TECHNICAL MEMORANDUM #4: FUTURE SYSTEMS CONDITIONS

Date: October 2, 2020 Project #: 23021.005

To: Fred Evander, *City of Independence*
Michael Duncan, *Oregon Department of Transportation*

From: Matt Bell, Molly McCormick, Alec Kauffman, Matt Hughart, *Kittelson & Associates, Inc.*

Project: Independence Transportation System Plan (TSP) Update

Subject: Tech Memo #4: Future System Conditions

TABLE OF CONTENTS

INTRODUCTION

This memorandum summarizes future (no-build) transportation system conditions in Independence for the Independence Transportation System Plan (TSP) update. The information provided in this memorandum is based on population and employment forecasts developed for Independence and corresponding growth in traffic volumes throughout the City. The future deficiencies identified in this memorandum will serve as the basis for developing transportation system alternatives and improvement projects for the TSP update.

POPULATION AND EMPLOYMENT FORECASTS

Population and employment forecasts were developed for Independence based on state and local data and an assessment of the capacity for additional growth and development within the current Urban Growth Boundary (UGB). The following provides a summary of the forecast; a more detailed summary is provided in Attachment A.

Population Forecast

Historic and projected population information for Independence was obtained from the Portland State University (PSU) Population Research Center (PRC). The PRC generates coordinated forecasts for Oregon counties and cities every four years. The most recent coordinated population forecast for Polk County was released in 2017. The 2017 report includes historic and projected population estimates for Polk County and Independence as well as estimates of persons per household.

According to the report, the base year (2017) population for Independence is 9,326 persons. The population is expected to increase by 2.2 percent per year between 2017 and 2035 and by 1.4 percent per year between 2035 and 2067. Therefore, the end year (2040) population for Independence is expected to be 15,023 persons.

The report also shows that persons per household remained unchanged between the 2000 and 2010 census. Therefore, the assumption for Independence is that it will remain 3.0 persons per household for the base year (2017), but decrease to 2.7 persons per household through 2040. After accounting for adjustments related to recent development, there is an estimated 3,322 households in the base year (2017) and 5,735 households in the end year (2040). The difference between the base year and end year is 2,413 households.

Employment Forecast

The most recent employment data available for Independence is provided from the Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Statistics. This data provides employment information by North American Industry Classification System (NAICS) sector that serves as a general basis of comparison with the Employment Department's employment forecast analysis.

The data shows that base year (2017) employment for Independence is 2,467 jobs. Employment is expected to increase by an overall average of 1.4 percent between 2017 and 2040, with higher increases in construction, retail, transportation/warehousing, education services, and health care/social assistance. Therefore, the end year (2040) employment for Independence is expected to be 3,252 jobs.

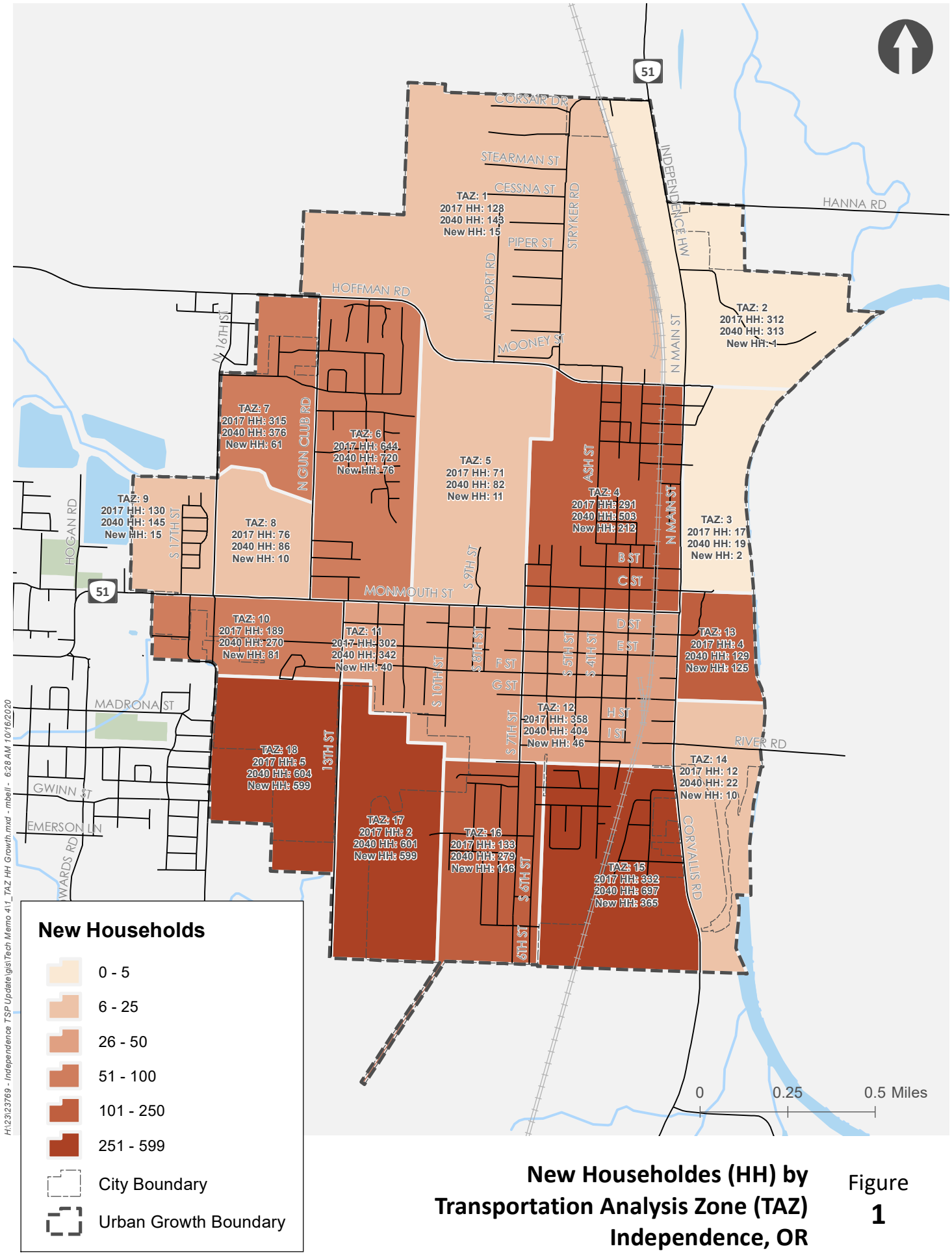
Table 1 summarizes the population and employment data for year 2017 and forecast year 2040 conditions. As shown, population is expected to grow at a higher rate than the employment over the 23-year period, primarily due to growth in the SW Independence Concept Plan area.

Table 1: Population, Household, and Employment Summary

Land Use	2017	2040	Change	Percent Change
Population	9,326	15,023	5,697	61%
Households	3,322	5,735	2,413	73%
Employment	2,467	3,252	785	32%

The population and employment data shown in Table 1 was distributed throughout the City based on current zoning designations and an evaluation of developable and re-developable lands. Based on the evaluation, there is adequate capacity within the City to accommodate the projected growth in population, households, and employment over the planning horizon without changes to current zoning designations, development patterns, and/or the UGB.

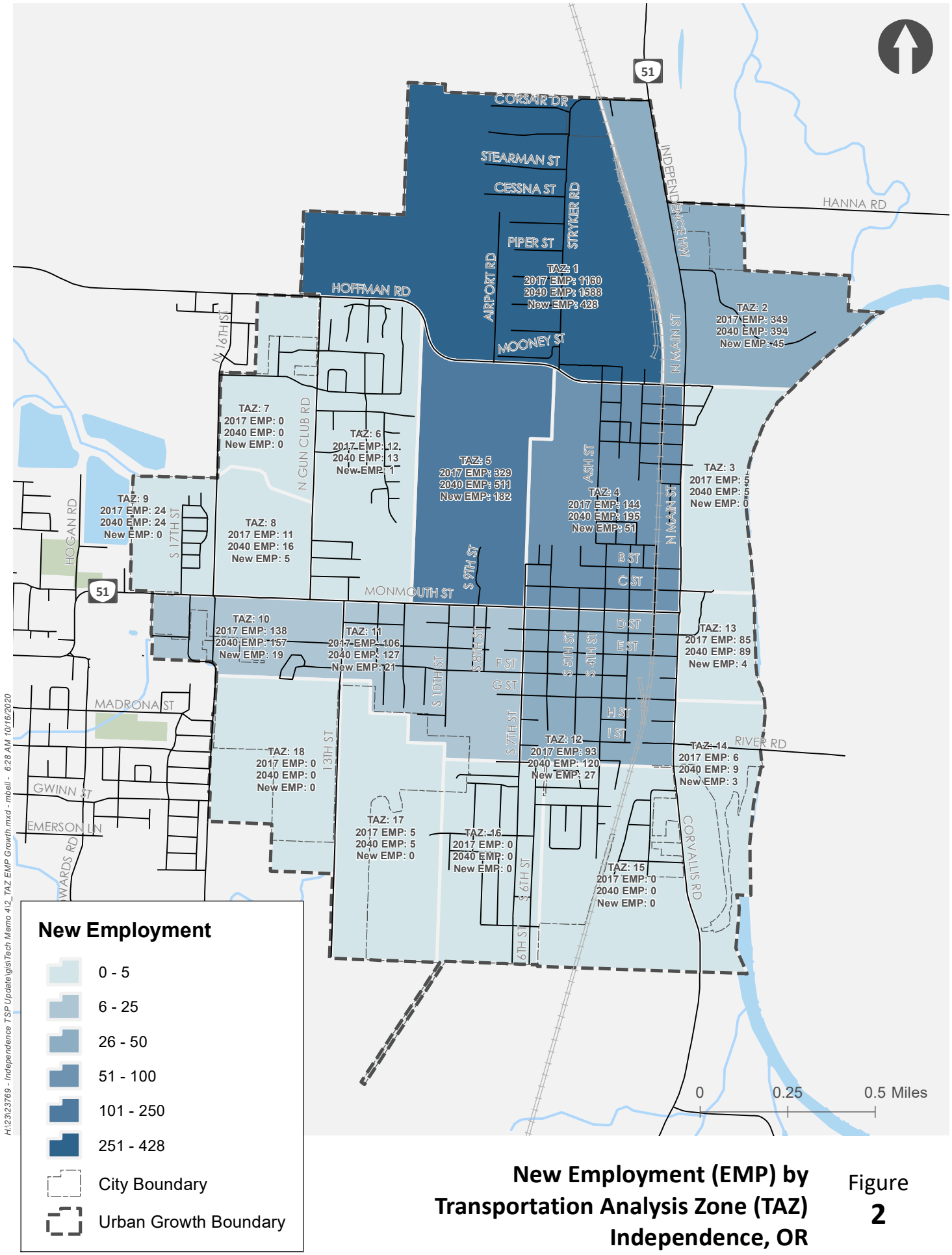
Figures 1 and 2 illustrate the changes in households and employment by Transportation Analysis Zone (TAZ). The TAZs shown in Figures 1 and 2 were developed based on the current zoning designations and the location of major roadways and intersections throughout the City. The TAZs provide a convenient way of evaluating and summarizing the population and employment data for the City.



New Households (HH) by Transportation Analysis Zone (TAZ) Independence, OR

Figure **1**

Data Source: Polk County Data Portal, ODOT



New Employment (EMP) by Transportation Analysis Zone (TAZ) Independence, OR

Figure **2**

Data Source: Polk County Data Portal, ODOT

PLANNED IMPROVEMENTS

This section summarizes planned improvements identified in the Statewide Transportation Improvement Program (STIP) and the Independence Capital Improvement Program (CIP). One expected outcome of the Independence TSP update is the identification of projects for inclusion in updated/amended versions of the STIP and CIP.

Statewide Transportation Improvement Program

The Statewide Transportation Improvement Program (STIP) is the Oregon Department of Transportation's (ODOT) capital improvement program for state and federally funded projects. The Oregon Transportation Commission (OTC) and ODOT develop the STIP in coordination with a wide range of stakeholders, including local jurisdictions and the public. The Commission allocates funding among the following categories:

- **Fix-it** programs fund projects that fix or preserve the state's transportation system, including bridges, pavement, culverts, traffic signals, and others.
- **Enhance it** programs fund projects that enhance or expand the transportation system, these are typically high-priority projects from state and local transportation plans, such as the Independence TSP.
- **Safety** programs reduce deaths and injuries on Oregon roads. This includes the All Roads Transportation Safety (ARTS) program, which includes projects on state highways and local roads.
- **Non-highway** programs fund bicycle and pedestrian projects and public transportation.
- **Local government** programs direct funding to local governments so they can fund projects.

The current STIP (2018-2021) includes several projects in Independence, many of which are currently under construction or complete. Table 2 summarizes projects from the current STIP.

Table 2: Statewide Transportation Improvement Program Projects for Independence

Key	Project Name	Description	Work Type	Status	Project Total
2018-2021 STIP					
20296	River Rd S: Willamette River (Independence) Bridge	Erosion repairs and install bridge rail to preserve the bridge structure	Bridge	Project Under Construction	$2,850,800
19962	OR194: Monmouth Ave. to Catron St (Monmouth) & OR51: 4th St. to B St. (Independence)	Upgrade substandard ADA curb ramps	ADAP, ADAR	Project Under Construction	$1,187,049
20354	F Street: South Fork Ash Creek Bridge	Replace the existing structure with a new bridge	Bridge	Project Under Design	$2,329,500
20693	IOF Independence Landing (City of Independence)	Immediate Opportunity Funds (IOF) to aid in various road improvements to include 1,000 ft of new roadway and a roundabout at C Street	Modern	Project is Complete	$250,000

The projects shown in Table 2 will be accounted for in the future (no-build) traffic conditions analysis and alternatives analysis summarized in Tech Memo 5; however, all have limited or no impact on overall capacity within the UGB.

Independence Capital Improvement Plan

The Independence Capital Improvement Plan (CIP) establishes, prioritizes, and ensures funding for projects to improve existing infrastructure or to pave the way for new development. Projects generally increase functionality, efficiency, and capacity of the infrastructure, or increase capacity to meet the demands of growth, or provide community livability and enhancement.

The current CIP identifies several projects for Fiscal Year (FY) 2016/2017 along with projects for FY 2017-2018, FY 2018-2019 and FY 2019-2020, each of which are expected to be completed within the planning horizon. Table 3 summarizes key characteristics of relevant projects.

Table 3: Independence Capital Improvement Plan

Fiscal Year	Fund	Projects	Estimated Cost	Funding Source
FY 2017-2018*	Parks/Recreation and SDC	Riverfront Bike/Ped Extension	$330,173	SDC, Grants, GO Bond
FY 2018-2019*	Parks/Recreation and SDC	Unnamed Park Development	$267,600	SDC, Grants, GO Bond
FY 2018-2019*	Transportation Operating and SDC	Southern Arterial Phase A	$1,978,250	SDC and Development Contributions
FY 2019-2020*	Transportation Operating and SDC	Southern Arterial Phase B	$4,279,050	SDC and Development Contributions
FY 2018-2019*	Transportation Operating and SDC	Southern Arterial Bridge	$4,776,980	SDC and Development Contributions, and Grants

*Budget calls for funding in multiple FYs, the FY with the largest project budget is displayed

All the projects shown in Table 3 will be accounted for in the future (no-build) traffic conditions analysis except the Southern Arterial Phase A, Phase B, and Bridge projects, which will be evaluated in the alternatives analysis and summarized in Tech Memo 5.

FUTURE TRAFFIC VOLUMES

Future traffic volumes were developed for the study intersections based on the Zonal Cumulative Analysis methodology described in ODOT's Analysis Procedures Manual (APM). This type of analysis combines growth in regional traffic volumes with growth in local traffic volumes associated with household and employment growth in the city. The traffic volume projection process includes three major steps: trip generation, trip distribution, and trip assignment. The process accounts for the following four categories of vehicle trips:

- **External-External (through trips):** vehicles with an origin and destination outside the UGB. An example of an external-external trip is someone traveling from Monmouth to Salem.
- **External-Internal (inbound trips):** vehicles with an origin outside the UGB and a destination inside the UGB. An example of an external-internal trip is someone who works in Salem and returns home to Independence during the evening peak hour.

- **Internal-External (outbound trips):** vehicles with an origin inside the UGB and a destination outside the UGB. An example of an internal-external trip is someone who works in Independence and returns home to Salem during the evening peak hour.
- **Internal-Internal (local trips):** vehicles with an origin and destination inside the UGB. An example of an internal-internal trip is someone who travels from their home to the grocery store without leaving the UGB.

Using these vehicle trip types, the basic steps for a zonal cumulative analysis are:

- Develop regional growth rates for highway traffic volumes;
- Identify where household and employment growth is likely to occur in the community;
- Develop estimates of the number of vehicle trips associated with household and employment growth, and;
- Allocate those trips across the city to various growth areas.

An overview of each of these steps is presented below.

Regional Traffic Growth

ODOT's Future Volume Tables were used to develop regional growth rates for OR 51. Based on the tables, traffic volumes along OR 51 are expected to increase by approximately 18.7 percent north of the City limits on Main Street and 3.6 percent west of the City limits on Monmouth Street over the 20-year planning horizon. These growth rates were applied to existing traffic volumes along OR 51 (Main Street and Monmouth Street) to estimate growth in regional traffic volumes. Similar growth rates were developed for River Road, Corvallis Road, and Hoffman Road to capture the potential for regional traffic growth associated with these routes.

Household and Employment Growth

Projected household and employment growth also contribute to future growth in traffic volumes. Growth estimates were developed based on the PRC's Coordinated Population Forecast for Polk County, the Census Bureau's LEHD Origin-Destination Statistics, and the Oregon Employment Department's employment forecast analysis. The distribution of new households and employment within the City was determined based on an evaluation of developable and re-developable lands as well as a review of existing land use, zoning designations, and development patterns. *Additional information on projected household and employment growth is provided earlier in this memo and in Attachment A.*

Trip Generation

The projected household and employment growth can be equated to increases in local traffic volumes by calculating the trip generation of the future uses. Trip generation estimates were prepared based on information provided in the standard reference, *Trip Generation Manual, 10th Edition*, published by the Institute of Transportation Engineers (ITE). *Table B-1 in Attachment B summarizes the total trips by TAZ.*

Transportation Analysis Zone

The trips associated with the projected household and employment growth were distributed throughout the city based on the type of trips (i.e. external-internal, internal-external, internal-internal) and the location of the TAZs developed for the project. *Additional information on the TAZs is provided earlier in this memo and in Attachment A.*

INTERSECTION OPERATIONS ANALYSIS

The intersection operations analysis was conducted using Synchro 10, which is a software tool designed to assist with operations analyses in accordance with Highway Capacity Manual (HCM) methodologies. The analysis results include level-of-service (LOS), delay, and volume-to-capacity (v/c) ratios at all intersections, regardless of jurisdiction. The LOS, delay, and v/c ratios are reported for the overall intersection at signalized intersections and the critical movement at unsignalized intersections – the overall intersection v/c ratios were hand-calculated in accordance with the methodologies outlined in ODOT's APM.

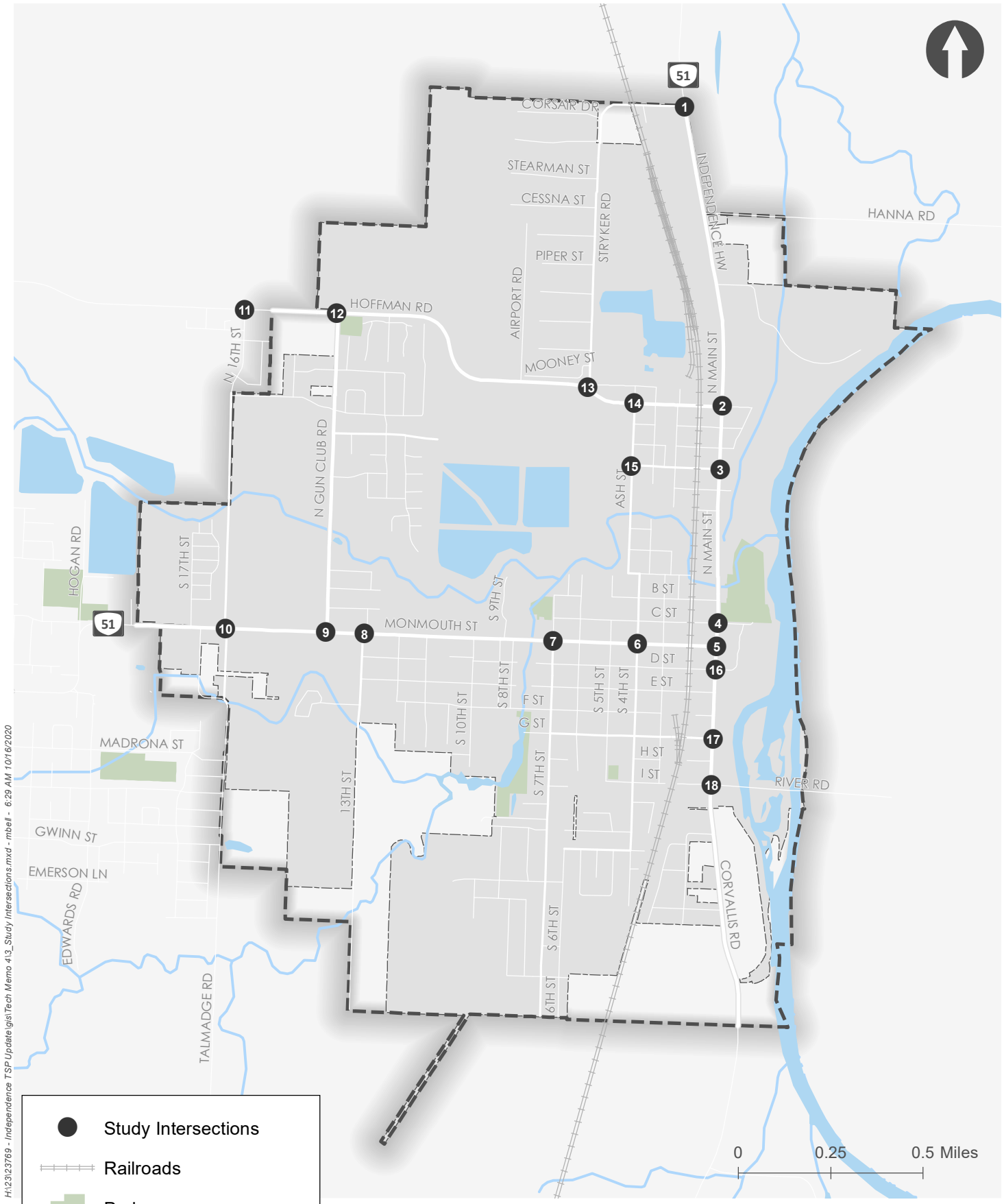
Figure 3 illustrates the location of the study intersections. Table 4 and Figure 4 summarize the results of the intersection operations analysis and compares the results to the applicable mobility standards and targets which were presented in the *Analysis Methodology and Assumptions Memorandum*.

Table 4: Intersection Operations, Weekday PM Peak Hour

Map ID	Intersection	Control Type	Mobility Standard/ Target	Intersection Operations			
				Critical Movement/ Approach	LOS	Delay	v/c
1	OR 51/Stryker Road	TWSC	0.90	EB	D	31.9	0.54
2	OR 51/Polk Street	TWSC	0.95	EB	F	205.7	**1.27**
3	Main Street/Williams Street	TWSC	0.95	EB	C	21.7	0.24
4	Main Street/C Street	TWSC	1.0	WB	C	19.5	0.18
5	Main Street/Monmouth Street	AWSC	1.0	NB	F	100.4	**1.14**
6	Monmouth Street/4th Street	TWSC	1.0	NB	F	1492.0	**>2.0**
7	Monmouth Street/7th Street	TWSC	0.95	NB	F	746.7	**>2.0**
8	Monmouth Street/13th Street	TWSC	0.95	NB	F	86.0	0.95
9	Monmouth Street/Gun Club Road	Signal	0.95	-	C	31.8	**0.97**
10	Monmouth Street/16th Street	Signal	0.95	-	C	24.6	0.85
11	Hoffman Road/16th Street	TWSC	LOS C	NBL	C	18.4	0.16
12	Hoffman Road/Gun Club Road	TWSC	0.80	NB	D	26.0	0.57
13	Hoffman Road/Stryker Road	TWSC	0.80	SB	D	29.4	0.66
14	Polk Street/Ash Street	TWSC	0.80	NB	C	15.1	0.18
15	Ash Street/Williams Street	TWSC	0.80	EB	B	12.2	0.18
16	Main Street/D Street	TWSC	0.95	WB	E	35.9	0.26
17	Main Street/G Street	TWSC	0.80	EB	C	18.6	0.23
18	S Main Street/River Road S	TWSC	0.80	WB	F	186.6	**1.32**

LOS = Intersection Level of Service (Signal); CM Level of Service (TWSC, AWSC).
Delay = Intersection average vehicle delay (Signal); CM vehicle delay (TWSC, AWSC).
v/c = Intersection v/c (Signal); CM v/c (TWSC, AWSC).

As shown in Table 4 and Figure 4, six intersections are forecast to exceed their applicable mobility standards/targets in 2040 during the weekday PM peak hour. The intersections include:



Study Intersections

Railroads

Parks

City Boundary

Urban Growth Boundary

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Study Intersections
Independence, OR

Figure
3

Data Source: Polk County Data Portal, ODOT

Figure 4: Year 2040 Intersection Operations, Weekday PM Peak Hour

- **OR 51/Polk Street** – The eastbound approach to the intersection is forecast to operate at LOS F and above capacity (v/c > 1.0). This is primarily due to growth in TAZ 1 as well as growth in through traffic along OR 51-Main Street.
- **Main Street/Monmouth Street** – All approaches to the intersection are forecast to operate at LOS F and above capacity (v/c > 1.0). This is primarily due to growth in TAZs throughout the city. Many trips go through this intersection as it is the primary connector for east-west to north-south traffic on the east side of the city. Growth in most TAZs is routed through this intersection.
- **Monmouth Street/4th Street** – The northbound and southbound approaches to the intersection are forecast to operate at LOS F and above capacity (v/c > 1.0). This is primarily due to growth in TAZs north and south of the intersection as well as growth in through traffic along OR 51-Monmouth Street. The intersection also serves cut-through traffic from Polk Street to OR 51-Monmouth Street via 4th Street and Ash Street.
- **Monmouth Street/7th Street** – The northbound approach to the intersection is forecast to operate at LOS F and above capacity (v/c > 1.0). This is primarily due to growth in TAZs south of the intersection as well as through traffic along OR 51-Monmouth Street.
- **Monmouth Street/Gun Club Road** – The intersection is forecast to operate at LOS C and below capacity (v/c = 0.97); however, it is expected to exceed its applicable mobility standard. This is primarily due to growth in through traffic along OR 51-Monmouth Street and traffic to/from Gun Club Road.
- **Main Street/River Road** – The eastbound and westbound approaches to the intersection are forecast to operate at LOS F and above capacity (v/c > 1.0). This is primarily due to growth in through traffic along Corvallis Road and traffic to/from River Road.

All other study intersections are forecast to operate acceptably during the weekday PM peak hour with respect to their applicable mobility standards and targets. *Attachment C includes the intersection operations analysis worksheets.*

Queueing Analysis

A queuing analysis was conducted at the signalized study intersections using Synchro 10. Table 5 summarizes the 95th percentile queues during the weekday PM peak hour and indicates if existing storage can accommodate the queues. The vehicle queue and storage lengths were rounded up to the nearest 25-feet. The storage lengths reflect the striped storage for each movement.

Table 5: Queuing Summary, Weekday PM Peak Hour

Map ID	Intersection	Movement	Storage Length (feet)	95th Percentile Queue (feet)	Adequate?
9	Monmouth Street/Gun Club Road	EBL	150	125	Yes
		WBL	150	25	Yes
		NBL	100	100	Yes
		SBL	50	275	**No**
10	Monmouth Street/16th Street	EBL	250	50	Yes
		WBL	225	100	Yes
		NBL	100	50	Yes
		SBL	225	75	Yes

EB = Eastbound, WB = Westbound, NB = Northbound, SB = Southbound, L = Left

As shown in Table 5, the striped storage lengths at the signalized study intersections are currently adequate for the 95th percentile queues except for the southbound left-turn queue at the Monmouth Street/Gun Club Road intersection. The storage length of the southbound left-turn lane on Gun Club Road is restricted by the pavement width between Monmouth Street and C Street. The left turn lane is provided along the segment of Gun Club Road where the southbound bike lane ends north of Monmouth Street. *Attachment C contains the queuing analysis worksheets.*

NON-AUTOMOBILE TRANSPORTATION ANALYSIS

Transit Qualitative Multimodal Assessment

As described in *Technical Memorandum #3A: Existing Conditions Inventory,* public transit services for Independence are provided by Cherriots. These existing services include Cherriots Regional Route 40X: Polk County/Salem Express fixed-route service and the Polk County Flex origin-to-destination service. In fall 2020, Cherriots plans to adjust the Polk County Flex to become a deviated fixed route service called Cherriots Regional Route 45: Central Polk County. Cherriots staff worked with the cities of Independence, Monmouth, and Dallas and in coordination with ODOT to determine a route and identify bus stop locations. The service will operate on a fixed route, including 50 stops within the three cities, but will also allow riders to call beforehand and request service at any location within the Route 45 service area. Service will be provided on weekdays from 7:00 a.m. to 5:00 p.m. with 2-hour headways. Figure 5 shows the future transit facilities based on this planned service change.

A future transit qualitative multimodal assessment was conducted in accordance with the methodology described in ODOT's APM, similar to the assessment conducted under existing conditions in *Technical Memorandum #3B: Existing Conditions Analysis*. Table 6 outlines the methodology used for conducting a future transit qualitative multimodal assessment within Independence. The assessment ratings for Cherriots Regional Route 40X: Polk County/Salem Express have not changed from the existing conditions analysis.

Table 6: Transit Qualitative Multimodal Assessment Methodology – For Rural Express Service

Category	Excellent	Good	Fair	Poor
Frequency	12 daily round trips	8-10 daily round trips	5-7 daily round trips	4 or fewer daily round trips
Schedule Speed/ Travel Times	<20% slower than driving	20% to 40% slower than driving	40% to 60% slower than driving	>60% slower than driving
Transit Stop Amenities	Shelter with bench and sign	Bench with sign	Sign with waiting area	No sign and/or no waiting area
Connecting Pedestrian/ Bicycle Network	Wide shoulders or bike lanes and sidewalks with frequent crossing	Standard shoulders or bike lanes and sidewalks with crossings	Substandard shoulders or bike lanes and sidewalks with no crossing	No shoulders, bike lanes, or sidewalks and no crossings
ADA Accessibility	All stops are ADA-compliant, provide concrete landing pads, and have adjacent parking prohibited	85-99% of stops are ADA-compliant, provide concrete landing pads, and have adjacent parking prohibited	70-84% of stops are ADA-compliant, provide concrete landing pads, and have adjacent parking prohibited	Less the 70% of stops are ADA-compliant, provide concrete landing pads, and have adjacent parking prohibited

Frequency

From the user's perspective, *frequency* determines how many times an hour a user has access to transit service, assuming that service is provided within acceptable walking distance and at the times the user wishes to travel. Frequency also helps determine the convenience of transit service to riders and is one component of overall transit trip time (helping to determine the wait time at a stop). The planned future Route 45 service operates five daily trips with 120-minute frequencies. Service is not provided on weekends. The frequency rating for Route 45 is fair. As discussed in *Technical Memorandum #3B,* the frequency rating for existing Route 40X is good with eight daily weekday trips.

Schedule Speed/Travel Times

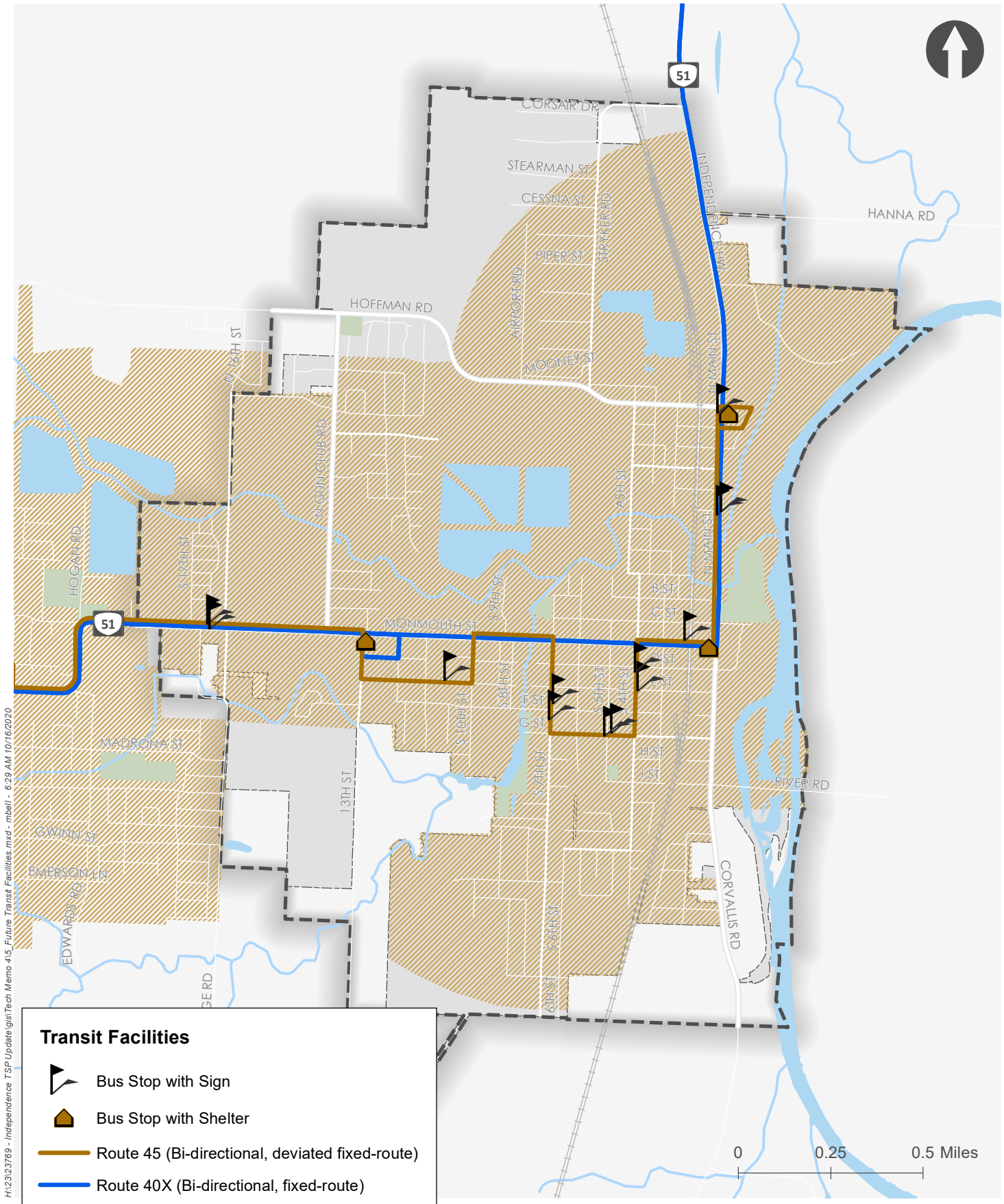
Schedule speed and travel time refer to the time it takes to complete a transit route in full and the length of time between stops. The planned future Route 45: Central Polk County connects Independence, Monmouth, and Dallas. On one full roundtrip, the bus makes 18 stops in Independence (two served by the same transit stop on 13th Street) and 52 stops total in 120 minutes. The same route driven in a single-occupancy vehicle is approximately 95 minutes roundtrip. The schedule speed/travel speed rating for Route 45 is good. As discussed in *Technical Memorandum #3B,* the schedule speed/travel speed rating for existing Route 40X is good with a schedule speed approximately 33 percent slower than driving.

Transit Stop Amenities

Amenities at transit stops, such as bus benches and bus shelters, enhance a transit route and make it more user-friendly. Steps that can make this mode as comfortable and accommodating as possible may help encourage ridership. The planned future Route 45 will use the existing Route 40X transit stops as well as 11 new transit stops within Independence. Cherriots plans to install a sign and pole at every new transit stop for Route 45. No additional shelters, trash receptacles, or posted schedules are planned at this time. The transit stop amenities rating for Route 45 is fair. As discussed in *Technical Memorandum #3B,* the transit stop amenities rating for existing Route 40X is good with three of five transit stops providing shelters and other amenities in addition to signage.

Connecting Pedestrian/Bicycle Network

Pedestrian facilities are provided adjacent to all existing and proposed bus stops in Independence. Of the 11 proposed new transit stops to serve planned future Route 45, marked crosswalks are only provided within a city block of the G Street/5th Street stops. Designated bicycle facilities, such as on-street bike lanes, are not provided adjacent to the majority of bus stops in Independence, except at the Main Street/Oak Street and OR 51/Talmadge Street stops. For the bus stops not on OR 51, mixed traffic may support cyclists due to low-speed roadways. The connecting pedestrian/bicycle network rating for Route 45 is fair. As discussed in *Technical Memorandum #3B,* the connecting pedestrian/bicycle network rating for existing Route 40X is good with adjacent pedestrian facilities, nearby marked crosswalks, and several stops on low-speed roadways that support mixed traffic. Filling gaps in the existing bicycle network would help create more of a multimodal system to support transit within Independence.



Transit Facilities

- Bus Stop with Sign
- Bus Stop with Shelter
- Route 45 (Bi-directional, deviated fixed-route)
- Route 40X (Bi-directional, fixed-route)
- Route 45 Service Area
- City Boundary
- Urban Growth Boundary

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Future Transit Facilities and Service
Independence, OR

Figure
5

Data Source: General Transit Feed Service

ADA Accessibility

Pedestrian ramp ratings are only available along OR 51 through ODOT's TransGIS inventory. Based on TransGIS, all pedestrian ramps adjacent to existing and new bus stops along OR 51 within the city are rated as poor or missing. Based on information from Cherriots staff, bus stop landing pads will not be provided at five of the 11 future bus stops to be added with planned future Route 45 service. In addition, parking is currently allowed adjacent to nine of the future Route 45 bus stops. Cherriots is working with the City to establish no parking zones for these locations as part of the bus stop installations. The ADA accessibility rating for Route 45 is poor. As discussed in *Technical Memorandum #3B,* the ADA accessibility rating for existing Route 40X is also poor with three of five transit stops allowing parking and all adjacent pedestrian ramps rated as poor or missing.

Pedestrian Level of Traffic Stress

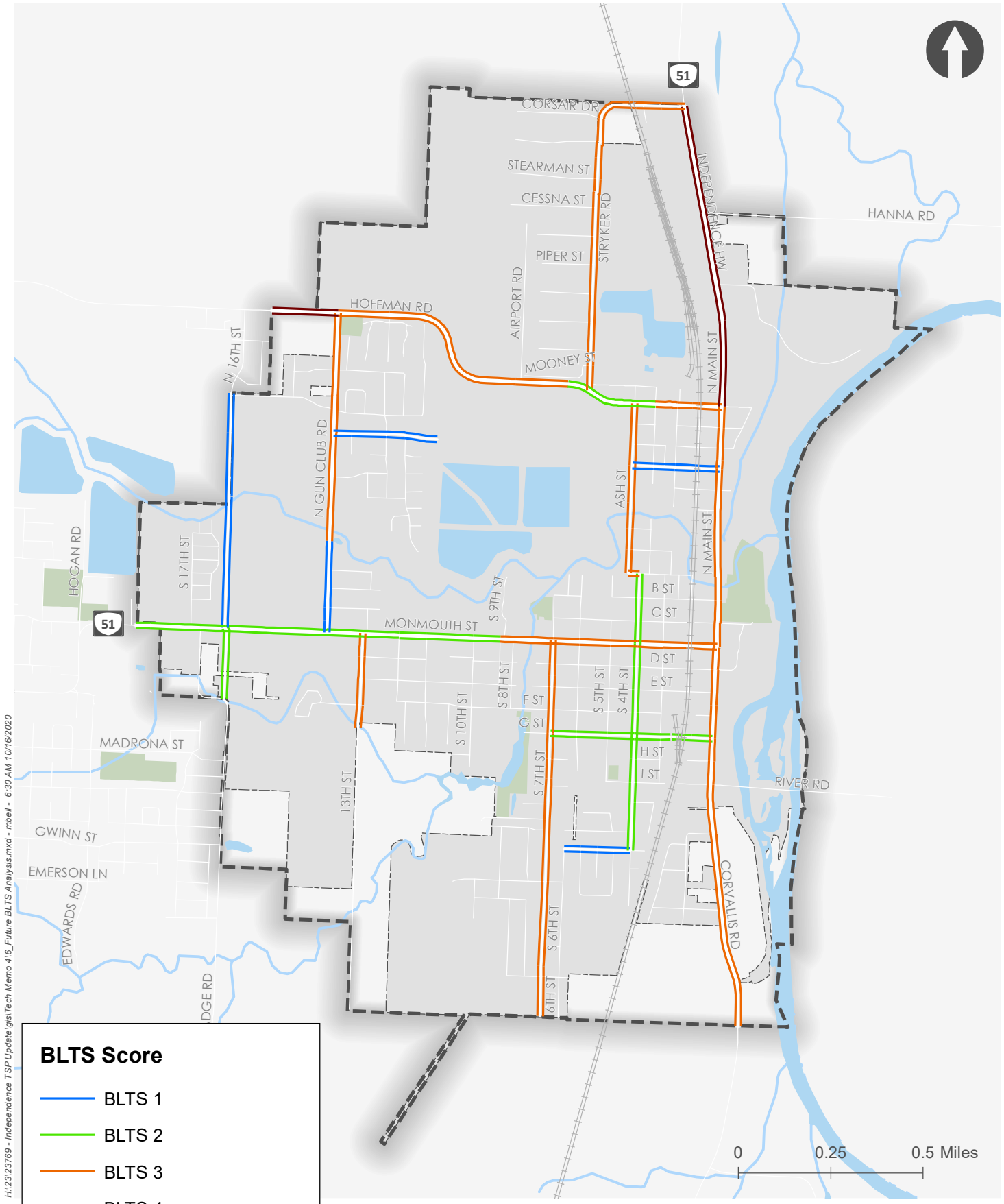
Pedestrian Level of Traffic Stress (PLTS) along roadway segments is determined based on sidewalk condition, physical buffer type, total buffering width, and general land use. Traffic volumes do not impact PLTS along roadway segments. Therefore, the forecast traffic volumes describe above are not expected to change the PLTS analysis results relative to existing conditions. In addition, none of the planned improvements identified in the STIP or the CIP are expected to change the factors that determine PLTS along roadway segments. Therefore, the PLTS analysis results summarized in *Tech Memo #3B: Existing Conditions Analysis* remain the same under future (no-build) traffic conditions.

Bicycle Level of Traffic Stress

Bicycle Level of Traffic Stress (BLTS) along roadway segments is determined based on traffic volumes, travel speeds, the number of travel lanes per direction, the presence and width of on-street bicycle lanes and/or adjacent parking lanes, and several other factors. Unlike PLTS, the forecast traffic volumes described above are expected to change the BLTS analysis results relative to existing conditions. Table D-1 in Attachment D summarizes the BLTS analysis results under future (no-build) traffic conditions. Figure 6 illustrates the BLTS analysis results for arterial and collector streets. It is important to note that while some segments are shown as BLTS 3 or 4, they may have shorter segments with lower BLTS scores. As shown in Figure 6, several arterial and collector streets in Independence are forecast to have segments that are rated BLTS 3 or 4. These segments may have bike lanes that are too narrow for roadway conditions or may be shared roadways (i.e. *mixed traffic*) with relatively high traffic volumes.

ATTACHMENTS

A. Population and Employment Forecast Methodology Memorandum
B. Trip Generation Estimate
C. Future Traffic Operations and Queuing Analysis Worksheets
D. Future BLTS Analysis Results



BLTS Score

- BLTS 1
- BLTS 2
- BLTS 3
- BLTS 4
- City Boundary
- Urban Growth Boundary

Future BLTS Analysis Results
Independence, OR

Figure
6

Data Source: Polk County Data Portal, ODOT

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Attachment A Population and Employment Forecast Methodology Memorandum

MEMORANDUM

Population and Employment Forecast Methodology (Technical Memorandum #4, Task 4A)

Independence Transportation System Plan Update

DATE	September 7, 2020
TO	Project Management Team
FROM	Matt Hastie and Clinton "CJ" Doxsee, Angelo Planning Group
CC	FILE

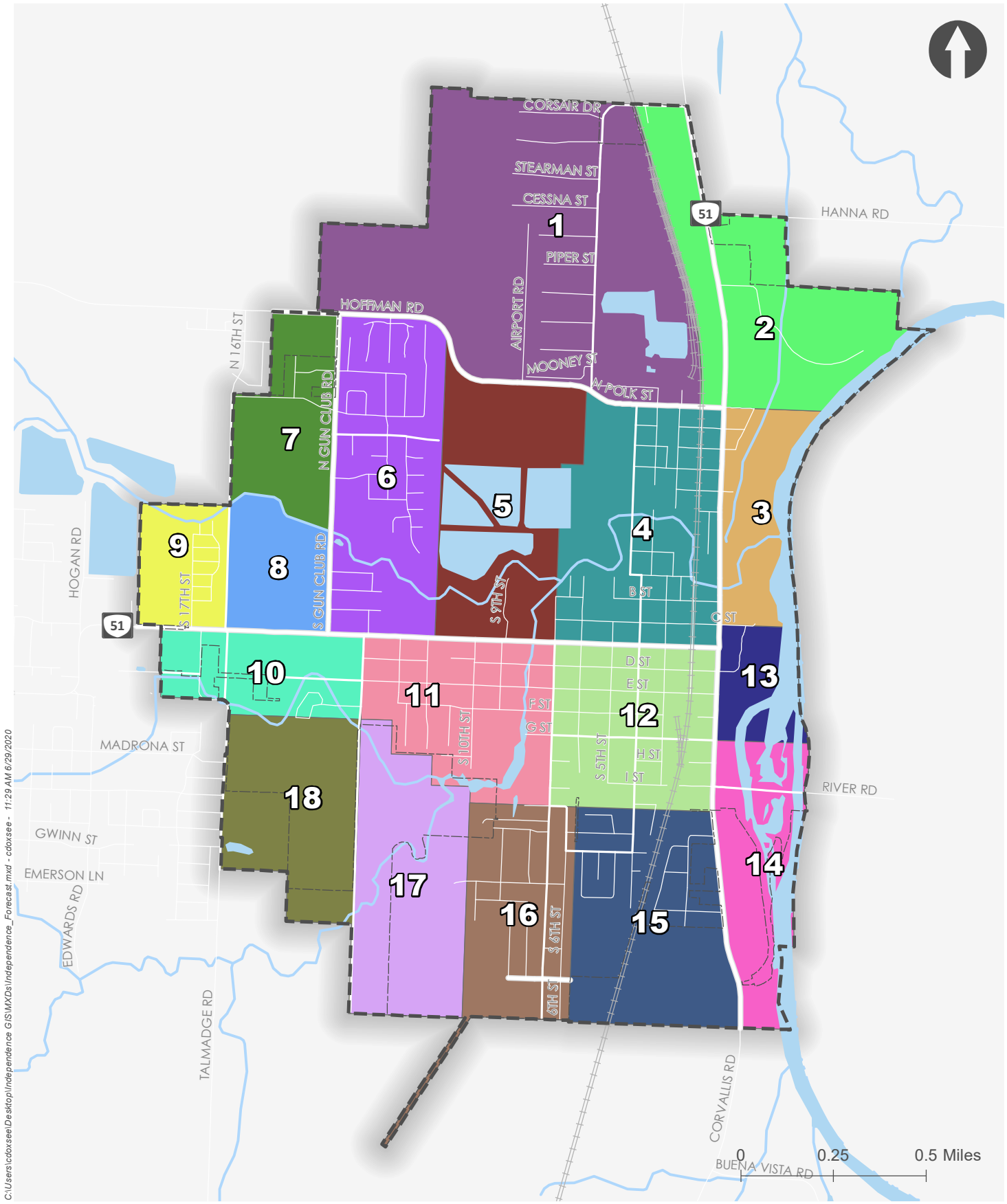
INTRODUCTION

This memorandum describes the land use forecast for the City of Independence Transportation System Plan (TSP) update, and the methodology behind the forecast. This forecast will ultimately provide the following:

- Number of single family detached (SFD), single family attached (SFA), and multifamily (MF) housing units in each Transportation Analysis Zone (TAZ) in base year (2017) and end year (2040).
- Square footage of employment uses (as categorized by the draft Independence Economic Opportunities Analysis), current year and end year.

The forecast assumes that growth will occur within the City of Independence's current Urban Growth Boundary (UGB). This forecast relies on an assessment of the estimated capacity for additional growth and development within the current UGB, using existing land use designations. In general, the forecast assumes that future development will occur at the average densities identified in a combination of the City's adopted buildable land inventory and SW Independence Concept Plan, although densities of actual development ultimately may be lower than allowed.

TAZs were developed for the City using existing zoning and considerations of particular corridors/ intersections of concern. The 18 TAZs are shown on Figure 1 below.



Transportation Analysis Zones (TAZs)
Independence, OR

Figure
1

Data Source: Pok County Data Portal, ODOT

POPULATION AND HOUSEHOLD FORECAST

Portland State University's Population Research Center (PRC) is responsible for forecasting populations for cities and counties within the State of Oregon. Their Coordinated Population Forecast for Polk County, its Urban Growth Boundaries (UGB), and Area Outside UGBs 2017-2067 was published in 2017 and is the basis for population and household analysis.

Figure 2 shows the historical and forecast population for communities within Polk County. Base-year population for the Independence UGB is 9,326 persons. The average annual growth rate (AAGR) is expected to be 2.2% through the year 2035 and will drop to 1.4% between 2035 to 2067. Projecting to the year 2040 with the AAGR period results in an end-year population of **15,023 persons in the year 2040.**

Figure 3 shows the persons per household for Independence, which remained unchanged between the 2000 and 2010 census. The assumption for the base year is that persons per household will remain at 3.0 person per household. The assumption for 2040 is that the average will decrease to 2.7 persons per household. After accounting for adjustments related to recent development[1], there is an estimated 3,322 households in the base year and 5,735 households in the end year 2040. The difference between the Base Year and End Year is 2,413 households. This is the overall growth in housing units estimated for Independence during the planning period.

Figure 2: Polk County and Sub-Areas – Historical and Forecast Populations and Average Annual Growth Rates (AAGR)

Figure 1. Polk County and Sub-Areas—Historical and Forecast Populations, and Average Annual Growth Rates (AAGR)

	Historical			Forecast				
	2000	2010	AAGR (2000-2010)	2017	2035	2067	AAGR (2017-2035)	AAGR (2035-2067)
Polk County	*62,380*	*75,403*	*1.9%*	*81,089*	*105,217*	*149,203*	*1.5%*	*1.1%*
Dallas UGB	13,277	15,356	1.5%	16,414	22,665	33,208	1.8%	1.2%
Falls City UGB	966	947	-0.2%	1,003	1,119	1,285	0.6%	0.4%
Independence UGB	6,248	8,696	3.4%	9,326	13,803	21,741	2.2%	1.4%
Monmouth UGB	7,834	9,598	2.1%	9,944	12,943	17,708	1.5%	1.0%
Salem/Keizer UGB (Polk)	19,919	26,139	2.8%	27,888	36,936	54,045	1.6%	1.2%
Willamina UGB (Polk)	731	866	1.7%	898	1,049	1,277	0.9%	0.6%
Outside UGBs	13,405	13,801	0.3%	15,616	16,702	19,940	0.4%	0.6%

Sources: U.S. Census Bureau, 2000 and 2010 Censuses; Forecast by Population Research Center (PRC).

[1] Adjustments based on recent development are summarized in the *Locating Households and Housing* Types section below.

Source: Portland State University Population Research Center Coordinated Population Forecast for Polk County, 2017

Figure 3: Polk County and Sub-Areas – Persons per Household (PPH) and Occupancy Rate

Figure 14. Polk County and Sub-Areas—Persons per Household (PPH) and Occupancy Rate

	Persons Per Household (PPH)			Occupancy Rate		
	2000	2010	Change 2000-2010	2000	2010	Change 2000-2010
Polk County	*2.6*	*2.6*	*0.0*	*94.3%*	*93.4%*	*-0.9%*
Dallas	2.6	2.5	-0.1	95.3%	93.8%	-1.5%
Falls City	2.9	2.6	-0.3	90.6%	92.7%	2.0%
Independence	3.0	3.0	0.0	93.6%	90.3%	-3.3%
Monmouth	2.5	2.5	0.0	94.0%	94.1%	0.1%
Salem/Keizer (Polk)	2.5	2.6	0.1	94.5%	94.0%	-0.5%
Willamina (Polk)	2.8	2.8	0.0	94.3%	89.6%	-4.7%
Outside UGBs	2.8	2.6	-0.1	93.6%	93.1%	-0.5%

Sources: U.S. Census Bureau, 2000 and 2010 Censuses.

Note: For simplicity each UGB is referred to by its primary city's name.

Source: Portland State University Population Research Center Coordinated Population Forecast for Polk County, 2017

RESIDENTIAL CAPACITY OF THE INDEPENDENCE UGB

The project team produced a land inventory as part of *Technical Memorandum #3, Existing Conditions Inventory and Analysis*. The inventory is used as the basis for determining future residential capacity in Independence. The inventory produced as part of *Technical Memorandum #3* includes an inventory of vacant land within the UGB that was provided to the project team by City staff. The vacant land inventory was supplemented to include an inventory of land that is potentially redevelopable over the planning horizon. Land identified as potentially redevelopable is assumed to include partially vacant land with an improvement value of between 5% and 40% of the property's land value.

This analysis incorporates elements of the buildable lands inventory the City adopted in 2007. The amount of vacant and developable land identified in the 2007 buildable lands inventory is dated and not used as the basis for this analysis. However, the adopted buildable lands inventory provides standards and policy guidance for evaluating densities in individual zones. It describes the average and maximum densities that are applicable for determining residential capacity. The average and maximum residential densities are summarized in Table 1 below.

Table 1: Residential Development Density

ZONE	AVERAGE DENSITY	MAXIMUM DENSITY
Low Density Residential (RS)	Single-family: 5.5 units/acre Multi-family: 12 units/acre	8 units/acre
Medium Density Residential (RM)		12 units/acre
High Density Residential (RH)		20 units/acre
Residential Single-Family Airpark (RSA)*	1 unit/lot	1 unit/lot
Mixed Residential Density (MX)**	9 units/acre	

* The Residential Single-Family Airpark (RSA) zone is a specialized zoning designation reserved for single family dwellings that have access to the Independence State Airport by a taxiway and contain aircraft hangars for personal aviation use. Due to the unique characteristics associated with this type of housing, this analysis assumes one unit per vacant lot.
** The Mixed Residential Density (MX) designation is applied to areas that were recently annexed into the City, consistent with the SW Independence Concept Plan.

Table 2 provides a summary of residential zones within the Independence UGB. The table also lists the assumptions for the types of residential housing that is used in this forecast. Overall, the forecast assumes that approximately 60 percent of new development will be detached single-family residential. This assumption is supported by inspection of the diversity of residential development using Google Street View at various locations throughout the City.

Table 2: Zoning Summary

ZONE	DESCRIPTION	ASSUMPTION
Low Density Residential (RS)	The purpose of the RS Zone is to define and protect areas suitable for low-density residential uses.	Assume 5.5 DU/acre at 100% single-family detached dwellings.
Medium Density Residential (RM)	The purpose of the RM Zone is to define and protect areas suitable for low or medium-density residential uses. Such areas are intended for the development and use of single-family dwellings and medium density residential structures such as duplexes, row houses, and townhouses.	Assume 5.5 DU/acre at 60% single-family detached dwellings. 5.5 DU/acre at 30% single-family attached dwellings. 12 DU/acre at 10% multi-family dwellings. The estimate assumes that most development will utilize single-family residential housing types due to the availability of developable land.
High Density Residential (RH)	The purpose of the RH Zone is to define and protect areas suitable for medium and high-density residential uses.	Assume 5.5 DU/acre at 20% for single-family. attached. 12 DU/acre at 80% at multi-family.
Residential Single-Family Airpark		Assume 1 DU per parcel.

ZONE	DESCRIPTION	ASSUMPTION
Mixed Residential Density (MX)	The purpose of the MX Zone is to allow a creative mixture of housing types that is coordinated with local conditions and emphasizes multi-modal circulation.	The MX Zone implements the 2012 SW Independence Concept Plan. This analysis will use the buildable acreage and housing unit capacity from the Concept Plan, assuming the Scenario 2 estimate (assumes 50% of wetlands preserved). Capacity from the estimate will be reduced to account for any development construction since adoption of the Concept Plan. The average density is 9 DU/acre. The analysis assumes 60% single-family detached. 10% single-family attached. 30% multi-family.
Polk County Suburban Residential (SR) Zone	The purpose of Polk County's SR Zone is to provide a transition between urban and rural living within an officially designated sewered area, or an area that may be served with sewers.	For lots or parcels in the SR zone and located outside of the Southwest Area UGB (MX zones), the following assumptions will apply. New lots or parcels within an urban growth boundary are required to conform with requirements identified in the urban growth management agreement between the County and the City. Most parcels are assumed to have similar growth as the RS Zone summarized above: 5.5 DU/acre at 100% single-family detached dwellings. Limited areas are assumed to be incorporated into the City with RM Zoning, which will use the same assumptions.

This analysis assumes that most of the growth and capacity will be in the MX Zone, consistent with SW Independence Concept Plan. As noted in Table 2 above, the analysis will use the buildable acreage and housing unit capacity from the Concept Plan, assuming the middle range estimate. It assumes that the Concept Plan area will be built out over the planning horizon. Housing built since the MX zone was applied will be deducted from the SW Independence Concept Plan's capacity. At the time of this memorandum, 48 housing units have been constructed, reducing the unit capacity from 1,235 to 1,197. The remainder of the forecasted growth is assumed to be distributed in the vacant and redevelopable areas outside of the MX Zone.

The expected capacity of households within the remaining UGB is estimated using the following assumptions.

- Vacant lots are assumed to add a minimum of one residential unit regardless of size or constraints.
- Vacant lots assume 15% are set aside for future streets and right-of-way dedication.
- Half of partially vacant lots are available for new residential development.

Table 3: Capacity and Unit Split of Buildable Land within Independence UGB

ZONE	BUILDABLE ACRES	ASSUMED DENSITY (DU/ACRE)	UNIT CAPACITY	UNIT SPLIT
RS	Partially Vacant: 0.8 Vacant: 4.4	5.5	37	100% single-family detached
RM	Partially Vacant: 29.8 Vacant: 16.3	5.5 – 12	194	60% single-family detached 30% single-family attached 10% multi-family
RH	Partially Vacant: 0.2 Vacant: 9.2	5.5 – 12	85	20% single-family attached 80% multi-family
RSA	Vacant: 6.0	1 per lot	17	100% single-family detached
MX*	139.4 acres	9	1,197	60% single-family detached 10% single-family attached 30% multi-family
SR	Partially Vacant: 0.2 Vacant: 76.7	5.5	355	100% single-family detached
TOTAL	Partially Vacant: 31.0 Vacant: 252.1		1,885	

* Buildable acres and unit capacity in the MX zone are based on Scenario 2 from SW Independence Concept Plan analysis. Housing built since the UGB was expanded has been deducted from the capacity.

Given these assumptions, the UGB has approximately enough capacity to accommodate the new housing units expected within the planning period.

LOCATING HOUSEHOLDS AND HOUSING TYPES

For the base year, households are assigned to TAZs based on block-level US Census data, which provides total population per census block for the year 2010.[2] Table 4 shows the 2010 population for each TAZ and the share of the city's 2010 population within each TAZ, and applies that share to the 2017 (Current Year) population and household totals. The following adjustments were made to individual TAZs to account for past development.

- Riverplace Apartments. 210 apartments located in TAZ 2 and constructed in 2014. Persons per household assumed at 1.4.[3]
- Legacy Oaks Apartments. 196 apartments located in TAZ 7 and constructed in 2009. Persons per household assumed at 1.4.

Table 4: TAZ Share of 2010 Population and 2017 Population

TAZ	2010 POPULATION	SHARE OF POPULATION	2017 POPULATION	2017 HOUSEHOLDS
1	382	4.4%	385	128
2	304	3.5%	600	312
3	50	0.6%	50	17
4	865	9.9%	872	291
5	212	2.4%	214	71
6	1,916	22.0%	1,931	644
7	371	4.3%	640	315
8	227	2.6%	229	76
9	388	4.5%	391	130
10	561	6.5%	566	189
11	899	10.3%	906	302
12	1,064	12.2%	1,073	358
13	13	0.1%	13	4
14	37	0.4%	37	12
15	989	11.4%	997	332
16	396	4.6%	399	133
17	6	0.1%	6	2
18	16	0.2%	16	5
TOTAL	8,696	**100%**	9,326	3,109

Source: 2010 US Decennial Census Data

[2] 2010 is the most recent year for which block-level data is available. Census block boundaries do not always align with TAZ boundaries – blocks were assigned to the TAZ in which the preponderance of residential units was located, based on review of aerial imagery. One census block was apportioned evenly between TAZ 18 and TAZ 19.

[3] A lower average household size was assumed for these developments in comparison to the average household size for the city as a whole for two reasons. First, multi-family developments have lower average households sizes in general. Second, assuming a higher average size would have resulted in decreases in population in other TAZs across the City, given the overall levels of growth in population and households between 2010 and 2017 and the need to distribute that growth across all TAZs.

Table 5 assigns the number of households and household types to individual TAZs based on the 2017 population estimate. The number of households assumes approximately three persons per household in the base year. The distribution of housing types is based on the acreage of zoning in each TAZ and the assumptions described in Tables 2 and 3. The following adjustments were made to individual TAZs to account for the mix of housing types associated with recent development.

- Riverplace Apartments. 210 apartments located in TAZ 2 and constructed in 2014.
- Creekside Meadows. 69 apartments located in TAZ 6 and constructed in 1996.
- Legacy Oaks Apartments. 196 apartments located in TAZ 7 and constructed in 2009.

Table 6 distributes the forecasted population growth among TAZs based on the amount of vacant and partially vacant land within each. The number of households assumes approximately 2.7 persons per household in the year 2040. Environmental constraints such as wetlands and steep slopes were deducted from the supply of vacant and partially vacant land. Partially vacant land was assumed to have 50% of the site available for infill or redevelopment. The following adjustments were made to individual TAZs to account for development that is under construction or recently approved.

- Housing Mix. 110 multi-family and 14 single-family attached units are under construction currently in TAZ 3.
- Independence Landing and Osprey Point. 146 multi-family and 14 single-family attached units are approved for construction in TAZ 4.
- SW Area. 48 single-family units located between TAZs 16 and 17.
-

Table 5: Base-Year Household Distribution

TAZ	2017 POPULATION	2017 HOUSEHOLDS	SINGLE-FAM DETACHED	SINGLE-FAM ATTACHED	MULTI-FAMILY
1	385	128	128	-	-
2	600	312	61	31	220
3	50	17	11	4	1
4	872	291	219	54	18
5	214	71	36	20	15
6	1,931	644	513	46	84
7	640	315	89	22	203
8	229	76	76	-	-
9	391	130	-	26	104
10	566	189	67	24	97
11	906	302	154	76	72
12	1,073	358	218	28	112
13	13	4	-	-	-
14	37	12	12	-	-
15	997	332	332	-	-
16	399	133	80	40	13
17	6	2	1	0	1
18	16	5	3	1	2
TOTAL	9,326	3,322	2,002	373	943

Table 6: Residential Growth and 2040 Households

TAZ	POPULATION GROWTH	2040 POPULATION	2040 HOUSEHOLDS	SINGLE-FAM DETACHED	SINGLE-FAM ATTACHED	MULTI-FAMILY
1	-	385	143	143	-	-
2	1	601	313	62	31	220
3	1	52	19	13	5	2
4	487	1,359	503	259	77	167
5	8	222	82	42	23	17
6	14	1,945	720	581	52	86
7	165	805	376	134	34	207
8	4	232	86	86	-	-
9	1	392	145	-	29	116
10	164	730	270	96	35	139
11	16	922	342	174	86	81
12	19	1,092	404	246	32	127
13	335	348	129	-	14	110
14	22	59	22	22	-	-
15	885	1,882	697	697	-	-
16	353	752	279	183	72	24
17	1,616	1,622	601	364	59	177
18	1,616	1,632	604	363	60	181
TOTAL	5,706	15,032	5,735	3,464	610	1,656

EMPLOYMENT BLI

Projected Employment

The Oregon Employment Department Workforce and Economic Research Division publishes employment forecasts by industry. These ten-year forecasts are defined by regions (as opposed to counties or cities) and organize employment forecasts by primary industry. The region that includes Polk County also includes Linn, Marion, and Yamhill Counties.

Table 7 provides a summary of forecasted changes by employment industry. As shown in the table, overall employment is expected to grow by 33,400 (12% increase). Self-employment and private sector employment are expected to have the highest growth rate at 14% and 13% respectively. Overall growth in government employment is also expected to increase, but at a much lower rate of 7%.

With few exceptions, all industries in the private sector are anticipated to have over 10% growth. Most of the growth is expected to occur in construction (20% increase) and private educational and health services (19% growth). Industries that are expected to experience the least growth – under 10% - include manufacturing (7% growth), information (6% growth), and financial activities (5% growth).

Employment growth in the government sector is only expected to grow for state and local employment at 9% and 5% growth, respectively. There is no anticipated growth among federal government employees in this region.

Table 7: 2017 – 2027 Industry Employment Forecast

	2017	2027	CHANGE	% CHANGE
Total Employment	**277,200**	**310,600**	**33,400**	**12%**
Total payroll employment	261,000	292,100	31,100	12%
Total private	208,800	236,400	27,600	13%
Natural resources and mining	17,700	20,100	2,400	14%
Construction	14,700	17,700	3,000	20%
Manufacturing	27,700	30,100	2,400	9%
Trade, transportation, and utilities	42,500	47,600	5,100	12%
Information	1,800	1,900	100	6%
Financial activities	9,200	9,700	500	5%
Professional and business services	19,000	21,000	2,000	11%
Private educational and health services	43,700	51,800	8,100	19%
Leisure and hospitality	22,400	25,400	3,000	13%
Other services and private households	10,100	11,100	1,000	10%
Government	52,200	55,700	3,500	7%
Federal government	2,100	2,100	0	0%
State government	21,900	23,900	2,000	9%
Local government	28,200	29,700	1,500	5%
Self-employment	16,200	18,500	2,300	14%

Source: Industry Employment Forecast, 2017-2027 (Linn, Marion, Polk, and Yamhill Counties)

The most recent employment data by North American Industry Classification System (NAICS) sector available for the City of Independence is provided from the Census Bureaus' Longitudinal Employer-

Household Dynamics (LEHD) Origin-Destination Statistics. This provides a general basis of comparison with the Oregon Employment Department's employment forecast analysis. As summarized in Table 8, nearly 2,500 people worked in Independence in the year 2017. Over half of the employment in the City is concentrated in three sectors: manufacturing, educational services, and agriculture/forestry/fishing/hunting. Approximately one-quarter of the jobs in the City are in the manufacturing sector (25.1%). Both the educational services and agriculture/forestry/fishing/hunting sectors employ over 10% of the population each at 14.5% and 12% respectively of the City's employment. The next largest employment sectors include health care/social assistance (9.9%), retail trade (8.6%) and accommodation/food services (6.9%).

Table 8 also shows the estimated forecast for current employment sectors within the City. The assumption is that employment growth in the City will have similar trends to the regional growth forecasts. Actual growth rates for individual employment sectors in the City may vary depending on changing market conditions. The forecasts apply an average annual growth rate (AAGR) to each employment sector based on the regional forecast growth rates. AAGR rates are applied according to the employment industry forecast it most closely aligns with in Table 7 above to provide a general estimate. As summarized in the table, employment is anticipated to grow at an overall AAGR of 1.4%. Based on regional growth estimates, the sectors with AAGR growth rates higher than the City average include construction, retail, transportation/warehousing, education services, and health care/social assistance.

Table 8: Independence Employment by NAICS Sector

INDEPENDENCE EMPLOYMENT BY NAICS SECTOR	2017		AAGR	2040	
	Emp	%		Emp	%
Total Employment	2,467	100%	1.4%	3,252	
Agriculture, Forestry, Fishing and Hunting	295	12.0%	1.4%	390	12.0%
Mining, Quarrying, and Oil and Gas Extraction	0	0.0%	1.4%	0	0.0%
Utilities	0	0.0%	1.2%	-	0.0%
Construction	26	1.1%	2.0%	38	1.2%
Manufacturing	620	25.1%	0.9%	748	23.0%
Wholesale Trade	30	1.2%	0.6%	34	1.0%
Retail Trade	212	8.6%	2.0%	310	9.5%
Transportation and Warehousing	84	3.4%	2.0%	123	3.8%
Information	18	0.7%	0.6%	20	0.6%
Finance and Insurance	14	0.6%	0.5%	16	0.5%
Real Estate and Rental and Leasing	14	0.6%	0.5%	16	0.5%
Professional, Scientific, and Technical Services	19	0.8%	1.1%	24	0.7%
Management of Companies and Enterprises	2	0.1%	1.1%	3	0.1%
Admin. & Support, Waste Management and Remediation	167	6.8%	1.1%	209	6.4%
Educational Services	357	14.5%	1.9%	513	15.8%
Health Care and Social Assistance	244	9.9%	1.9%	351	10.8%
Arts, Entertainment, and Recreation	25	1.0%	1.3%	32	1.0%
Accommodation and Food Services	169	6.9%	1.3%	220	6.8%
Other Services (excluding Public Administration)	109	4.4%	1.0%	134	4.1%
Public Administration	62	2.5%	0.7%	72	2.2%

Source: US Census Bureau, on the Map Application and LEHD Origin-Destination Statistics (Beginning of Quarterly Employment, 2nd Quarter of 2002-2017)

Table 9 translates the forecasted employment growth into six general employment categories. The table estimates the square footage needs for each of these typologies. The estimate for the square footage is based on the following assumptions:

- Commercial Uses (Office, Institutional, Flex, and Retail) typically have about 400 square feet per employee on average
- Industrial Uses (General Industrial and Warehouse) typically have approximately 750 square feet per employee on average

Table 9: Independence Employment Needs

EMPLOYMENT CATEGORY	2017		2040		CHANGE	
	Emp.	Sq. Ft.	Emp.	Sq. Ft.	Emp.	Sq. Ft.
TOTAL	2,467	1,216,194	3,252	1,599,022	785	382,829
Office	581	232,220	759	303,415	178	71,195
Institutional	348	139,016	493	197,018	145	58,002
Flex	231	173,573	290	217,414	58	43,841
Gen. Industrial	411	164,212	500	200,141	90	35,929
Warehouse	424	317,985	563	422,017	139	104,032
Retail	473	189,188	648	259,017	175	69,829

The project team produced a land inventory as part of *Technical Memorandum #3* like that for the population analysis described above. The inventory is used as the basis for determining future employment capacity in Independence. It includes an inventory of vacant land within the UGB that was provided to the project team by City staff and was supplemented to include potentially redevelopable areas. Land identified as potentially redevelopable is assumed to include partially vacant land with an improvement value of between 5% and 40% of the property's land value.

As summarized in Table 10, Independence is anticipated have enough buildable land to accommodate the forecasted growth within the planning horizon. The amount of buildable area assumes that undeveloped and partially developed lots will develop with a floor-to-area ratio (FAR) of 0.25. Vacant lots assume 15% are set aside for future streets and right-of-way dedication. Half of partially vacant lots available for new commercial or industrial development.

Table 10: Buildable Employment Capacity

ZONE	PARTIALLY VACANT	VACANT	COMBINED ACRES	SQ. FT. CAPACITY
TOTAL	22.1	107.6	129.7	1,412,448
IH	8.0	34.4	42.4	461,735
IL	10.7	28.2	38.9	423,778
IP		36.4	36.4	396,663
MUPC	3.4	8.6	12.0	130,271

LOCATING EMPLOYMENT USES BY TAZ

Employment square footage was assigned to TAZs by determining the overall amount of employment-designated land and the amount of buildable employment land within each TAZ using GIS data. Table 11 summarizes overall amount of employment acres and the amount of buildable employment acres. Buildable employment acres include vacant and partially vacant employment land identified in the Technical Memorandum #3.

Table 11: Employment Designated and Buildable Land

TAZ	EMPLOYMENT ACRES	SHARE	BUILDABLE ACRES	SHARE
1	243.5	49.1%	74.35	57.3%
2	67.3	13.6%	6.97	5.4%
3	1.0	0.2%	0.00	0.0%
4	27.8	5.6%	7.93	6.1%
5	63.5	12.8%	28.47	22.0%
6	2.4	0.5%	0.00	0.0%
7	0.0	0.0%	0.00	0.0%
8	2.1	0.4%	0.73	0.6%
9	4.7	0.9%	0.00	0.0%
10	26.7	5.4%	2.85	2.2%
11	20.5	4.1%	3.17	2.4%
12	17.9	3.6%	4.18	3.2%
13	16.4	3.3%	0.55	0.4%
14	1.2	0.2%	0.48	0.4%
15	0.0	0.0%	0.00	0.0%
16	0.0	0.0%	0.00	0.0%
17	0.9	0.2%	0.01	0.0%
18	0.0	0.0%	0.00	0.0%

Existing employment square footage is assigned to TAZs based on the proportion of overall employment land within each TAZ (Table 12). Land that is zoned for residential uses are screened from the allocation assignment.

Table 13 provides a summary of forecasted growth by TAZ. The 2040 forecast adds all the growth projected through 2040 to TAZs using the share of buildable acreage contained within each TAZ. The results are summarized in the table below.

Table 12: Base Year Employment Square Footage

TAZ	OFFICE	INSTITUTIONAL	FLEX	GEN. INDUSTRIAL	WAREHOUSE	RETAIL
1	135,044	80,843	100,939	95,495	184,920	-
2	25,917	15,515	19,371	18,327	35,488	50,456
3	383	229	286	271	525	746
4	10,717	6,416	8,011	7,579	14,676	20,865
5	24,441	14,631	18,268	17,283	33,468	47,583
6	927	555	693	655	1,269	1,804
7	-	-	-	-	-	-
8	817	489	611	578	1,119	1,591
9	1,791	1,072	1,339	1,266	2,452	3,487
10	10,268	6,147	7,675	7,261	14,060	19,991
11	7,893	4,725	5,900	5,582	10,809	15,368
12	6,890	4,125	5,150	4,873	9,435	13,415
13	6,316	3,781	4,721	4,466	8,648	12,296
14	466	279	348	329	638	907
15	-	-	-	-	-	-
16	-	-	-	-	-	-
17	349	209	261	247	478	680
18	-	-	-	-	-	-
TOTAL	232,220	139,016	173,573	164,212	317,985	189,188

Table 13: 2040 Employment Square Footage

TAZ	OFFICE	INSTITUTIONAL	FLEX	GEN. INDUSTRIAL	WAREHOUSE	RETAIL
1	184,945	120,879	132,043	121,257	257,573	-
2	28,324	17,618	20,767	19,408	39,066	60,460
3	376	225	281	266	514	780
4	13,832	9,029	9,883	9,080	19,259	30,585
5	35,907	24,169	25,210	22,886	50,306	81,243
6	908	544	679	642	1,243	1,886
7	-	-	-	-	-	-
8	1,106	731	785	718	1,544	2,468
9	1,755	1,051	1,312	1,241	2,403	3,645
10	11,261	7,013	8,252	7,709	15,536	24,058
11	9,064	5,726	6,592	6,129	12,540	19,568
12	8,510	5,490	6,119	5,647	11,821	18,654
13	6,421	3,897	4,767	4,491	8,815	13,467
14	658	439	464	423	920	1,478
15	-	-	-	-	-	-
16	-	-	-	-	-	-
17	348	209	259	245	477	725
18	-	-	-	-	-	-
TOTAL	303,415	197,018	217,414	200,141	422,017	259,017

Attachment B Trip Generation Estimate

TRIP GENERATION ESTIMATE

Trip generation estimates were prepared for the forecast household and employment growth based on information provided in the standard reference, *Trip Generation Manual, 10th Edition*, published by the Institute of Transportation Engineers (ITE). Table B-1 summarizes the total trips by Transportation Analysis Zone (TAZ).

Table B-1: Trip Generation Estimate – Net New Trips

	Households			Employment			Total		
TAZ	Total	In	Out	Total	In	Out	Total	In	Out
1	15	9	5	168	34	134	183	43	139
2	1	1	0	46	20	26	47	21	27
3	4	2	1	0	0	0	4	2	1
4	146	92	54	47	20	28	193	112	82
5	10	6	4	167	69	97	177	76	101
6	74	47	28	0	0	0	75	47	28
7	59	37	22	0	0	0	59	37	22
8	10	6	4	4	2	3	14	8	6
9	10	6	4	0	0	0	10	6	4
10	63	40	23	19	8	11	82	48	34
11	35	22	13	20	8	11	55	30	24
12	40	25	15	25	11	15	65	36	30
13	75	48	28	5	2	3	80	50	31
14	10	6	4	3	1	2	13	7	5
15	361	228	134	0	0	0	361	228	134
16	140	88	52	0	0	0	140	88	52
17	516	325	191	0	0	0	517	325	191
18	515	324	191	0	0	0	515	324	191
Total	**2,084**	**1313**	**771**	**505**	**176**	**329**	**2,589**	**1,489**	**1,100**

Attachment C Future Traffic Operations and Queuing Analysis Worksheets

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	103	46	31	477	476	105
Future Vol, veh/h	103	46	31	477	476	105
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	190	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	2	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	1	0	0	5	2	0
Mvmt Flow	105	47	32	487	486	107

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1091	540	593	0	-	0
Stage 1	540	-	-	-	-	-
Stage 2	551	-	-	-	-	-
Critical Hdwy	6.41	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	239	546	993	-	-	-
Stage 1	586	-	-	-	-	-
Stage 2	579	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	231	546	993	-	-	-
Mov Cap-2 Maneuver	231	-	-	-	-	-
Stage 1	567	-	-	-	-	-
Stage 2	579	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	31.9	0.5	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	993	-	281	-	-
HCM Lane V/C Ratio	0.032	-	0.541	-	-
HCM Control Delay (s)	8.7	-	31.9	-	-
HCM Lane LOS	A	-	D	-	-
HCM 95th %tile Q(veh)	0.1	-	3	-	-

Intersection	
Int Delay, s/veh	33.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	120	2	102	6	2	4	99	444	4	8	499	139
Future Vol, veh/h	120	2	102	6	2	4	99	444	4	8	499	139
Conflicting Peds, #/hr	0	0	9	9	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	200	-	-
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, %	6	0	2	0	0	0	1	5	0	0	2	3
Mvmt Flow	126	2	107	6	2	4	104	467	4	8	525	146

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1294	1293	607	1355	1364	469	671	0	0	471	0	0
Stage 1	614	614	-	677	677	-	-	-	-	-	-	-
Stage 2	680	679	-	678	687	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.5	6.22	7.1	6.5	6.2	4.11	-	-	4.1	-	-
Critical Hdwy Stg 1	6.16	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4	3.318	3.5	4	3.3	2.209	-	-	2.2	-	-
Pot Cap-1 Maneuver	137	164	496	128	149	598	924	-	-	1101	-	-
Stage 1	472	486	-	446	455	-	-	-	-	-	-	-
Stage 2	434	454	-	445	450	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 122	144	492	89	131	598	924	-	-	1101	-	-
Mov Cap-2 Maneuver	~ 122	144	-	89	131	-	-	-	-	-	-	-
Stage 1	419	483	-	396	404	-	-	-	-	-	-	-
Stage 2	380	403	-	341	447	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	205.7	34.6	1.7	0.1
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	924	-	-	186	134	1101	-	-
HCM Lane V/C Ratio	0.113	-	-	1.268	0.094	0.008	-	-
HCM Control Delay (s)	9.4	-	-	205.7	34.6	8.3	-	-
HCM Lane LOS	A	-	-	F	D	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	13	0.3	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	0	45	1	0	0	10	540	2	0	601	14
Future Vol, veh/h	20	0	45	1	0	0	10	540	2	0	601	14
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	2	2	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	0	0	10	0	0	0	0	6	0	0	2	17
Mvmt Flow	21	0	47	1	0	0	11	568	2	0	633	15

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1233	1236	642	1257	1242	571	649	0	0	572	0	0
Stage 1	642	642	-	593	593	-	-	-	-	-	-	-
Stage 2	591	594	-	664	649	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.3	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.39	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	155	178	460	149	176	524	947	-	-	1011	-	-
Stage 1	466	472	-	496	497	-	-	-	-	-	-	-
Stage 2	497	496	-	453	469	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	153	174	460	132	172	523	946	-	-	1009	-	-
Mov Cap-2 Maneuver	153	174	-	132	172	-	-	-	-	-	-	-
Stage 1	458	472	-	487	488	-	-	-	-	-	-	-
Stage 2	489	487	-	406	469	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	21.7	32.5	0.2	0
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	946	-	-	284	132	1009	-	-
HCM Lane V/C Ratio	0.011	-	-	0.241	0.008	-	-	-
HCM Control Delay (s)	8.8	0	-	21.7	32.5	0	-	-
HCM Lane LOS	A	A	-	C	D	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0	0	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	0	2	17	9	25	17	487	12	35	535	42
Future Vol, veh/h	6	0	2	17	9	25	17	487	12	35	535	42
Conflicting Peds, #/hr	6	0	10	10	0	6	7	0	2	2	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	0	0	0	0	0	0	0	4	0	0	3	0
Mvmt Flow	6	0	2	18	9	26	18	513	13	37	563	44

Major/Minor	Minor1		Major1			Major2			
Conflicting Flow All	1227	1246	528	614	0	0	528	0	0
Stage 1	558	558	-	-	-	-	-	-	-
Stage 2	669	688	-	-	-	-	-	-	-
Critical Hdwy	6.4	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	199	175	554	975	-	-	1049	-	-
Stage 1	577	515	-	-	-	-	-	-	-
Stage 2	513	450	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	181	0	550	975	-	-	1047	-	-
Mov Cap-2 Maneuver	181	0	-	-	-	-	-	-	-
Stage 1	561	0	-	-	-	-	-	-	-
Stage 2	481	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.5	0.3	0.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	975	-	-	301	1047	-	-
HCM Lane V/C Ratio	0.018	-	-	0.178	0.035	-	-
HCM Control Delay (s)	8.8	0	-	19.5	8.6	0	-
HCM Lane LOS	A	A	-	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	0.1	-	-

Intersection	
Intersection Delay, s/veh	87.7
Intersection LOS	F

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	254	257	280	257	285	262
Future Vol, veh/h	254	257	280	257	285	262
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	3	1	0	4	4	2
Mvmt Flow	267	271	295	271	300	276
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	73.2	100.4	88.9
HCM LOS	F	F	F

Lane	NBLn1	EBLn1	SBLn1
Vol Left, %	52%	50%	0%
Vol Thru, %	48%	0%	52%
Vol Right, %	0%	50%	48%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	537	511	547
LT Vol	280	254	0
Through Vol	257	0	285
RT Vol	0	257	262
Lane Flow Rate	565	538	576
Geometry Grp	1	1	1
Degree of Util (X)	1.109	1.023	1.078
Departure Headway (Hd)	7.394	7.197	7.098
Convergence, Y/N	Yes	Yes	Yes
Cap	497	506	518
Service Time	5.394	5.197	5.098
HCM Lane V/C Ratio	1.137	1.063	1.112
HCM Control Delay	100.4	73.2	88.9
HCM Lane LOS	F	F	F
HCM 95th-tile Q	17.9	14.6	17

Intersection	
Int Delay, s/veh	149.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	140	525	52	15	588	41	59	39	20	21	49	170
Future Vol, veh/h	140	525	52	15	588	41	59	39	20	21	49	170
Conflicting Peds, #/hr	6	0	2	2	0	6	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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	1	0	0	2	0	0	0	20	0	0	0
Mvmt Flow	147	553	55	16	619	43	62	41	21	22	52	179

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	668	0	0	610	0	0	1665	1577	585	1587	1583	647
Stage 1	-	-	-	-	-	-	877	877	-	679	679	-
Stage 2	-	-	-	-	-	-	788	700	-	908	904	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.5	6.4	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4	3.48	3.5	4	3.3
Pot Cap-1 Maneuver	922	-	-	979	-	-	78	111	479	88	110	475
Stage 1	-	-	-	-	-	-	346	369	-	445	454	-
Stage 2	-	-	-	-	-	-	387	444	-	332	358	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	917	-	-	977	-	-	~ 19	81	477	41	80	472
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 19	81	-	41	80	-
Stage 1	-	-	-	-	-	-	261	278	-	335	439	-
Stage 2	-	-	-	-	-	-	207	430	-	204	270	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.9	0.2	$ 1492	$ 330.4
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	33	917	-	-	977	-	-	162
HCM Lane V/C Ratio	3.764	0.161	-	-	0.016	-	-	1.559
HCM Control Delay (s)	$ 1492	9.7	0	-	8.7	0	-	$ 330.4
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	14.6	0.6	-	-	0	-	-	16.9

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	82.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	627	100	139	760	1	85	0	117	1	1	6
Future Vol, veh/h	7	627	100	139	760	1	85	0	117	1	1	6
Conflicting Peds, #/hr	4	0	12	12	0	4	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	0	2	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	7	660	105	146	800	1	89	0	123	1	1	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	805	0	0	777	0	0	1835	1836	727	1887	1888	805
Stage 1	-	-	-	-	-	-	739	739	-	1097	1097	-
Stage 2	-	-	-	-	-	-	1096	1097	-	790	791	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	828	-	-	848	-	-	~ 59	77	427	54	71	386
Stage 1	-	-	-	-	-	-	412	427	-	261	291	-
Stage 2	-	-	-	-	-	-	261	291	-	386	404	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	825	-	-	838	-	-	~ 42	51	421	28	47	385
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 42	51	-	28	47	-
Stage 1	-	-	-	-	-	-	401	416	-	256	199	-
Stage 2	-	-	-	-	-	-	175	199	-	268	393	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.6	$ 746.7	40.4
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	88	825	-	-	838	-	-	110
HCM Lane V/C Ratio	2.416	0.009	-	-	0.175	-	-	0.077
HCM Control Delay (s)	$ 746.7	9.4	0	-	10.2	0	-	40.4
HCM Lane LOS	F	A	A	-	B	A	-	E
HCM 95th %tile Q(veh)	19.6	0	-	-	0.6	-	-	0.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	11.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	695	133	110	741	117	115
Future Vol, veh/h	695	133	110	741	117	115
Conflicting Peds, #/hr	0	4	4	0	2	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	20	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	1	2	4	1	0	0
Mvmt Flow	732	140	116	780	123	121

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	876	0	1820	806
Stage 1	-	-	-	-	806	-
Stage 2	-	-	-	-	1014	-
Critical Hdwy	-	-	4.14	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.236	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	762	-	~ 86	385
Stage 1	-	-	-	-	443	-
Stage 2	-	-	-	-	353	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	759	-	~ 72	384
Mov Cap-2 Maneuver	-	-	-	-	194	-
Stage 1	-	-	-	-	441	-
Stage 2	-	-	-	-	298	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	86
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	257	-	-	759	-
HCM Lane V/C Ratio	0.95	-	-	0.153	-
HCM Control Delay (s)	86	-	-	10.6	-
HCM Lane LOS	F	-	-	B	-
HCM 95th %tile Q(veh)	8.8	-	-	0.5	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	153	572	32	816	91	122	249	226
v/c Ratio	0.60	0.57	0.08	1.01	0.43	0.27	0.84	0.49
Control Delay	23.8	17.0	7.5	59.6	35.4	23.9	56.7	22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.8	17.0	7.5	59.6	35.4	23.9	56.7	22.6
Queue Length 50th (ft)	34	228	7	~513	43	46	135	71
Queue Length 95th (ft)	102	371	18	#854	97	98	#274	151
Internal Link Dist (ft)		1366		439		96		4493
Turn Bay Length (ft)	145		150		100		50	
Base Capacity (vph)	428	1004	608	809	262	550	368	552
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.57	0.05	1.01	0.35	0.22	0.68	0.41

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	513	30	30	523	252	86	81	35	237	83	132
Future Volume (vph)	145	513	30	30	523	252	86	81	35	237	83	132
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.98		1.00	0.99		1.00	0.96	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.98	1.00		0.99	1.00	
Frt	1.00	0.99		1.00	0.95		1.00	0.95		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1630	1716		1662	1612		1621	1629		1639	1529	
Flt Permitted	0.10	1.00		0.33	1.00		0.47	1.00		0.65	1.00	
Satd. Flow (perm)	167	1716		572	1612		798	1629		1122	1529	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	153	540	32	32	551	265	91	85	37	249	87	139
RTOR Reduction (vph)	0	1	0	0	14	0	0	15	0	0	55	0
Lane Group Flow (vph)	153	571	0	32	802	0	91	107	0	249	171	0
Confl. Peds. (#/hr)	14		3	3		14	15		7	7		15
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	2%	1%	0%	0%	1%	2%	0%	2%	0%	0%	0%	0%
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	6			2			8			4		
Actuated Green, G (s)	57.2	53.7		57.2	47.3		24.5	24.5		24.5	24.5	
Effective Green, g (s)	57.2	53.7		57.2	47.3		24.5	24.5		24.5	24.5	
Actuated g/C Ratio	0.61	0.57		0.61	0.50		0.26	0.26		0.26	0.26	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	6.8		2.5	6.1		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	256	983		389	813		208	425		293	399	
v/s Ratio Prot	c0.06	0.33		0.00	c0.50			0.07			0.11	
v/s Ratio Perm	0.30			0.05			0.11			c0.22		
v/c Ratio	0.60	0.58		0.08	0.99		0.44	0.25		0.85	0.43	
Uniform Delay, d1	16.3	12.8		8.4	22.9		28.9	27.4		32.9	28.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.1	1.9		0.1	28.3		1.1	0.2		19.7	0.5	
Delay (s)	19.4	14.7		8.5	51.2		29.9	27.6		52.6	29.3	
Level of Service	B	B		A	D		C	C		D	C	
Approach Delay (s)		15.7			49.6			28.6			41.5	
Approach LOS		B			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	35.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	93.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	145	513	30	30	523	252	86	81	35	237	83	132
Future Volume (veh/h)	145	513	30	30	523	252	86	81	35	237	83	132
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.99	0.99		0.97	0.98		0.97
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	1723	1736	1736	1750	1736	1736	1750	1723	1723	1750	1750	1750
Adj Flow Rate, veh/h	153	540	32	32	551	265	91	85	37	249	87	139
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	1	1	0	1	1	0	2	2	0	0	0
Cap, veh/h	210	889	53	410	565	272	269	319	139	366	169	269
Arrive On Green	0.07	0.55	0.55	0.03	0.51	0.51	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1641	1619	96	1667	1102	530	1163	1128	491	1266	596	952
Grp Volume(v), veh/h	153	0	572	32	0	816	91	0	122	249	0	226
Grp Sat Flow(s),veh/h/ln	1641	0	1715	1667	0	1632	1163	0	1619	1266	0	1548
Q Serve(g_s), s	3.8	0.0	19.8	0.7	0.0	42.6	6.2	0.0	5.1	16.6	0.0	10.7
Cycle Q Clear(g_c), s	3.8	0.0	19.8	0.7	0.0	42.6	17.0	0.0	5.1	21.7	0.0	10.7
Prop In Lane	1.00		0.06	1.00		0.32	1.00		0.30	1.00		0.62
Lane Grp Cap(c), veh/h	210	0	942	410	0	837	269	0	458	366	0	438
V/C Ratio(X)	0.73	0.00	0.61	0.08	0.00	0.97	0.34	0.00	0.27	0.68	0.00	0.52
Avail Cap(c_a), veh/h	474	0	942	739	0	839	338	0	554	442	0	530
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.9	0.0	13.3	10.2	0.0	20.8	33.5	0.0	24.4	32.8	0.0	26.4
Incr Delay (d2), s/veh	3.6	0.0	2.9	0.1	0.0	25.3	0.5	0.0	0.2	2.7	0.0	0.7
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	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	7.7	0.2	0.0	20.5	1.8	0.0	2.0	5.2	0.0	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.5	0.0	16.3	10.2	0.0	46.1	34.1	0.0	24.6	35.5	0.0	27.1
LnGrp LOS	C	A	B	B	A	D	C	A	C	D	A	C
Approach Vol, veh/h		725			848			213			475	
Approach Delay, s/veh		17.8			44.7			28.6			31.5	
Approach LOS		B			D			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.7	52.1		28.8	9.9	48.9		28.8
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	20.0	45.0		30.0	20.0	45.0		30.0
Max Q Clear Time (g_c+I1), s	2.7	21.8		23.7	5.8	44.6		19.0
Green Ext Time (p_c), s	0.0	10.4		1.0	0.2	0.3		0.6

Intersection Summary	
HCM 6th Ctrl Delay	31.8
HCM 6th LOS	C

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	73	598	152	664	22	276	64	203
v/c Ratio	0.23	0.75	0.43	0.74	0.07	0.76	0.27	0.46
Control Delay	11.8	30.7	14.2	28.0	27.9	44.2	30.6	32.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.8	30.7	14.2	28.0	27.9	44.2	30.6	32.7
Queue Length 50th (ft)	18	307	40	343	10	131	31	88
Queue Length 95th (ft)	47	573	89	631	32	263	71	200
Internal Link Dist (ft)		1726		1366		496		3282
Turn Bay Length (ft)	250		215		110		215	
Base Capacity (vph)	517	1090	531	1105	410	558	362	580
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.55	0.29	0.60	0.05	0.49	0.18	0.35

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	553	33	149	594	57	22	82	188	63	99	100
Future Volume (vph)	72	553	33	149	594	57	22	82	188	63	99	100
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.90		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1646	1699		1662	1703		1657	1502		1658	1594	
Flt Permitted	0.21	1.00		0.23	1.00		0.49	1.00		0.31	1.00	
Satd. Flow (perm)	372	1699		401	1703		859	1502		538	1594	
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)	73	564	34	152	606	58	22	84	192	64	101	102
RTOR Reduction (vph)	0	2	0	0	2	0	0	58	0	0	25	0
Lane Group Flow (vph)	73	596	0	152	662	0	22	218	0	64	178	0
Confl. Peds. (#/hr)	6		9	9		6	4		7	7		4
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	2%	0%	0%	1%	2%	0%	3%	1%	0%	0%	0%
Turn Type	D.P+P	NA		D.P+P	NA		D.P+P	NA		D.P+P	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	57.6	47.8		57.6	52.1		28.1	21.9		28.1	25.8	
Effective Green, g (s)	57.6	47.8		57.6	52.1		28.1	21.9		28.1	25.8	
Actuated g/C Ratio	0.57	0.47		0.57	0.51		0.28	0.22		0.28	0.25	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.5	6.1		2.5	6.1		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	279	798		348	872		255	323		216	404	
v/s Ratio Prot	0.01	0.35		c0.04	c0.39		0.00	c0.15		c0.02	c0.11	
v/s Ratio Perm	0.13			0.20			0.02			0.06		
v/c Ratio	0.26	0.75		0.44	0.76		0.09	0.67		0.30	0.44	
Uniform Delay, d1	13.4	22.0		13.7	19.8		27.2	36.6		28.3	31.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	5.2		0.6	5.1		0.1	5.0		0.6	0.6	
Delay (s)	13.8	27.2		14.4	24.9		27.3	41.6		28.8	32.5	
Level of Service	B	C		B	C		C	D		C	C	
Approach Delay (s)		25.8			22.9			40.6			31.6	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	27.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	101.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	553	33	149	594	57	22	82	188	63	99	100
Future Volume (veh/h)	72	553	33	149	594	57	22	82	188	63	99	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.99	0.99		0.98	0.99		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	1736	1723	1723	1750	1736	1736	1750	1709	1709	1750	1750	1750
Adj Flow Rate, veh/h	73	564	34	152	606	58	22	84	192	64	101	102
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, %	1	2	2	0	1	1	0	3	3	0	0	0
Cap, veh/h	305	765	46	364	776	74	277	99	226	207	189	191
Arrive On Green	0.05	0.48	0.48	0.07	0.50	0.50	0.02	0.22	0.22	0.05	0.24	0.24
Sat Flow, veh/h	1654	1605	97	1667	1559	149	1667	457	1044	1667	792	800
Grp Volume(v), veh/h	73	0	598	152	0	664	22	0	276	64	0	203
Grp Sat Flow(s),veh/h/ln	1654	0	1702	1667	0	1708	1667	0	1501	1667	0	1592
Q Serve(g_s), s	1.8	0.0	23.8	3.8	0.0	26.8	0.8	0.0	14.8	2.5	0.0	9.3
Cycle Q Clear(g_c), s	1.8	0.0	23.8	3.8	0.0	26.8	0.8	0.0	14.8	2.5	0.0	9.3
Prop In Lane	1.00		0.06	1.00		0.09	1.00		0.70	1.00		0.50
Lane Grp Cap(c), veh/h	305	0	811	364	0	851	277	0	325	207	0	380
V/C Ratio(X)	0.24	0.00	0.74	0.42	0.00	0.78	0.08	0.00	0.85	0.31	0.00	0.53
Avail Cap(c_a), veh/h	619	0	1216	644	0	1220	535	0	536	428	0	569
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.7	0.0	17.7	13.6	0.0	17.3	23.7	0.0	31.6	25.1	0.0	27.9
Incr Delay (d2), s/veh	0.3	0.0	5.0	0.6	0.0	6.0	0.1	0.0	5.4	0.6	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	9.7	1.3	0.0	11.0	0.3	0.0	5.8	1.0	0.0	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.0	0.0	22.7	14.2	0.0	23.3	23.8	0.0	36.9	25.8	0.0	28.8
LnGrp LOS	B	A	C	B	A	C	C	A	D	C	A	C
Approach Vol, veh/h		671			816			298			267	
Approach Delay, s/veh		21.8			21.6			36.0			28.0	
Approach LOS		C			C			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.9	44.0	6.0	24.1	8.1	45.8	7.9	22.2
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	20.0	60.0	15.0	30.0	20.0	60.0	15.0	30.0
Max Q Clear Time (g_c+I1), s	5.8	25.8	2.8	11.3	3.8	28.8	4.5	16.8
Green Ext Time (p_c), s	0.2	11.8	0.0	1.0	0.1	13.0	0.1	1.2

Intersection Summary	
HCM 6th Ctrl Delay	24.6
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	277	67	104	249	48	76
Future Vol, veh/h	277	67	104	249	48	76
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	160	-	125	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	0	2	3	2	0
Mvmt Flow	292	71	109	262	51	80

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	363	0	808	328
Stage 1	-	-	-	-	328	-
Stage 2	-	-	-	-	480	-
Critical Hdwy	-	-	4.12	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.3
Pot Cap-1 Maneuver	-	-	1196	-	350	718
Stage 1	-	-	-	-	730	-
Stage 2	-	-	-	-	622	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1196	-	318	718
Mov Cap-2 Maneuver	-	-	-	-	318	-
Stage 1	-	-	-	-	730	-
Stage 2	-	-	-	-	565	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.4	13.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	318	718	-	-	1196	-
HCM Lane V/C Ratio	0.159	0.111	-	-	0.092	-
HCM Control Delay (s)	18.4	10.6	-	-	8.3	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.6	0.4	-	-	0.3	-

Intersection	
Int Delay, s/veh	6.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	215	138	213	281	69	136
Future Vol, veh/h	215	138	213	281	69	136
Conflicting Peds, #/hr	0	0	0	0	0	0
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	95	95	95	95	95	95
Heavy Vehicles, %	3	1	0	3	3	3
Mvmt Flow	226	145	224	296	73	143

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	371	0	1043	299
Stage 1	-	-	-	-	299	-
Stage 2	-	-	-	-	744	-
Critical Hdwy	-	-	4.1	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.2	-	3.527	3.327
Pot Cap-1 Maneuver	-	-	1199	-	253	738
Stage 1	-	-	-	-	750	-
Stage 2	-	-	-	-	468	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1199	-	196	738
Mov Cap-2 Maneuver	-	-	-	-	196	-
Stage 1	-	-	-	-	750	-
Stage 2	-	-	-	-	363	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.7	26
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	382	-	-	1199	-
HCM Lane V/C Ratio	0.565	-	-	0.187	-
HCM Control Delay (s)	26	-	-	8.7	0
HCM Lane LOS	D	-	-	A	A
HCM 95th %tile Q(veh)	3.4	-	-	0.7	-

Intersection	
Int Delay, s/veh	9.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	181	227	268	74	64	194
Future Vol, veh/h	181	227	268	74	64	194
Conflicting Peds, #/hr	1	0	0	1	104	0
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	95	95	95	95	95	95
Heavy Vehicles, %	11	4	2	6	33	1
Mvmt Flow	191	239	282	78	67	204

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	361	0	-	0	1047	322
Stage 1	-	-	-	-	322	-
Stage 2	-	-	-	-	725	-
Critical Hdwy	4.21	-	-	-	6.73	6.21
Critical Hdwy Stg 1	-	-	-	-	5.73	-
Critical Hdwy Stg 2	-	-	-	-	5.73	-
Follow-up Hdwy	2.299	-	-	-	3.797	3.309
Pot Cap-1 Maneuver	1150	-	-	-	221	721
Stage 1	-	-	-	-	670	-
Stage 2	-	-	-	-	428	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1149	-	-	-	178	720
Mov Cap-2 Maneuver	-	-	-	-	178	-
Stage 1	-	-	-	-	541	-
Stage 2	-	-	-	-	428	-

Approach	EB	WB	SB
HCM Control Delay, s	3.9	0	29.4
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1149	-	-	-	410
HCM Lane V/C Ratio	0.166	-	-	-	0.662
HCM Control Delay (s)	8.8	0	-	-	29.4
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0.6	-	-	-	4.6

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	238	101	10	234	3	65	3	6	8	3	2
Future Vol, veh/h	2	238	101	10	234	3	65	3	6	8	3	2
Conflicting Peds, #/hr	2	0	0	0	0	2	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	0	4	4	0	2	0	0	0	0	0	0	0
Mvmt Flow	2	251	106	11	246	3	68	3	6	8	3	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	251	0	0	357	0	0	582	581	304	585	633	252
Stage 1	-	-	-	-	-	-	308	308	-	272	272	-
Stage 2	-	-	-	-	-	-	274	273	-	313	361	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1326	-	-	1213	-	-	427	428	740	425	400	792
Stage 1	-	-	-	-	-	-	706	664	-	738	688	-
Stage 2	-	-	-	-	-	-	736	688	-	702	629	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1323	-	-	1213	-	-	418	422	740	414	394	789
Mov Cap-2 Maneuver	-	-	-	-	-	-	418	422	-	414	394	-
Stage 1	-	-	-	-	-	-	705	663	-	735	679	-
Stage 2	-	-	-	-	-	-	721	679	-	691	628	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.3	15.1	13.4
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	433	1323	-	-	1213	-	-	441
HCM Lane V/C Ratio	0.18	0.002	-	-	0.009	-	-	0.031
HCM Control Delay (s)	15.1	7.7	0	-	8	0	-	13.4
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	41	40	8	12	2	46	56	22	9	93	14
Future Vol, veh/h	14	41	40	8	12	2	46	56	22	9	93	14
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	100	0	0	0	0	0	0	0	11	2	0
Mvmt Flow	16	46	44	9	13	2	51	62	24	10	103	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	315	320	111	353	316	75	119	0	0	87	0	0
Stage 1	131	131	-	177	177	-	-	-	-	-	-	-
Stage 2	184	189	-	176	139	-	-	-	-	-	-	-
Critical Hdwy	7.1	7.5	6.2	7.1	6.5	6.2	4.1	-	-	4.21	-	-
Critical Hdwy Stg 1	6.1	6.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	6.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.9	3.3	3.5	4	3.3	2.2	-	-	2.299	-	-
Pot Cap-1 Maneuver	642	465	948	606	603	992	1482	-	-	1454	-	-
Stage 1	877	633	-	829	756	-	-	-	-	-	-	-
Stage 2	822	592	-	831	785	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	609	445	948	514	576	991	1482	-	-	1453	-	-
Mov Cap-2 Maneuver	609	445	-	514	576	-	-	-	-	-	-	-
Stage 1	845	629	-	798	728	-	-	-	-	-	-	-
Stage 2	776	570	-	730	780	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.2	11.6	2.8	0.6
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1482	-	-	604	573	1453	-	-
HCM Lane V/C Ratio	0.034	-	-	0.175	0.043	0.007	-	-
HCM Control Delay (s)	7.5	0	-	12.2	11.6	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	6	11	15	19	4	19	538	14	51	463	22
Future Vol, veh/h	6	6	11	15	19	4	19	538	14	51	463	22
Conflicting Peds, #/hr	0	0	1	1	0	0	12	0	8	8	0	12
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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, %	0	0	0	0	0	0	0	2	0	0	2	0
Mvmt Flow	6	6	12	16	20	4	20	566	15	54	487	23

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1245	1248	512	1239	1252	582	522	0	0	589	0	0
Stage 1	619	619	-	622	622	-	-	-	-	-	-	-
Stage 2	626	629	-	617	630	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	152	175	566	154	174	517	1055	-	-	996	-	-
Stage 1	480	483	-	478	482	-	-	-	-	-	-	-
Stage 2	475	478	-	481	478	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	124	154	559	134	153	513	1043	-	-	988	-	-
Mov Cap-2 Maneuver	124	154	-	134	153	-	-	-	-	-	-	-
Stage 1	461	441	-	461	465	-	-	-	-	-	-	-
Stage 2	438	461	-	428	436	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	23.9	35.9	0.3	0.8
HCM LOS	C	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1043	-	-	215	156	988	-	-
HCM Lane V/C Ratio	0.019	-	-	0.113	0.256	0.054	-	-
HCM Control Delay (s)	8.5	0	-	23.9	35.9	8.9	0	-
HCM Lane LOS	A	A	-	C	E	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.4	1	0.2	-	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	61	143	590	454	37
Future Vol, veh/h	13	61	143	590	454	37
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	2	1	2	1	3
Mvmt Flow	14	64	151	621	478	39

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1421	498	517	0	-	0
Stage 1	498	-	-	-	-	-
Stage 2	923	-	-	-	-	-
Critical Hdwy	6.4	6.22	4.11	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.318	2.209	-	-	-
Pot Cap-1 Maneuver	152	572	1054	-	-	-
Stage 1	615	-	-	-	-	-
Stage 2	390	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	119	572	1054	-	-	-
Mov Cap-2 Maneuver	119	-	-	-	-	-
Stage 1	480	-	-	-	-	-
Stage 2	390	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.6	1.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1054	-	343	-	-
HCM Lane V/C Ratio	0.143	-	0.227	-	-
HCM Control Delay (s)	9	0	18.6	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.5	-	0.9	-	-

Intersection	
Int Delay, s/veh	71.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	3	1	97	9	419	6	246	94	262	252	16
Future Vol, veh/h	6	3	1	97	9	419	6	246	94	262	252	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	3	3	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	-2	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	2	0	4	4	2	3	0
Mvmt Flow	6	3	1	102	9	441	6	259	99	276	265	17

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1372	1199	274	1152	1158	312	282	0	0	361	0	0
Stage 1	826	826	-	324	324	-	-	-	-	-	-	-
Stage 2	546	373	-	828	834	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	6.7	6.1	6.02	4.1	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	5.7	5.1	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	5.7	5.1	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.318	2.2	-	-	2.218	-	-
Pot Cap-1 Maneuver	124	187	770	200	225	741	1292	-	-	1198	-	-
Stage 1	369	389	-	718	677	-	-	-	-	-	-	-
Stage 2	526	622	-	404	424	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	38	134	770	154	162	739	1292	-	-	1195	-	-
Mov Cap-2 Maneuver	38	134	-	154	162	-	-	-	-	-	-	-
Stage 1	367	282	-	712	671	-	-	-	-	-	-	-
Stage 2	208	616	-	290	308	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	85.3	186.6	0.1	4.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1292	-	-	55	419	1195	-	-
HCM Lane V/C Ratio	0.005	-	-	0.191	1.319	0.231	-	-
HCM Control Delay (s)	7.8	0	-	85.3	186.6	8.9	0	-
HCM Lane LOS	A	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.6	25	0.9	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	810	850	10	2	2
Future Vol, veh/h	1	810	850	10	2	2
Conflicting Peds, #/hr	5	0	0	5	0	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	20	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	1	853	895	11	2	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	911	0	-	0	1761	908
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	855	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	756	-	-	-	94	336
Stage 1	-	-	-	-	398	-
Stage 2	-	-	-	-	420	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	752	-	-	-	93	334
Mov Cap-2 Maneuver	-	-	-	-	228	-
Stage 1	-	-	-	-	396	-
Stage 2	-	-	-	-	418	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	18.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	752	-	-	-	271
HCM Lane V/C Ratio	0.001	-	-	-	0.016
HCM Control Delay (s)	9.8	-	-	-	18.5
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0

HCM 6th Edition Analysis May 2020

Based on ODOT Analysis Procedures Manual, Volume 2, Chapter 13

INTERSECTION	9. Gun Club Road & Monmouth Street				
CYCLE LENGTH	107				
TOTAL LOST TIME	12				
TOTAL LOST TIME (2025)					
CRITICAL MOVEMENTS	**EB (L)**	**WB (TR)**	**NB (TR)**	**SB (L)**	
	EXISTING PM				
Adj Flow Rate, (veh/h)	153	816	122	249	
Sat Flow (veh/h)	1641	1632	1619	1266	
Flow Ratio	0.09	0.50	0.08	0.20	
CRITICAL INTERSECTION V/C RATIO	**0.97**				

INTERSECTION	10. 16th Street & Monmouth Street				
CYCLE LENGTH	141				
TOTAL LOST TIME	16				
TOTAL LOST TIME (2025)					
CRITICAL MOVEMENTS	**EB (TR)**	**WB (L)**	**NB (TR)**	**SB (L)**	
	EXISTING PM				
Adj Flow Rate, (veh/h)	598	152	276	102	
Sat Flow (veh/h)	1702	1667	1501	800	
Flow Ratio	0.35	0.09	0.18	0.13	
CRITICAL INTERSECTION V/C RATIO	**0.85**				

INTERSECTION					
CYCLE LENGTH					
TOTAL LOST TIME					
TOTAL LOST TIME (2025)					
CRITICAL MOVEMENTS					
Adj Flow Rate, (veh/h)					
Sat Flow (veh/h)					
Flow Ratio	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
CRITICAL INTERSECTION V/C RATIO	**#DIV/0!**				

INTERSECTION					
CYCLE LENGTH					
TOTAL LOST TIME					
TOTAL LOST TIME (2025)					
CRITICAL MOVEMENTS					
Adj Flow Rate, (veh/h)					
Sat Flow (veh/h)					
Flow Ratio	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
CRITICAL INTERSECTION V/C RATIO	**#DIV/0!**				

Attachment D Future BLTS Analysis Results

FUTURE BLTS ANALYSIS RESULTS

Table D-1 summarizes the BLTS analysis results under future (no-build) traffic conditions. It is important to note that while some segments are shown as BLTS 3 or 4, they may have shorter segments with lower BLTS scores. As shown, several arterial and collector streets in Independence are forecast to have segments that are rated BLTS 3 or 4. These segments may have bike lanes that are too narrow for roadway conditions or may be shared roadways (i.e. mixed traffic) with relatively high traffic volumes.

Table D-1: Future Bicycle Level of Traffic Stress (BLTS) Analysis Results

Street	From	To	Side	Facility Type	BLTS Criteria						BLTS
					ADT	Speed (mph)	Lanes per Direction	Bike Lane Width (feet)	Parking Lane Width (feet)	Frequent Blockage	
OR 51-Main Street	Stryker Road	Hanna Road	East	Bike Lane	>3,000	45	1	None/7	None	No	4
	Stryker Road	Hanna Road	West	Bike Lane	>3,000	45	1	6	None	No	4
	Hanna Road	Polk Street	East	Bike Lane	>3,000	35 - 45	1	5.5 - 6	None	No	4
	Hanna Road	Polk Street	West	Bike Lane	>3,000	35 - 45	1	5.5 - 6	None	No	4
	Polk Street	B Street	East	Mixed Traffic/ Shoulder Bikeway	>3,000	35	1	None/9 - 11	None/ Permitted	No	3
	Polk Street	B Street	West	Mixed traffic/ Shoulder Bikeway	>3,000	35	1	None/4 - 11	None/ Permitted	No	3
	B Street	Monmouth Street	East	Mixed Traffic	>3,000	20	1	None	Yes	No	3
	B Street	Monmouth Street	West	Mixed Traffic	>3,000	20	1	None	Yes	No	3
Main Street	Monmouth Street	E Street	East	Mixed Traffic	>3,000	20	1	None	Yes	No	3

Street	From	To	Side	Facility Type	BLTS Criteria						BLTS
					ADT	Speed (mph)	Lanes per Direction	Bike Lane Width (feet)	Parking Lane Width (feet)	Frequent Blockage	
	Monmouth Street	E Street	West	Mixed Traffic	>3,000	20	1	None	Yes	No	3
	E Street	River Road	East	Mixed Traffic/ Shoulder Bikeway	>3,000	20 - 30	1	None/6	None/ Marked	No	3
	E Street	River Road	West	Mixed Traffic/ Shoulder Bikeway	>3,000	20 - 30	1	None/6	None/ Marked	No	3
Corvallis Road	River Road	Southern UGB	East	Mixed Traffic	>3,000	30	1	None	None	No	3
	River Road	Southern UGB	West	Mixed Traffic	>3,000	30	1	None	None/ Marked	No	3
OR 51-Monmouth Street	Western UGB	9th Street	North	Bike Lane	>3,000	25 – 30	1	5	None	No	2
	Western UGB	9th Street	South	Bike Lane	>3,000	25 – 30	1	5	None	No	2
	9th Street	OR 51-Main Street	North	Mixed Traffic/Bike Lane	>3,000	20 – 25	1	None/5	None/ Permitted/ Marked	No	3
	9th Street	OR 51-Main Street	South	Mixed Traffic/Bike Lane	>3,000	20 – 25	1	None/5	None/ Permitted/ Marked	No	3
Gun Club Road	Hoffman Road	Picture Street	East	Mixed Traffic/Bike Lane/ Shoulder Bikeway	>3,000	30	1	None/4 - 6	None	No	3
	Hoffman Road	Picture Street	West	Mixed Traffic/Bike Lane	>3,000	30	1	None/6 - 8	None	No	3

Street	From	To	Side	Facility Type	BLTS Criteria						BLTS
					ADT	Speed (mph)	Lanes per Direction	Bike Lane Width (feet)	Parking Lane Width (feet)	Frequent Blockage	
	Picture Street	South of Ash Creek	East	Mixed Traffic/Bike Lane	>3,000	30	1	None/6 - 8	None	No	3
	Picture Street	South of Ash Creek	West	Mixed Traffic	>3,000	30	1	None	None	No	3
	South of Ash Creek	Monmouth Street	East	Bike Lane	>3,000	30	1	6	None	No	1
	South of Ash Creek	Monmouth Street	West	Bike Lane	>3,000	30	1	6	None	No	1
Hoffman Road	Western UGB	Gun Club Road	North	Mixed Traffic	>3,000	35 - 40	1	None	None	No	4
	Western UGB	Gun Club Road	South	Mixed Traffic	>3,000	35 - 40	1	None	None	No	4
	Gun Club Road	West of Stryker Road	North	Bike Lane	>3,000	35	1	4	None	No	3
	Gun Club Road	West of Stryker Road	South	Bike Lane	>3,000	35	1	4	None	No	3
Polk Street	West of Stryker Road	Walnut Street	North	Bike Lane	>3,000	25	1	4	None	No	2
	West of Stryker Road	Walnut Street	South	Bike Lane	>3,000	25	1	4	None	No	2
	Walnut Street	OR 51-Main Street	North	Mixed Traffic/Bike Lane	>3,000	25	1	None/4 - 6	No	No	3

Street	From	To	Side	Facility Type	BLTS Criteria						BLTS
					ADT	Speed (mph)	Lanes per Direction	Bike Lane Width (feet)	Parking Lane Width (feet)	Frequent Blockage	
	Walnut Street	OR 51-Main Street	South	Mixed Traffic	>3,000	25	1	None	None	No	3
Stryker Road	OR 51	Polk Street	East	Mixed Traffic/ Shoulder Bikeway	>3,000	35	1	None/5	None	No	3
	OR 51	Polk Street	West	Mixed Traffic/ Shoulder Bikeway	>3,000	35	1	None/5	None	No	3
Williams Street	Ash Street	OR 51-Main Street	North	Mixed Traffic	750 - ≤1,500	25	0	None	Permitted	No	1
	Ash Street	OR 51-Main Street	South	Mixed Traffic	750 - ≤1,500	25	0	None	Permitted	No	1
Picture Street	Gun Club Road	End of road	North	Mixed Traffic	750 - ≤1,500[1]	25	0	None	Permitted	No	1
	Gun Club Road	End of road	South	Mixed Traffic	750 - ≤1,500[1]	25	0	None	Permitted	No	1
Ash Street	Polk Street	A Street	East	Mixed Traffic	1,500 - ≤3,000	25	1	None	Permitted	No	3
	Polk Street	A Street	West	Mixed Traffic	1,500 - ≤3,000	25	1	None	Permitted	No	3
4th Street	A Street	Spruce Avenue	East	Mixed Traffic	1,500 - ≤3,000	25	0	None	None/ Permitted/ Marked	No	2
	A Street	Spruce Avenue	West	Mixed Traffic	1,500 - ≤3,000	25	0	None	None/ Permitted	No	2
7th Street	Monmouth Street	Chestnut Street	East	Mixed Traffic	>3,000	25	0	None	None	No	3

Street	From	To	Side	Facility Type	BLTS Criteria						BLTS
					ADT	Speed (mph)	Lanes per Direction	Bike Lane Width (feet)	Parking Lane Width (feet)	Frequent Blockage	
	Monmouth Street	Chestnut Street	West	Mixed Traffic	>3,000	25	0	None	Permitted	No	3
	Chestnut Street	Southern UGB	East	Mixed Traffic	>3,000	25	0	None	None	No	3
	Chestnut Street	Southern UGB	West	Mixed Traffic	>3,000	25	0	None	Permitted	No	3
13th Street	Monmouth Street	Southern UGB	East	Mixed Traffic	>3,000	25	0	None	None	No	3
	Monmouth Street	Southern UGB	West	Mixed Traffic	>3,000	25	0	None	None/ Permitted	No	3
16th Street	Northern UGB	Monmouth Street	East	Bike Lane	>3,000	25	1	6	None	No	1
	Northern UGB	Monmouth Street	West	Bike Lane	>3,000	25	1	6	None	No	1
	Monmouth Street	Southern UGB	East	Shoulder Bikeway	>3,000	25	1	4 - 11	None	No	2
	Monmouth Street	Southern UGB	West	Shoulder Bikeway	>3,000	25	1	5	None	No	2
G Street	7th Street	Main Street	North	Mixed Traffic	1,500 - ≤3,000	25	0	None	None/ Permitted	No	2
	7th Street	Main Street	South	Mixed Traffic	1,500 - ≤3,000	25	0	None	None/ Permitted	No	2
Spruce Avenue	6th Street	4th Street	North	Mixed Traffic	750 - ≤1,500[1]	25	0	None	Permitted	No	1
	6th Street	4th Street	South	Mixed Traffic	750 - ≤1,500[1]	25	0	None	Permitted	No	1

1. Estimated from similar roadways.