Sat Flow(s),veh/h/ln	1452	0	0	1409	0	0	1375	0	0	1603	0	1472
Q Serve(g_s), s	0.3	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.8	0.0	1.1
Cycle Q Clear(g_c), s	12.6	0.0	0.0	6.8	0.0	0.0	8.3	0.0	0.0	0.8	0.0	1.1
Prop In Lane	0.07		0.14	0.10		0.15	0.20		0.13	1.00		0.11
Lane Grp Cap(c), veh/h	725	0	0	708	0	0	401	0	0	409	0	536
V/C Ratio(X)	0.61	0.00	0.00	0.29	0.00	0.00	0.58	0.00	0.00	0.09	0.00	0.17
Avail Cap(c_a), veh/h	725	0	0	708	0	0	460	0	0	525	0	573
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	0.95	0.00	0.00	0.97	0.00	0.00	1.00	0.00	0.00	0.98	0.00	0.98
Uniform Delay (d), s/veh	11.6	0.0	0.0	15.5	0.0	0.0	19.0	0.0	0.0	12.7	0.0	4.8
Incr Delay (d2), s/veh	3.6	0.0	0.0	1.0	0.0	0.0	1.4	0.0	0.0	0.1	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.1	0.0	0.0	2.4	0.0	0.0	2.6	0.0	0.0	0.3	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.2	0.0	0.0	16.6	0.0	0.0	20.4	0.0	0.0	12.7	0.0	4.9
LnGrp LOS	B	A	A	B	A	A	C	A	A	B	A	A
Approach Vol, veh/h		442			208			234			129	
Approach Delay, s/veh		15.2			16.6			20.4			7.1	
Approach LOS		B			B			C			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	7.1	17.6		29.3		24.7		29.3				
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s	6.0	15.0		18.0		21.0		18.0				
Max Q Clear Time (g_c+I1), s	2.8	10.3		14.6		3.1		8.8				
Green Ext Time (p_c), s	0.0	0.5		0.9		0.4		0.8				

Intersection Summary												
HCM 6th Ctrl Delay			15.7									
HCM 6th LOS			B									

Notes

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	225	790	290	10	760	120	98	80	5	140	135	155
Future Volume (veh/h)	225	790	290	10	760	120	98	80	5	140	135	155
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	0.55		0.74	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	1691	1691	1691	1697	1697	1697	1710	1710	1710	1710	1710	1710
Adj Flow Rate, veh/h	232	814	299	10	784	124	101	82	5	144	139	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1	0	0	0	0	0	0
Cap, veh/h	422	825	853	165	1335	211	255	262	16	166	264	
Arrive On Green	0.06	0.49	0.49	0.11	0.96	0.96	0.12	0.17	0.17	0.10	0.15	0.00
Sat Flow, veh/h	1611	1691	1408	1616	2780	440	1629	1559	95	1629	1710	1449
Grp Volume(v), veh/h	232	814	299	10	454	454	101	0	87	144	139	0
Grp Sat Flow(s),veh/h/ln	1611	1691	1408	1616	1612	1608	1629	0	1654	1629	1710	1449
Q Serve(g_s), s	7.0	51.3	3.0	0.3	2.8	2.8	1.6	0.0	5.0	9.4	8.1	0.0
Cycle Q Clear(g_c), s	7.0	51.3	3.0	0.3	2.8	2.8	1.6	0.0	5.0	9.4	8.1	0.0
Prop In Lane	1.00		1.00	1.00		0.27	1.00		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	422	825	853	165	774	772	255	0	278	166	264	
V/C Ratio(X)	0.55	0.99	0.35	0.06	0.59	0.59	0.40	0.00	0.31	0.87	0.53	
Avail Cap(c_a), veh/h	422	825	853	267	774	772	293	0	352	166	301	
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)	0.51	0.51	0.51	0.87	0.87	0.87	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.6	27.3	3.5	22.2	1.2	1.2	42.4	0.0	39.4	47.8	42.0	0.0
Incr Delay (d2), s/veh	0.8	19.3	0.6	0.1	2.8	2.8	1.0	0.0	0.6	35.5	1.6	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	3.0	24.0	1.3	0.1	1.1	1.1	2.5	0.0	2.1	5.5	3.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.4	46.6	4.1	22.4	4.0	4.0	43.4	0.0	40.1	83.3	43.7	0.0
LnGrp LOS	B	D	A	C	A	A	D	A	D	F	D	
Approach Vol, veh/h		1345			918			188			283	A
Approach Delay, s/veh		31.6			4.2			41.9			63.8	
Approach LOS		C			A			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.0	23.2	11.1	57.7	17.5	21.7	12.0	56.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	11.0	23.0	13.0	41.0	15.0	19.0	7.0	47.0
Max Q Clear Time (g_c+I1), s	11.4	7.0	2.3	53.3	3.6	10.1	9.0	4.8
Green Ext Time (p_c), s	0.0	0.2	0.0	0.0	0.2	0.4	0.0	10.6

Intersection Summary	
HCM 6th Ctrl Delay	26.4
HCM 6th LOS	C

Notes

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	280	665	5	15	645	140	30	147	20	85	113	160
Future Volume (veh/h)	280	665	5	15	645	140	30	147	20	85	113	160
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.95	0.98		0.94	0.94		0.83	0.94		0.95
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	1683	1683	1683	1697	1697	1697	1649	1649	1649	1683	1683	1683
Adj Flow Rate, veh/h	286	679	5	15	658	143	31	150	20	87	115	163
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	1	1	1	1	1	1	2	2	2
Cap, veh/h	549	954	7	512	1253	272	201	204	27	212	425	341
Arrive On Green	0.25	1.00	1.00	0.07	0.96	0.96	0.29	0.29	0.29	0.06	0.25	0.25
Sat Flow, veh/h	1603	1668	12	1616	2602	565	910	1386	185	1603	1683	1350
Grp Volume(v), veh/h	286	0	684	15	407	394	31	0	170	87	115	163
Grp Sat Flow(s),veh/h/ln	1603	0	1680	1616	1612	1555	910	0	1571	1603	1683	1350
Q Serve(g_s), s	0.0	0.0	0.0	0.4	2.0	2.1	2.8	0.0	10.5	4.8	5.9	11.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.4	2.0	2.1	2.8	0.0	10.5	4.8	5.9	11.1
Prop In Lane	1.00		0.01	1.00		0.36	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	549	0	961	512	776	749	201	0	232	212	425	341
V/C Ratio(X)	0.52	0.00	0.71	0.03	0.52	0.53	0.15	0.00	0.73	0.41	0.27	0.48
Avail Cap(c_a), veh/h	549	0	961	602	776	749	218	0	262	222	436	350
HCM Platoon Ratio	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.50	0.00	0.50	1.00	1.00	1.00	0.88	0.00	0.88	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.1	0.0	0.0	8.0	1.1	1.1	33.4	0.0	36.2	35.1	32.4	34.3
Incr Delay (d2), s/veh	0.4	0.0	2.3	0.0	2.5	2.6	0.1	0.0	6.4	1.3	0.1	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	0.0	0.6	0.1	0.9	0.9	0.6	0.0	3.9	2.0	2.5	3.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.5	0.0	2.3	8.0	3.6	3.7	33.6	0.0	42.5	36.4	32.5	34.7
LnGrp LOS	B	A	A	A	A	A	C	A	D	D	C	C
Approach Vol, veh/h		970			816			201			365	
Approach Delay, s/veh		5.6			3.7			41.1			34.4	
Approach LOS		A			A			D			C	

Timer - Assigned Phs	1	2	3	4		6	7	8
Phs Duration (G+Y+Rc), s	11.3	20.9	9.0	66.8		32.2	18.8	57.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s	7.0	18.0	10.0	53.0		28.0	11.0	52.0
Max Q Clear Time (g_c+I1), s	6.8	12.5	2.4	2.0		13.1	2.0	4.1
Green Ext Time (p_c), s	0.0	0.2	0.0	4.1		1.0	1.0	7.7

Intersection Summary	
HCM 6th Ctrl Delay	12.5
HCM 6th LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	353	60	20	174	30	45	150	30	35	80	13
Future Volume (veh/h)	32	353	60	20	174	30	45	150	30	35	80	13
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.92	0.99		0.92	0.93		0.90	0.97		0.93
Parking Bus, Adj	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1710	1710	1710	1697	1697	1697	1697	1697	1697	1683	1683	1683
Adj Flow Rate, veh/h	33	368	62	21	181	31	47	156	31	36	83	14
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	1	1	1	1	1	1	2	2	2
Cap, veh/h	95	543	88	97	532	85	121	237	42	409	455	77
Arrive On Green	0.45	0.45	0.45	0.15	0.15	0.15	0.23	0.23	0.23	0.08	0.73	0.73
Sat Flow, veh/h	51	1206	194	53	1180	189	175	1017	182	1603	1248	210
Grp Volume(v), veh/h	463	0	0	233	0	0	234	0	0	36	0	97
Grp Sat Flow(s),veh/h/ln	1452	0	0	1423	0	0	1375	0	0	1603	0	1458
Q Serve(g_s), s	1.6	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.8	0.0	1.1
Cycle Q Clear(g_c), s	13.6	0.0	0.0	7.7	0.0	0.0	8.3	0.0	0.0	0.8	0.0	1.1
Prop In Lane	0.07		0.13	0.09		0.13	0.20		0.13	1.00		0.14
Lane Grp Cap(c), veh/h	725	0	0	713	0	0	401	0	0	409	0	531
V/C Ratio(X)	0.64	0.00	0.00	0.33	0.00	0.00	0.58	0.00	0.00	0.09	0.00	0.18
Avail Cap(c_a), veh/h	725	0	0	713	0	0	460	0	0	526	0	567
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	0.00	0.97	0.00	0.00	1.00	0.00	0.00	0.98	0.00	0.98
Uniform Delay (d), s/veh	11.9	0.0	0.0	15.9	0.0	0.0	19.0	0.0	0.0	12.7	0.0	4.8
Incr Delay (d2), s/veh	4.3	0.0	0.0	1.2	0.0	0.0	1.4	0.0	0.0	0.1	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.5	0.0	0.0	2.8	0.0	0.0	2.6	0.0	0.0	0.3	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.1	0.0	0.0	17.1	0.0	0.0	20.4	0.0	0.0	12.7	0.0	5.0
LnGrp LOS	B	A	A	B	A	A	C	A	A	B	A	A
Approach Vol, veh/h		463			233			234			133	
Approach Delay, s/veh		16.1			17.1			20.4			7.1	
Approach LOS		B			B			C			A	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	7.1	17.6		29.3		24.7		29.3				
Change Period (Y+Rc), s	5.0	5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s	6.0	15.0		18.0		21.0		18.0				
Max Q Clear Time (g_c+I1), s	2.8	10.3		15.6		3.1		9.7				
Green Ext Time (p_c), s	0.0	0.5		0.7		0.4		0.8				

Intersection Summary	
HCM 6th Ctrl Delay	16.1
HCM 6th LOS	B

Notes

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

Intersection	
Int Delay, s/veh	1.2

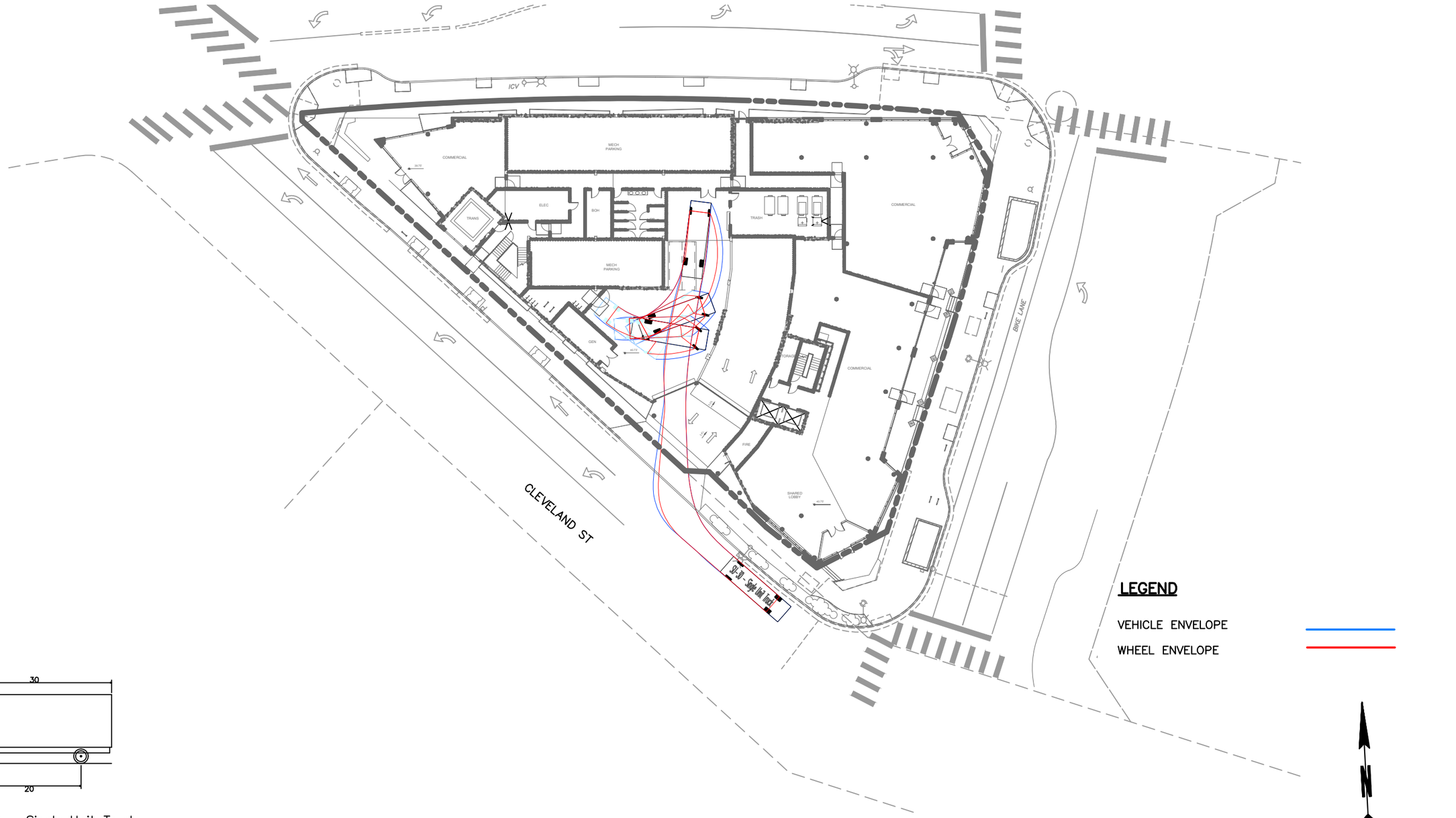
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	423	192	56	38	19
Future Vol, veh/h	10	423	192	56	38	19
Conflicting Peds, #/hr	26	0	0	26	26	26
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	1	1	2	2
Mvmt Flow	10	441	200	58	40	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	284	0	-	0	742	281
Stage 1	-	-	-	-	255	-
Stage 2	-	-	-	-	487	-
Critical Hdwy	4.1	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1290	-	-	-	383	758
Stage 1	-	-	-	-	788	-
Stage 2	-	-	-	-	618	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1262	-	-	-	363	726
Mov Cap-2 Maneuver	-	-	-	-	363	-
Stage 1	-	-	-	-	763	-
Stage 2	-	-	-	-	604	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	14.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1262	-	-	-	436
HCM Lane V/C Ratio	0.008	-	-	-	0.136
HCM Control Delay (s)	7.9	0	-	-	14.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Appendix D: AutoTurn Worksheets



SU–30 – Single Unit Truck	
Overall Length	30.000ft
Overall Width	8.000ft
Overall Body Height	13.500ft
Min Body Ground Clearance	1.367ft
Track Width	8.000ft
Lock–to–lock time	5.00s
Max Steering Angle (Virtual)	31.80°

Level 1 Turning Maneuver - SU-30

FIGURE 1

1.18271.00 - Redmond Central

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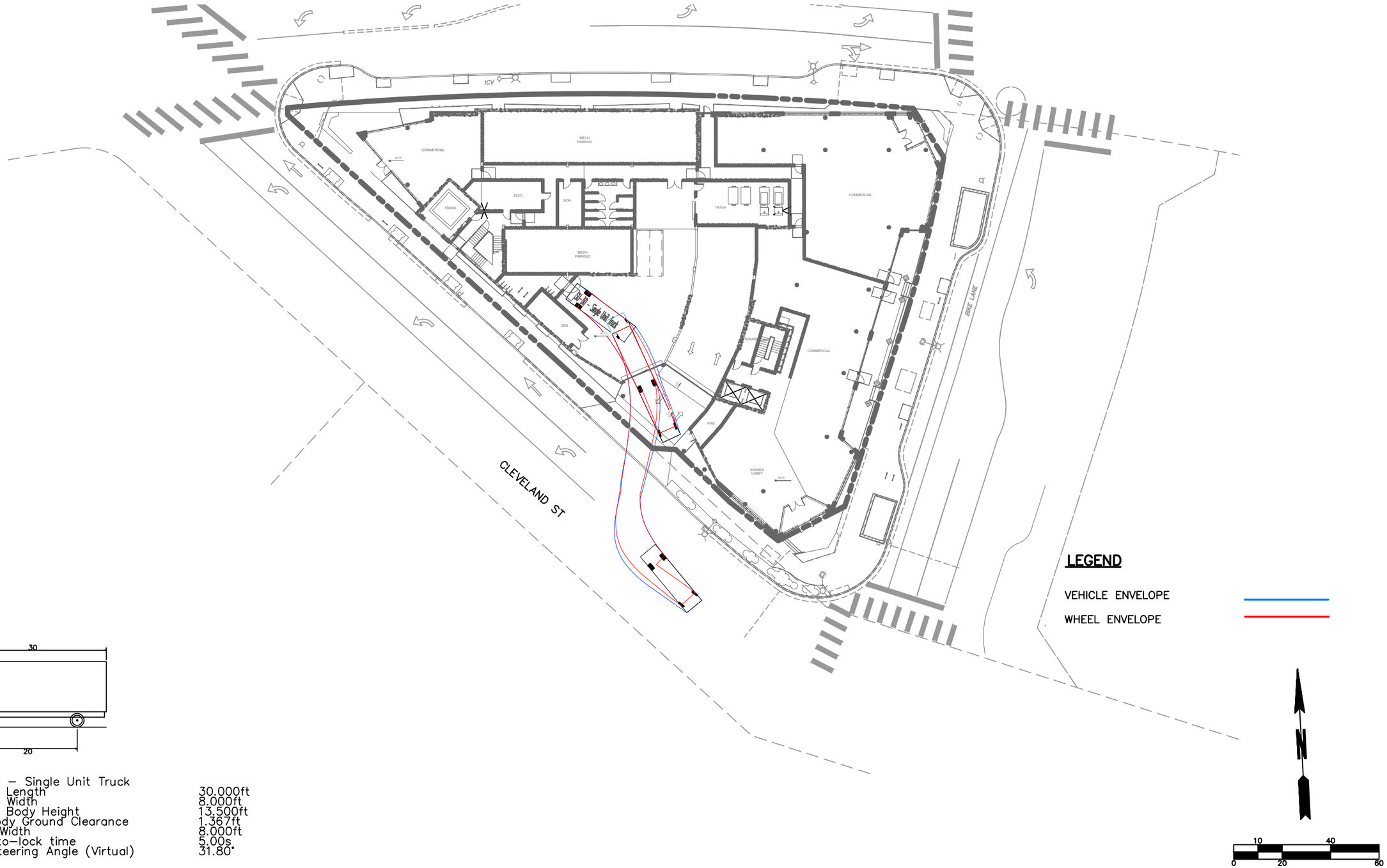
transpogroup
WHAT TRANSPORTATION CAN BE.



SU-30 – Single Unit Truck	
Overall Length	30.000ft
Overall Width	8.000ft
Overall Body Height	13.500ft
Min Body Ground Clearance	1.367ft
Track Width	8.000ft
Lock-to-lock time	5.00s
Max Steering Angle (Virtual)	31.80°

Level 1 Turning Maneuver - SU-30

FIGURE 2

1.18271.00 - Redmond Central

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transpogroup
WHAT TRANSPORTATION CAN BE.