2050 CONDITIONS & RECOMMENDATIONS

Date: July 23, 2020 Project #: 24667
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From: Bincy Koshy, Rachel Grosso, Andy Daleiden, PE – Kittelson & Associates
cc: Donny Pfeifer, PE – DJ&A

INTRODUCTION

In November 2019, Missoula County and the City of Missoula were jointly awarded a federal BUILD Grant for the development of infrastructure in the Mullan Area of Missoula, with the vision of "Proactively and Collaboratively Building a Better Missoula" (Reference 1). Kittelson & Associates, Inc. (Kittelson) prepared this memorandum to summarize the projected 2050 transportation conditions for the Mullan–BUILD project, herein referred to as the project. This assessment compiles the results of a range of tasks, including analysis of 2050 travel demand model outputs, intersection control evaluations for each project intersection and a roadway network evaluation. The primary intent of this effort was to evaluate and identify intersection control types and roadway cross sections to inform the project at the 30% design-level. As the project progresses into final design, Kittelson will work with the project team to evaluate multimodal elements in detail for incorporating into the design of the intersections and roadways for this project.

Table of Contents

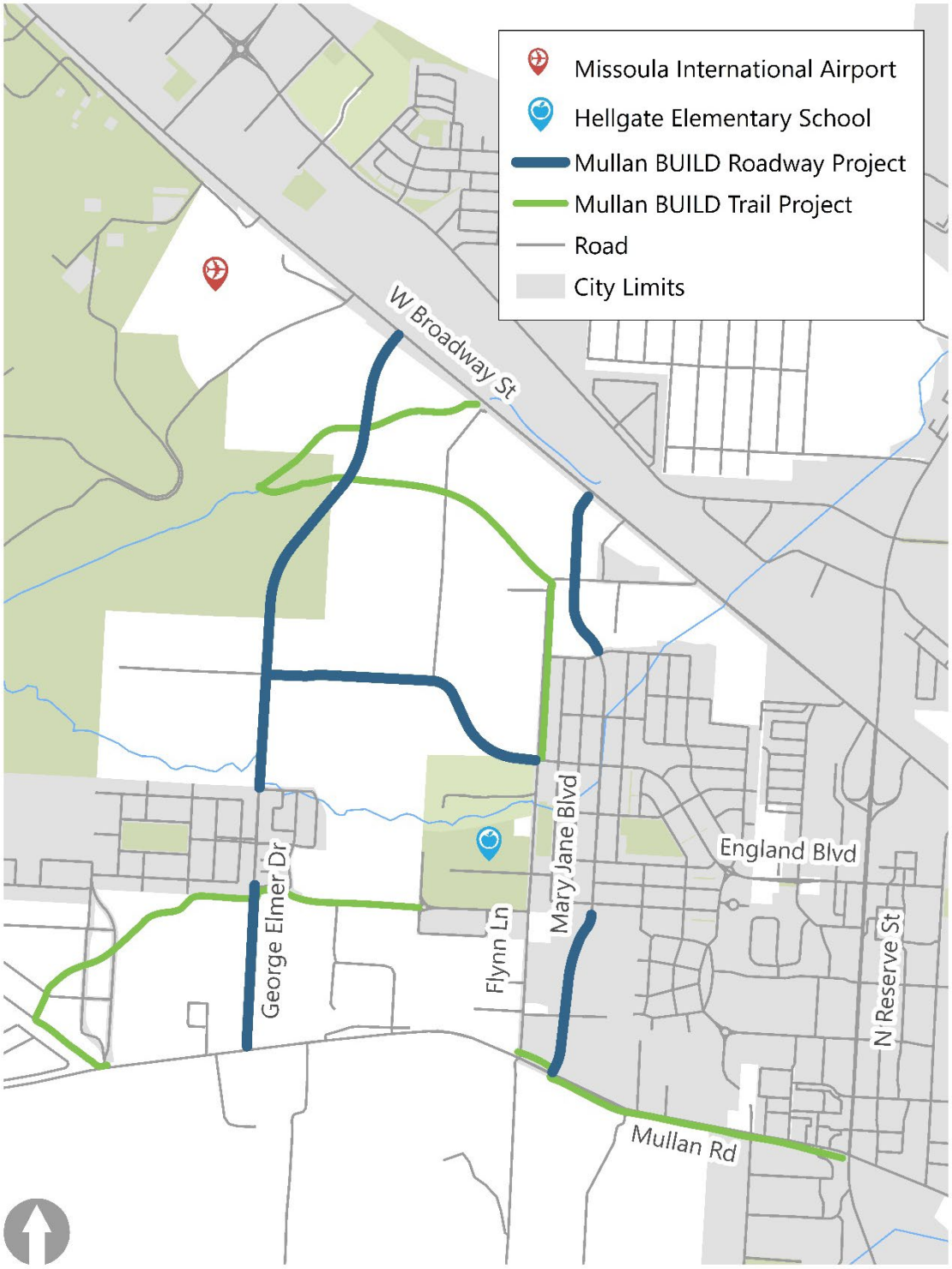
Project Area

The project is in Missoula County, Montana, generally west of the Missoula city limits, and approximately five miles from downtown Missoula. The project area is bordered by W Broadway Street to the north, Mary Jane Boulevard to the east, Mullan Road to the south and George Elmer Drive to the west. Other key roadways include Flynn Lane and England Boulevard in the project area. The project area, with BUILD facilities, is displayed in Figure 1.

The project area includes three major east-west roadways (W Broadway Street, England Boulevard and Mullan Road) and three major north-south roadways (George Elmer Drive, Flynn Lane and Mary Jane Boulevard). The project will construct:

- England Boulevard between Flynn Lane and George Elmer Drive,
- Mary Jane Boulevard between W Broadway Street and Camden Street, and Melrose Place and Mullan Road, and
- George Elmer Drive between Pius Way and W Broadway Street.

Figure 1 Project Area



PROJECTED TRANSPORTATION SYSTEM CHARACTERISTICS

This section summarizes the projected 2050 future conditions of the land uses and transportation system in the project area.

Population & Employment Growth

The comprehensive growth plans and land use policies applicable to the study area (detailed in *Technical Memorandum #1*: *Existing Transportation Conditions*) designate the general Mullan Area as nearly 1,500 acres of land for development with plans for light industrial, commercial, and workforce housing in the vicinity of the nearby airport (Reference 1). In the Missoula Metropolitan Planning Organization (MPO) travel demand model, the traffic analysis zones (TAZ) located in the Mullan Area were projected to grow by an additional 4,800 housing units as part of the Mullan Area Master Plan scenario planning (Reference 2). Further details on the travel demand model are available in A. These changes in housing development are reflected in Figure 2. Most notable is the increase in households south of the Flynn Lane & W Broadway Street intersection and northwest of the Mary Jane Boulevard & Flynn Lane intersection, as the increased density in these areas will affect traffic patterns on these roads. Additionally, changes in employment across all sectors is displayed in Figure 3, with an expected 4,100 jobs augmented by the Mullan BUILD project development.

Figure 2 Projected Population Growth (2015 - 2050) at TAZ Level

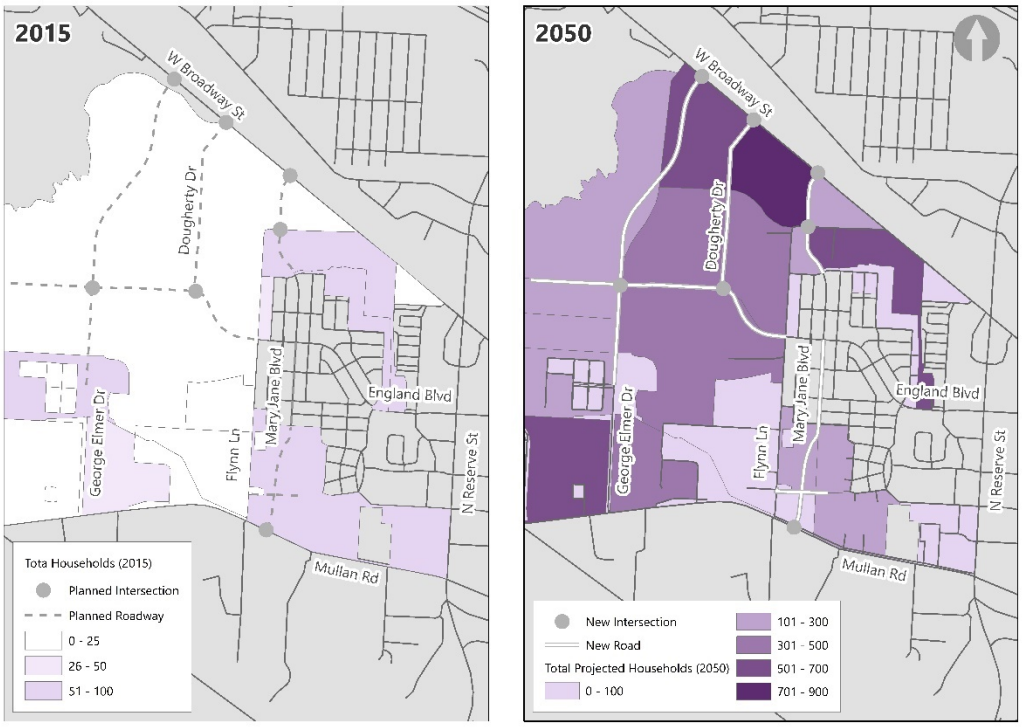
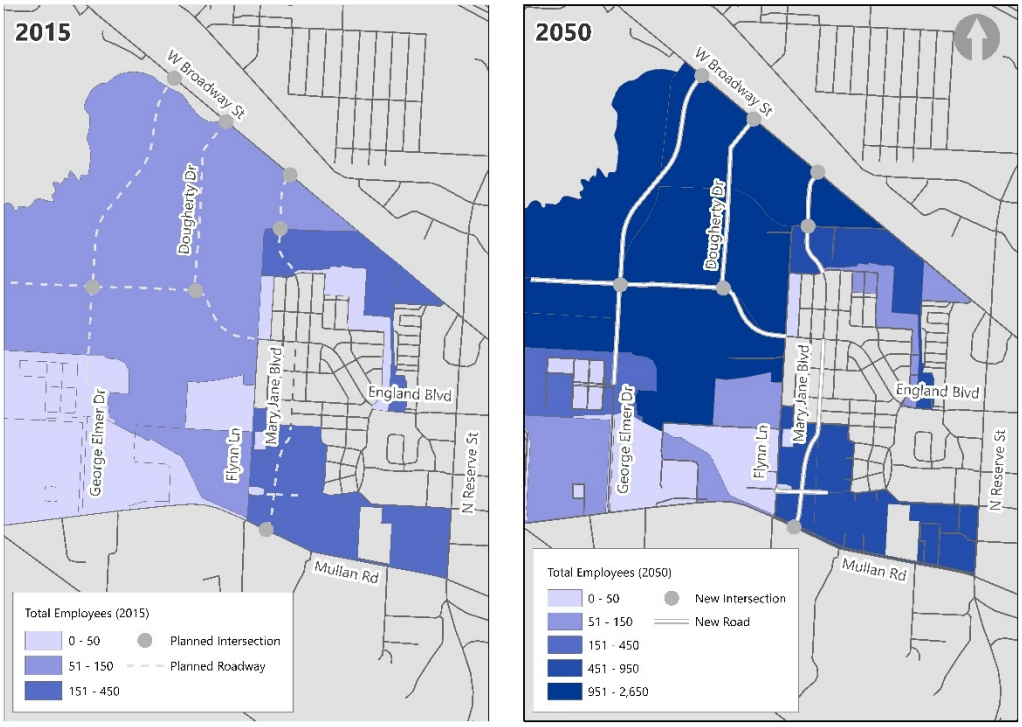


Figure 3 Projected Employment Growth (2015 - 2050) at TAZ Level



Roadway Network

Table 1 summarizes the roadway network characteristics for the project in comparison to current conditions.

Table 1 Roadway Network Characteristics

ROADWAY	EXTENTS	EXISTING CROSS-SECTION	PROPOSED FUNCTIONAL CLASSIFICATION & CROSS-SECTION	POSTED SPEED (MPH)
George Elmer Drive	W Broadway Street to England Boulevard	N/A	Two Lane Collector with Turn Lanes	30
	England Boulevard to Pius Way	N/A	Two Lane Collector with Turn Lanes	30
	Pius Way to Mullan Road	Two Lanes	Two Lane Collector with Turn Lanes	30
Flynn Lane	W Broadway Street to Mullan Road	Two Lanes	Two Lane Local	25
England Boulevard	George Elmer Drive to Flynn Lane	N/A	Two Lane Collector with Turn Lanes	30
Mary Jane Boulevard	W Broadway Street to Camden Street	N/A	Two Lane Collector with Turn Lanes	30

ROADWAY	EXTENTS	EXISTING CROSS-SECTION	PROPOSED FUNCTIONAL CLASSIFICATION & CROSS-SECTION	POSTED SPEED (MPH)
	Melrose Place to Mullan Road	N/A	Two Lane Collector with Turn Lanes	30
Mullan Road	George Elmer Drive to Mary Jane Boulevard	Two Lanes	Two Lane Arterial with Turn Lanes	45
	Mary Jane Boulevard to N Reserve Street	Two Lanes	Four Lane Arterial with Turn Lanes	45
W Broadway Street	Aviation Way to N Reserve Street	Five Lanes	No Change	55
N Reserve Street	W Broadway Street to Mullan Road	Five Lanes	No Change	45

Figure 4 displays the conditions of the 2050 model parameters, including functional classification and posted speed for the project area.

2050 Model Volumes

The Missoula MPO provided travel demand model daily, AM peak hour, and PM peak hour volumes for the year 2050. Figure 5 displays the projected daily volumes for 2050, and further information on the travel demand model is available in A. For each project intersection, Kittelson used the National Cooperative Highway Research Program (NCHRP) Report 765 (Reference 3) to estimate weekday AM and PM peak hour turning movement counts, derived from the 2050 model traffic volumes and existing traffic volumes collected in February 2020. This information can be found in B.

FREIGHT VOLUMES

The heavy vehicle percentages (HVP), calculated from the existing conditions data collection effort, were used where applicable in the new roadway network, but several HVPs were adjusted to reflect the higher classification roadways and additional connectivity of George Elmer Road and Mary Jane Boulevard over Flynn Lane. Further information on these approximate HVPs is available in C.

Figure 4 Roadway Network - Functional Classification & Posted Speed

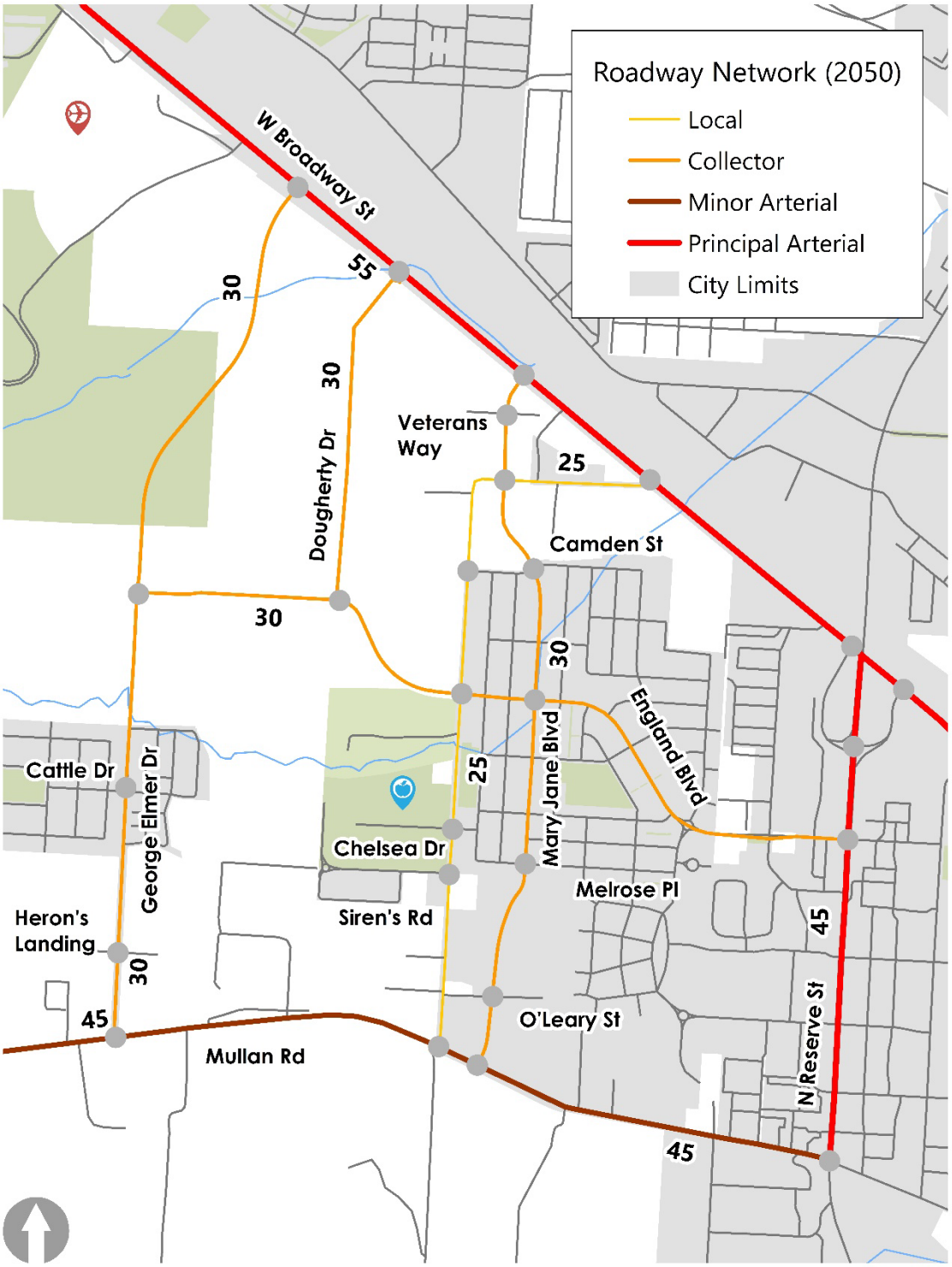
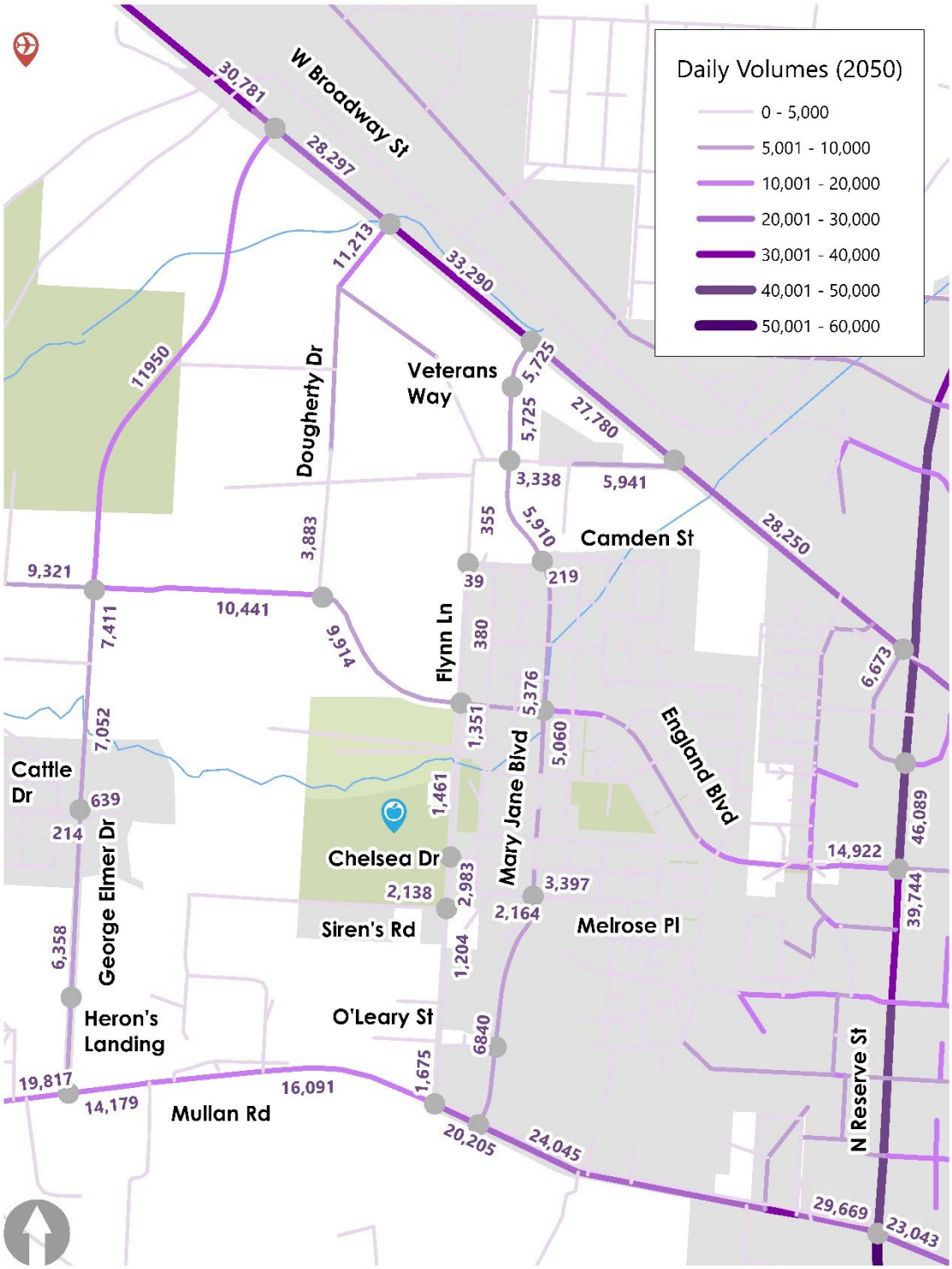


Figure 5 Daily Traffic Volumes (2050)



Multi-Modal Network

MULLAN AREA MASTER PLAN

The Mullan Area Master Plan (MAMP), a concurrent effort with the Mullan BUILD project, identifies typical sections for the planned roadways in the Mullan Area. While these sections are preliminary, not yet engineered, and flexible for implementation, they include details about how people walking, rolling, biking and driving will share the street space as its built (Reference 4). The roadway network is displayed in Figure 6, and typical sections are depicted in Figure 7 and Figure 8.

As shown in Figure 7 and Figure 8, the project roads of Mary Jane Boulevard, England Boulevard, Dougherty Drive, and George Elmer Drive, all fall within the Main Collector or Neighborhood Collector typical section categories. These sections indicate the need for standard or buffered 6' bicycle lanes, standard 6' sidewalks with landscaped buffers and accommodations for transit buses.

HELLGATE ELEMENTARY SCHOOL

This K-8 school, located along Flynn Lane between Siren's Drive and Chelsea Drive, is an important community institution in the Mullan Area. The school is connected to the surrounding neighborhood by a detached paved asphalt trail and sidewalks on the west side of Flynn Lane between Mullan Road and Chelsea Drive. On the east side of Flynn Lane, there are detached sidewalks between Siren's Drive and Camden Street. Additionally, at the southern approach of the Flynn Lane/Chelsea Drive intersection, a high visibility crosswalk with a school zone flasher and curb bulb-outs serves as the transition point from a posted speed limit of 35 mph to 25 mph.

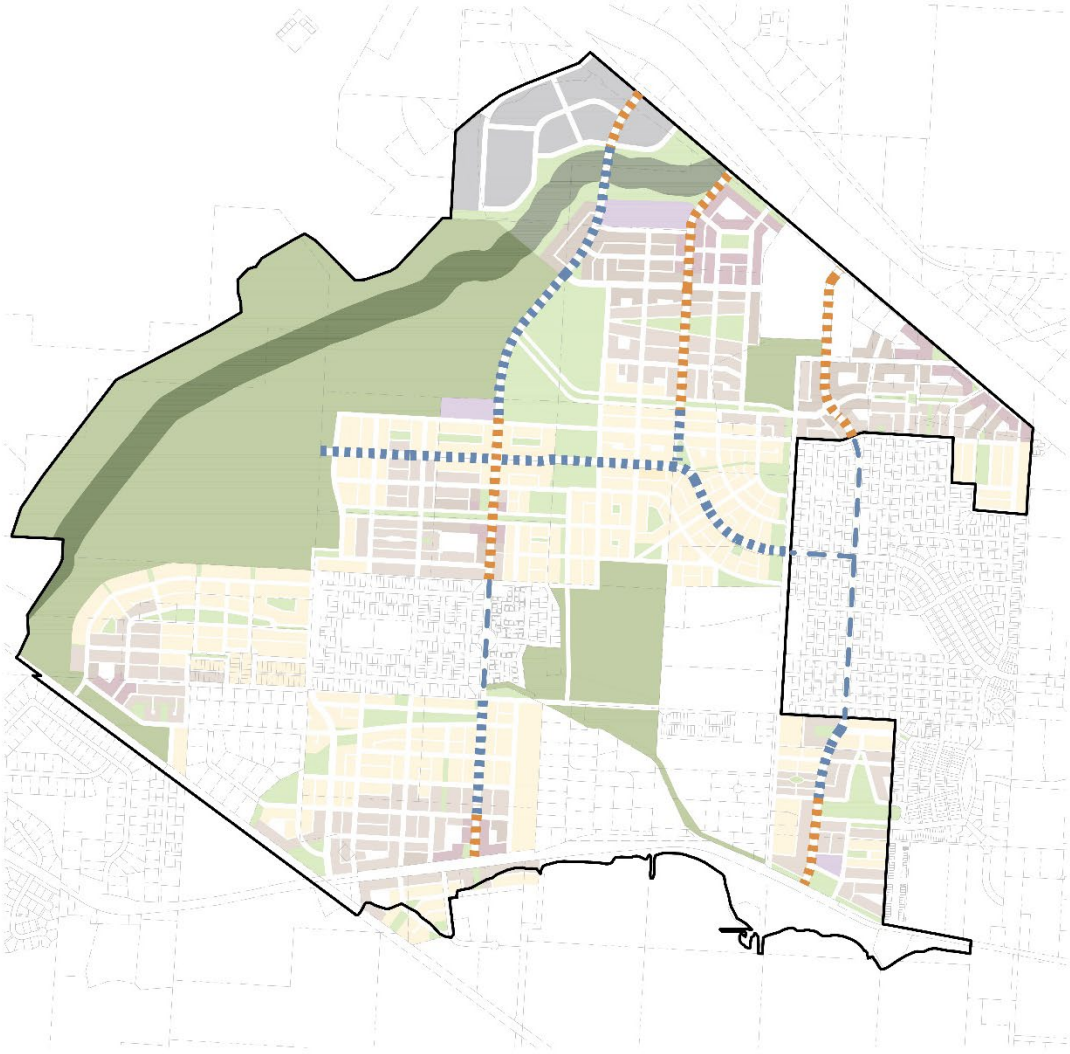
With the recommended intersection controls further described in subsequent sections, school bus routing will be altered due to the reconfiguration of the intersection of Flynn Lane and Mullan Road. To encourage the use of Mary Jane Boulevard as a primary north-south corridor in the eastern portion of the Mullan Area, the intersection of Flynn Lane & Mullan Road will be converted into an unsignalized right-in, right-out, left-in facility. This configuration will prevent southbound left turning traffic from Flynn Lane and redirect it to the intersection of Mary Jane Boulevard & Mullan Road over time. The objective of this configuration is both to redirect through traffic from Flynn Lane to Mary Jane Boulevard and to improve safety along this route due to the high volume of school-aged children using it. School bus routes that serve the areas east of Hellgate Elementary School and currently make a southbound left-turn at the intersection of Flynn Lane & Mullan Road, will require some alteration once these intersections are constructed.

Figure 6 Mullan Area Master Plan Street Atlas

MULLAN AREA MASTER PLAN
BUILD GRANT THOROUGHFARE STANDARDS

STREET ATLAS

Main Street Collector
Neighborhood Collector
Neighborhood Collector
Existing Street Segments



Mullan Area Master Plan - BUILD Grant Street Atlas

(preliminary draft for review)

Figure 7 Mullan Area Master Plan - Main Street Collector Typical Section

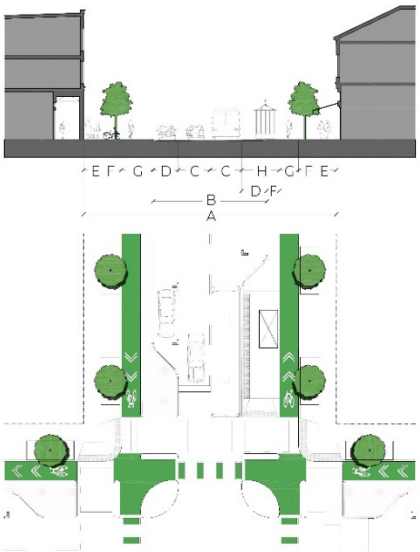
MULLAN AREA MASTER PLAN

BUILD GRANT THOROUGHFARE STANDARDS

STREET TYPES – TYPICAL SECTIONS AND INTERSECTIONS

The Typical Intersections shown represent possible intersection concepts only and are not fully engineered designs nor do they represent the full range of intersection treatments that may be appropriate.

A. Main Street Collector



Thoroughfare Type	Main Street Collector	
Right-of-Way Width	90 feet	A
Pavement Width	36 feet	B
Traffic Lanes	Two lanes - 10 feet wide	C
Transit	Bus	H
Bicycle / Micro-Mobility Facility	Two - 6' Protected Lanes 3 foot buffer	G
Parking Lanes/Curbside Flex Zone	Both sides @ 8 feet marked	D
Sidewalk: Clear & Frontage Zones	8 feet	E
Landscape Zone - Sidewalk	10' wide x 15' Tree Wells [1]	F
Landscape Type	Trees @ 35' o.c. average	F
Road Edge Treatment	Curb	
Green Infrastructure	Bioswale, Tree Box Filter	F

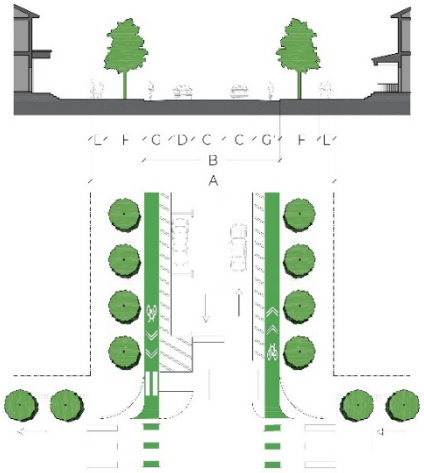
[1] Tree wells smaller than 7' wide by 15' are permitted if suspended pavement system is utilized.

(preliminary draft for review)

Figure 8 Mullan Area Master Plan - Neighborhood Collector Typical Section

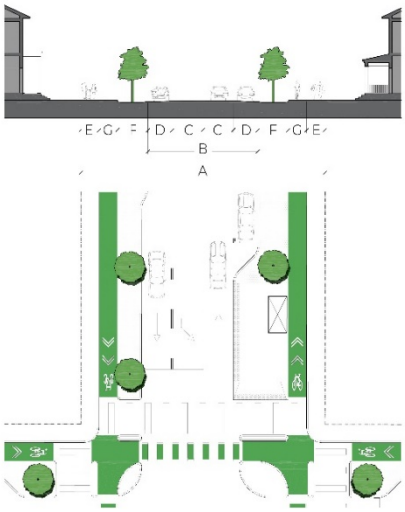
MULLAN AREA MASTER PLAN
BUILD GRANT THOROUGHFARE STANDARDS

B. Neighborhood Collector
Existing Street Segments



Thoroughfare Type	Neighborhood Collector Existing Street Segments	
Right-of-Way Width	80 feet	A
Pavement Width	44.5 feet	B
Traffic Lanes	Two - 10.5 foot drive lanes	C
Transit	Bus	
Bicycle / Micro-Mobility Facility	Two - 5' Protected Lanes 3 foot striped buffer	G
Parking Lanes/Curbside Flex Zone	One side @ 7.5 feet marked	D
Sidewalk: Clear & Frontage Zones	6 feet	E
Landscape Zone	12.75 foot continuous planter	F
Landscape Type	Trees @ 35' o.c. average	F
Road Edge Treatment	Curb	
Green Infrastructure	Bioswale	F

C. Neighborhood Collector



Thoroughfare Type	Neighborhood Collector	
Right-of-Way Width	90 feet	A
Pavement Width	36 feet	B
Traffic Lanes	Two - 10 foot drive lanes	C
Transit	Bus	
Bicycle / Micro-Mobility Facility	Two - 6' Protected Lanes	G
Parking Lanes/Curbside Flex Zone	Both sides @ 8 feet marked	D
Sidewalk: Clear & Frontage Zones	6 feet	E
Landscape Zone	10 to 15 foot continuous planter	F
Landscape Type	Trees @ 35' o.c. average	F
Road Edge Treatment	Curb	
Green Infrastructure	Bioswale	F

The Typical Intersections shown represent possible intersection concepts only and are not fully engineered designs nor do they represent the full range of intersection treatments that may be appropriate.

(preliminary draft for review)

TRAILS

In addition to the new roadways and intersections that will be designed and constructed as part of the project, 3.7 miles of new multi-use trails will also be included: the Grant Creek Trail, the Milwaukee Trail, the Tipperary Way Trail, the Flynn Lane Trail, and the Mullan Trail (Reference 1). These trails will include 10' asphalt paths with 1' shoulders. Major crossing locations, such as those at George Elmer Drive, Flynn Lane, and Mary Jane Boulevard are planned to include either rectangular rapid flashing beacons (RRFBs) or other crossing treatment to alert people driving of the presence of people walking, rolling, and biking (Reference 5). The trail components of the project are as follows:

- Grant Creek Trail
    - This trail extends south from W Broadway Street towards the Flynn Lane Trail.
    - This trail crosses George Elmer Drive just north of the creek.
- Milwaukee Trail
    - This trail connects the existing Mullan Trail northwest towards Grant Creek.
    - This trail will eventually provide a connection with the Grant Creek Trail.
- Tipperary Way Trail
    - This trail leads from Hellgate Elementary School towards Grant Creek along the Flynn Lowney Ditch, connecting with the Milwaukee Trail.
    - This trail crosses George Elmer Drive along the alignment of the Flynn Lowney Ditch, which is approximately 200 feet southeast of Filly Lane.
- Flynn Lane Trail
    - This trail extends north and west from its current terminus at Hellgate Elementary School, also connecting to the Grant Creek Trail.
    - As it traverses north, this trail crosses the new fourth leg of the Flynn Lane & England Boulevard intersection.
    - As the trail veers west after it reaches the bend of Flynn Lane, it crosses George Elmer Drive before crossing the creek and connecting with the Grant Creek Trail.
- Mullan Trail
    - This trail extends 0.75 miles from its current terminus to connect with the existing facilities along Reserve Street.
    - This trail is currently routed north of Mullan Road. Along the northern alignment, it crosses George Elmer Drive and crosses Flynn Lane towards Mary Jane Boulevard.
    - At the intersection of Mary Jane Boulevard with Mullan Road, the trail crosses and realigns south of Mullan Road towards Reserve Street.

TRANSIT NETWORK

Missoula Urban Transportation District (MUTD) operates the transit service in Missoula, called Mountain Line. Route 11 provides service every 60 minutes from 6 AM to 9 AM, 12 PM to 2 PM, 3 PM to 5 PM and at 6 PM between the Downtown Transfer Center and Missoula International Airport. Route 11 has stops on the eastern boundary of the project area on England Boulevard and northern boundary of the project area on W Broadway Street. In their long-range plan, MUTD identified the addition of route 15B to their service offerings, which will operate along England Boulevard, serving the expanded Mullan Area. This route is a part of MUTD's long term network, and as such, the expanded route and bus stop locations will be determined as funding becomes available and development occurs in the project area (Reference 6).

ANALYSIS METHODOLOGY

Kittelson analyzed future (2050) conditions to identify suitable options for intersection control and roadway segments in the project area. The purpose of the evaluation is to identify a preferred intersection control and the number of vehicular travel lanes for roadway segments based on 2050 traffic projections. Based on the study objectives, Kittelson used the safety performance and traffic operations results as primary drivers for selection of the recommended intersection control.

Intersection Methodology

Kittelson utilized the turning movement counts produced by the NCHRP 765 methodology to evaluate intersection control options based on 2050 AM and PM peak hour traffic volumes. Appendix B illustrates the process for developing 2050 AM and PM peak hour traffic volumes at the intersections.

TRAFFIC OPERATIONS

Working in PTV Vistro, four scenarios were developed for both the AM and PM peak HOURs, based on control type: Two Way Stop Control (TWSC), Signal, Roundabout (single-lane and multi-lane), and All Way Stop Control (AWSC). These scenarios were analyzed using the guidance of the 6th Edition of the Highway Capacity Manual (HCM) (Reference 7) as follows:

- All intersections were tested as TWSC. Intersections with failing movements and higher volume movements were evaluated for left-turn and right-turn lane warrants (Reference 8, Reference 9, and Reference 10).
- Intersections that met the Manual on Uniform Traffic Control Devices (MUTCD) signal warrants were evaluated as signalized intersections. MUTCD signal warrants #1, #2 and #3 were used in the evaluation (Reference 11).
- All intersections were tested as single-lane roundabouts with some being evaluated as multi-lane roundabouts to address any movement deficiencies.
- A few intersections were tested as AWSC due to an operational deficiency as a TWSC and not meeting MUTCD signal warrants.

SAFETY

In addition to the operational analysis, intersection safety analyses were performed by adapting the pedestrian risk score methodology developed by the Missoula MPO in their Pedestrian Facilities Master Plan (Reference 12). This analysis, utilizing the parameters of vehicular posted speed, vehicular daily traffic, and number of vehicular lanes, quantifies the level of risk that an unmitigated intersection poses for a person walking via a spreadsheet tool. The criteria, and associated risk scoring, are delineated in Table 2.

Table 2 Pedestrian Risk Scoring

SPEED (MPH)	POINTS	VOLUME (AADT)	POINTS	LANES	POINTS
25	1	<3,000	1	2	1
30	2	3,001 – 9,000	2	3	2
35	3	9,001 – 15,000	3	4	3
40	4	>15,001	4	5	4
45+	5	-	-	-	-

Additionally, Kittelson performed a safety analysis evaluating crash modification factors for total crashes and crash severity for the different intersection controls. This assessment is based on Highway Safety Manual methodology (Reference 13 and Reference 14) and the crash modification factor clearinghouse (Reference 14). Crash modification factors quantify the expected crash reduction associated with each intersection control are summarized in Table 3 (based on countermeasure scenario) and Table 4 (based on crash severity). In the case of a signalized intersection as a countermeasure, total number of crashes may be lower, however, crash severity will be generally low compared to a stop-controlled intersection. In the case of a roundabout at an intersection as a countermeasure, crash severity will be lower, compared to stop-controlled and signalized intersection. However, number of crashes are generally higher in case of a multi-lane roundabout when compared to a single-lane roundabout and traffic signal.

As needed for the project, Kittelson plans to prepare a separate memorandum to further analyze the safety component in detail at Flynn Lane and W Broadway Street, and Mary Jane Boulevard and W Broadway Street intersections after selection of intersection control type is determined. This memorandum will support the potential for securing funding associated with the Highway Safety Improvement Program (HSIP).

Table 3 Crash Modification Factors based on Intersection Control (All Crash Types)

COUNTERMEASURE	CMF	CRF[2]	QUALITY RATING[1]
Convert Intersection from Stop Control to Right-In/Right-Out	0.55	45	4 Stars
Convert an Open Median to a Left-In Only Median	0.95	5	3 Stars
Convert Intersection from Minor Road Stop Control to All Way Stop Control	0.319	68.1	4 Stars
Convert Intersection from Stop Control to Signal	0.56	44	5 Stars
Convert Intersection from Stop Control to Signal (major road 40 mph)	0.95	5	4 Stars
Convert Intersection from Stop Control to Single-Lane Roundabout	0.56	44	5 Stars
Convert Intersection from Stop Control to Multi-Lane Roundabout	0.88-0.95	12-5	3 Stars
Convert Intersection from Signal to Single-Lane Roundabout	0.74	26	4 Stars
Convert Intersection from Signal to Multi-Lane Roundabout	0.81	19	4 Stars

Source: CMF Clearinghouse

Table 4 Crash Modification Factors based on Intersection Control (Crash Severity)

COUNTERMEASURE	CMF	CRF[2]	QUALITY RATING[1]
Convert Intersection from Minor Road Stop Control to All Way Stop Control	0.23	77	4 Stars
Convert an Open Median to a Left-In Only Median	0.95	5	3 Stars
Install a Traffic Signal	0.782	21.8	4 Stars
Convert Intersection with Minor-Road Stop Control to Modern Roundabout (Single-Lane Roundabout)	0.22	78	4 Stars
Convert Intersection with Minor-Road Stop Control to Modern Roundabout (Multi-Lane Roundabout)	0.32	68	4 Stars
Convert Signalized Intersection into Single- or Multi-Lane Roundabout (Single-Lane Roundabout)	0.45	55	3 Stars
Convert Signalized Intersection into Single- or Multi-Lane Roundabout (Multi-Lane Roundabout)	0.29	71	4 Stars

Source: CMF Clearinghouse

Segment Methodology

Kittelson evaluated the project roadway segments based on 2050 daily traffic volumes using planning-level daily traffic volume thresholds from the Florida Department of Transportation's (FDOT) Quality/Level of Service Handbook tables (Reference 15). These planning-level thresholds are based on HCM methodology (Reference 7) and factor in roadway characteristics and land use-type considerations. These thresholds are used nationally as a reference guide for preliminary analysis of roadway cross-sections. Additionally, Kittelson used the intersection operations findings to assess consistency between the roadway segment analysis and lane arrangements identified at the study intersections.

[1] The star quality rating indicates the quality or confidence in the results of the study producing the CMF. The star rating is based on a scale of 1 to 5, with 5 indicating the highest or most reliable rating.
[2] The Crash Reduction Factor (CRF) indicates a decrease in crashes (%).

INTERSECTION AND ROADWAY CROSS-SECTION EVALUATION

This section describes the preliminary traffic control and cross-section options that can function at an acceptable LOS and under capacity at the intersections and on the segments under year 2050 traffic conditions. LOS D is used as the intersection LOS threshold. A volume-to-capacity ratio (V/C) of 0.90 is used as the movement V/C threshold for unsignalized and signalized intersections within the project area.

2050 Roadway Network Evaluation

The results of the level of service analysis are delineated in Table 5. All roadways are projected to operate at an acceptable level of service under year 2050 conditions with the proposed number of lanes.

Table 5 Roadway Level of Service (2050)

ROADWAY (LIMITS)	LANES	ADT (2050)	POSTED SPEED (MPH)	FUNCTIONAL CLASS	LEVEL OF SERVICE
West Broadway Street (Aviation Drive to Flynn Lane)	Four Lanes with Turn Lanes	30,780	55	Principal Arterial	C
George Elmer Drive (W Broadway Street to Pius Way)	Two Lanes with Turn Lanes	11,950	30	Collector	B
George Elmer Drive (Pius Way to Mullan Road)	Two Lanes with Turn Lanes	7,050	30	Collector	B
England Boulevard (George Elmer Drive to Flynn Lane)	Two Lanes with Turn Lanes	10,300	30	Collector	C
Mary Jane Boulevard (W Broadway Street to Camden Street)	Two Lanes with Turn Lanes	5,725	30	Collector	C
Mary Jane Boulevard (Camden Street to Melrose Place)	Two Lanes with Turn Lanes	5,910	30	Collector	C
Mary Jane Boulevard (Melrose Place to Mullan Road)	Two Lanes with Turn Lanes	6,840	30	Collector	C
Mullan Road (George Elmer Dr. to Mary Jane Blvd.)	Two Lanes with Turn Lanes	19,820	45	Minor Arterial	C
Mullan Road (Mary Jane Boulevard to Reserve St.)	Four Lanes with Turn Lanes	24,045	45	Minor Arterial	C

2050 Intersection Control Evaluation

This section outlines the evaluation of each project intersection by both congestion and safety performance measures, with the primary intent of selecting intersection control types for the project design effort. Kittelson evaluated control types at the following intersections:

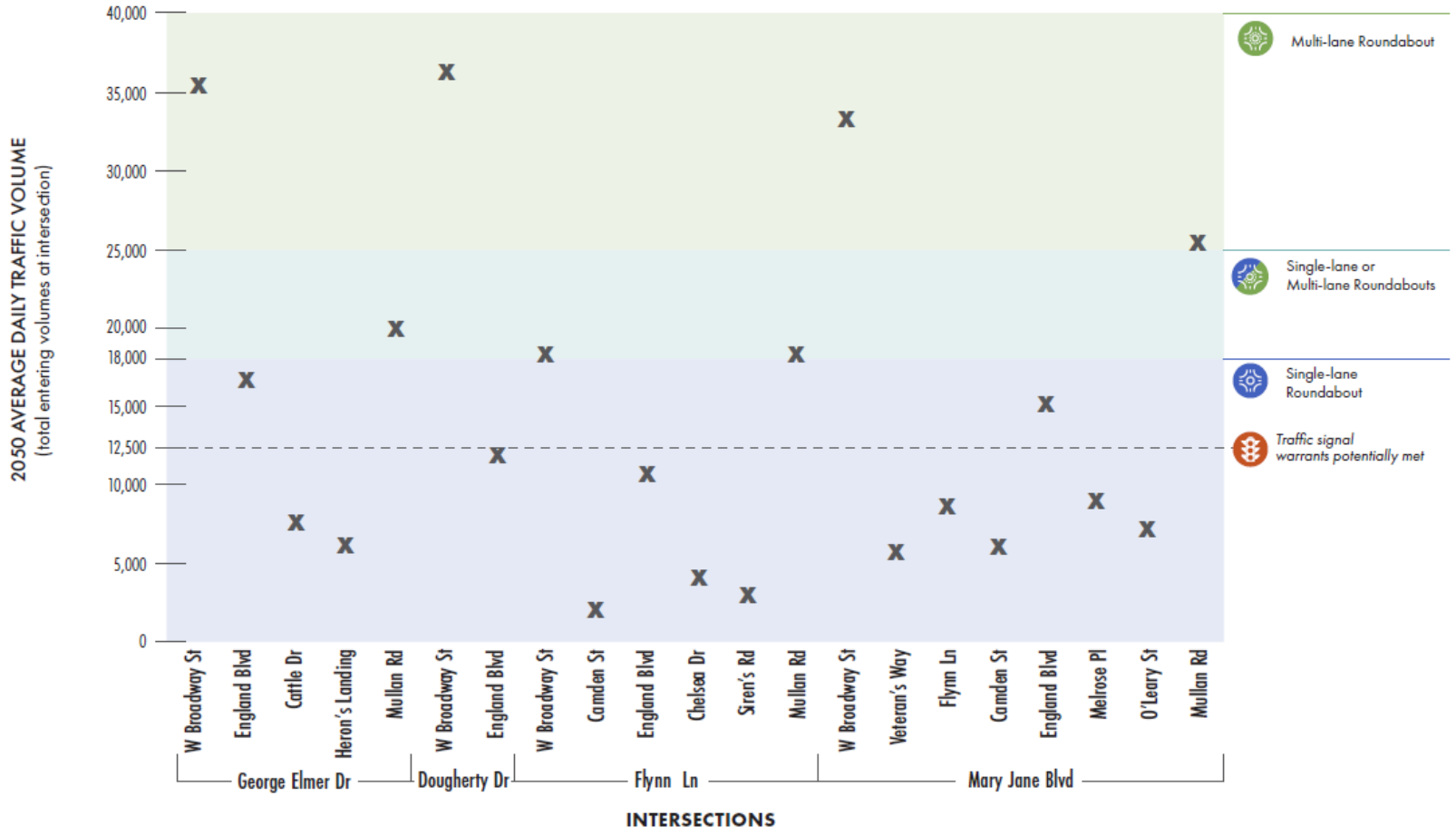
- #1 George Elmer Drive & W Broadway Street
- #2 George Elmer Drive & England Boulevard
- #3 George Elmer Drive & Cattle Drive
- #4 George Elmer Drive & Heron's Landing
- #5 George Elmer Drive & Mullan Road
- #6 Dougherty Drive & England Boulevard
- #7 Dougherty Drive & W Broadway Street
- #8 Flynn Lane & Camden Street
- #9 Flynn Lane & England Boulevard
- #10 Flynn Lane & Chelsea Drive
- #11 Flynn Lane & Siren's Road
- #12 Flynn Lane & Mullan Road
- #13 Mary Jane Boulevard & Mullan Road
- #14 Mary Jane Boulevard & O'Leary Street
- #15 Mary Jane Boulevard & Melrose Place
- #16 Mary Jane Boulevard & England Boulevard
- #17 Mary Jane Boulevard & Camden Street
- #18 Mary Jane Boulevard & Flynn Lane
- #19 Mary Jane Boulevard & Veteran's Way
- #20 Mary Jane Boulevard & W Broadway Street
- #21 Flynn Lane & W Broadway Street

On the next several pages (19 – 39), each intersection includes the following background and analysis results in tabular format:

- 2050 AM and PM peak hour traffic volumes
- MUTCD signal warrants #1, #2 and #3
- Left-turn lane and right-turn lane warrants
- Pedestrian risk score (Scores range between 3 – 13, with 13 being the riskiest)
- For each intersection control type:
    - Lane configurations
    - Traffic operations (LOS, delay, v/c ratio, 95th percentile queue in feet)
    - Safety assessment (crash modification factors and conflict points)
- Recommedation for intersection control type

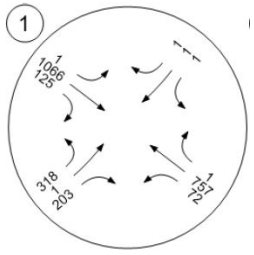
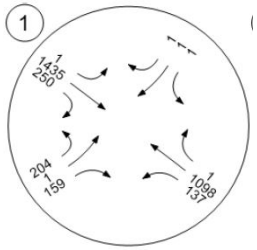
Figure 9 identifies the type of traffic control (e.g. roundabout and signal) anticipated based on year 2050 daily traffic volumes. Kittelson used this planning-level assessment to identify preliminary recommendations for intersection control at the study intersection.

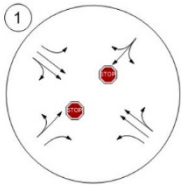
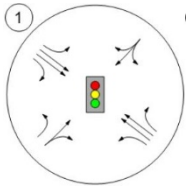
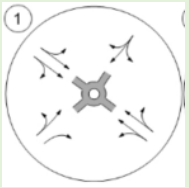
Figure 9 Planning Level Roundabout Capacity and Signal Warrant Thresholds



Note: Shaded areas correspond to volume thresholds for roundabout control
Source: Manual on Uniform Traffic Control Devices (MUTCD)
NCHRP Report 765 and NCHRP Report 825
Missoula MPO Travel Demand Model

#1 GEORGE ELMER DRIVE & WEST BROADWAY STREET

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)		RECOMMENDATION
N 		#1, #2, #3		**MULTI-LANE ROUNDABOUT**
		LEFT-TURN LANE WARRANTED ON MAJOR STREET	**RIGHT-TURN LANE WARRANTED ON MAJOR STREET**	
		Yes	Yes	
		PEDESTRIAN RISK SCORE		
		13[3]		

TWO WAY STOP CONTROL						SIGNAL						ROUNDABOUT					
NBL[4]	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR
1,303 / 746	1,030 / 746	78 / 98		0 / 0	0 / 0	0 / 0	477 / 301	-/-	214 / 194		0 / 0	504 / 658	101 / 186	202 / 134	-/-	62 / 64		-/-	72 / 161	90 / 232
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR
5 / 21	5 / 21	5 / 21		13 / 56	0 / 0	0 / 0	2 / 2	2 / 2	2 / 2		43 / 85	305 / 368	0 / 0	0 / 0	0 / 0	0 / 0		64 / 89	82 / 117	-/-

LOS	DELAY (SEC.)	V/C	LOS	DELAY (SEC.)	V/C	LOS	DELAY (SEC.)[5]	V/C
F / F	>50 / >50	>1 (NBTL)/ >1 (NBL)	C / C	34 / 28	0.71 (NBL) / 0.75 (NBL)	B / C	14 / 15	0.85 (NBL) / 0.8 (EBR)

CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY[6] (CRF)		
3 / 3 / 3 (9) ; N/A	3 / 3 / 3 (9) ; ↓ total crashes (5%), ↓ crash severity (21.8%)	2 / 4 / 3 (9) ; ↓ total crashes (5-12%), ↓ crash severity (68%)

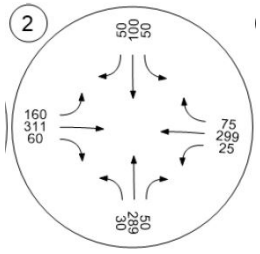
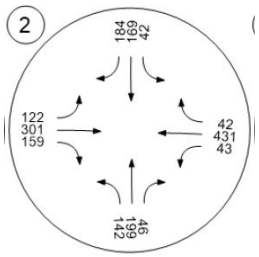
[3] Possible Pedestrian Risk Scores range between 3 – 13, with 13 being the riskiest.

[4] Queue length for approach (feet).

[5] Intersection delay is reported for roundabouts.

[6] Compared to two way stop control; color variation of arrows refers to level of change between intersection control types (↓ , ↓ , ↓)

#2 GEORGE ELMER DRIVE & ENGLAND BOULEVARD

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)	RECOMMENDATION
N 		#3 LEFT-TURN LANE WARRANTED ON MAJOR STREET: Yes RIGHT-TURN LANE WARRANTED ON MAJOR STREET: No PEDESTRIAN RISK SCORE: 7	**SINGLE-LANE ROUNDABOUT**

TWO WAY STOP CONTROL

NBL	NBT	NBR		EBL	EBT	EBR
58 / 547	719 / 465	719 / 465	2	0 / 0	0 / 0	1 / 0
SBL	SBT	SBR		WBL	WBT	WBR
225 / 198	133 / 674	13 / 674		0 / 56	0 / 0	0 / 0

LOS	DELAY (SEC.)	V/C
F / F	>50 / >50	>1 (NBTR)/ >1(NBTR)

ALL WAY STOP CONTROL

NBL	NBT	NBR		EBL	EBT	EBR
6 / 50	213 / 121	213 / 121	2	51 / 38	258 / 502	258 / 502
SBL	SBT	SBR		WBL	WBT	WBR
12 / 10	48 / 258	48 / 258		5 / 10	260 / 559	260 / 559

LOS	DELAY (SEC.)	V/C
E / F	41 / >50	0.92 (WBT)/ >1 (WBT)

SIGNAL

NBL	NBT	NBR		EBL	EBT	EBR
27 / 165	310 / 188	310 / 188	2	123 / 124	199 / 306	199 / 306
SBL	SBT	SBR		WBL	WBT	WBR
56 / 36	124 / 282	124 / 282		15 / 38	200 / 310	200 / 310

LOS	DELAY (SEC.)[2]	V/C
C / C	21 / 24	0.52 (SBL) / 0.6 (NBL)

CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)

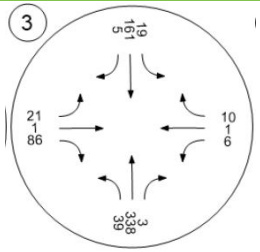
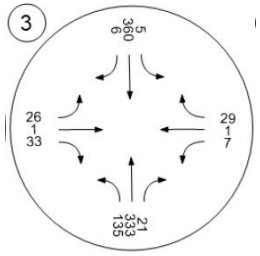
TWO WAY STOP CONTROL	ALL WAY STOP CONTROL	SIGNAL
8 / 8 / 16 (32) ; N/A	8 / 8 / 16 (32) ; ↓ total crashes (68.1%), ↓ crash severity(77%)	8 / 8 / 16 (32) ; ↓ total crashes (44%), ↓ crash severity (21.8%)

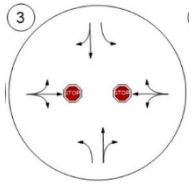
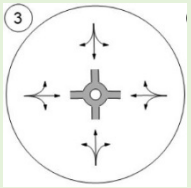
ROUNDABOUT

NBL	NBT	NBR		EBL	EBT	EBR
85 / 78	85 / 78	85 / 78	2	83 / 114	83 / 114	83 / 114
SBL	SBT	SBR		WBL	WBT	WBR
23 / 115	23 / 115	23 / 115		89 / 147	89 / 147	89 / 147

LOS	DELAY (SEC.)	V/C	CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)
B / B	11 / 14	0.56 (WBLTR) / 0.7 (WBLTR)	4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)

#3 GEORGE ELMER DRIVE & CATTLE DRIVE

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)		RECOMMENDATION
N 		No		**SINGLE-LANE ROUNDABOUT[7]**
		LEFT-TURN LANE WARRANTED ON MAJOR STREET	RIGHT-TURN LANE WARRANTED ON MAJOR STREET	
		Yes	No	
		PEDESTRIAN RISK SCORE		
		6		

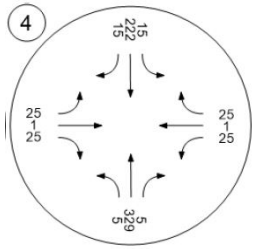
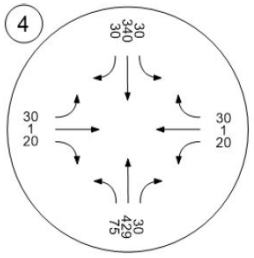
TWO WAY STOP CONTROL							ROUNDABOUT							
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR
2 / 10	0 / 0	0 / 0		15 / 21	15 / 21	15 / 21	35 / 51	35 / 51	35 / 51		8 / 5	8 / 5	8/ 5
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR
1 / 0	0 / 0	0 / 0		3 / 8	3 / 8	3 / 8	14 / 40	14 / 40	14 / 40		1 / 4	1 / 4	1 / 4

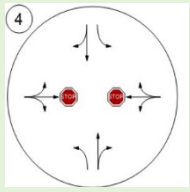
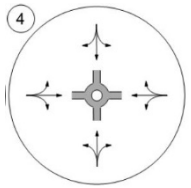
LOS	DELAY (SEC.)	V/C	LOS	DELAY (SEC.)	V/C
C / D	17 / 30	0.02 (WBL) / 0.17 (EBL)	A / A	5 / 6	0.32 (NBLTR) / 0.41 (NBLTR)

CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)	
8 / 8 / 16 (32) ; N/A	4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)

[7] A single-lane roundabout has been planned at this intersection as part of a past development approval.

#4 GEORGE ELMER DRIVE & HERON'S LANDING

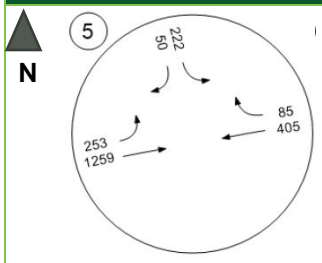
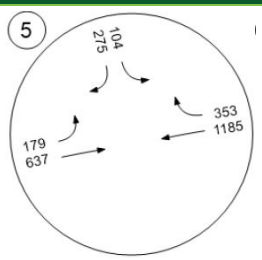
2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)	RECOMMENDATION
N 		No	**TWO WAY STOP CONTROL WITH NORTHBOUND & SOUTHBOUND LEFT-TURN LANES**
		LEFT-TURN LANE WARRANTED ON MAJOR STREET: Yes; **RIGHT-TURN LANE WARRANTED ON MAJOR STREET**: No	
		PEDESTRIAN RISK SCORE: 6	

TWO WAY STOP CONTROL							ROUNDABOUT							
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR
0 / 5	0 / 0	0 / 0		9 / 23	9 / 23	9 / 23	30 / 63	30 / 63	30 / 63		4 / 5	4 / 5	4 / 5
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR
1 / 2	0 / 0	0 / 0		10 / 17	10 / 17	10 / 17	20 / 41	20 / 41	20 / 41		4 / 6	4 / 6	4 / 6

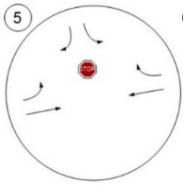
LOS	DELAY (SEC.)	V/C	LOS	DELAY (SEC.)	V/C
C / D	16 / 32	0.08 (WBL) / 0.21 (EBL)	A / A	4 / 6	0.29 (NBLTR) / 0.46 (NBLTR)

CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)	
8 / 8 / 16 (32) ; N/A	4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)

#5 GEORGE ELMER DRIVE & MULLAN ROAD

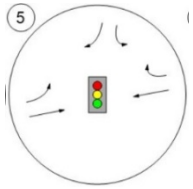
2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)	RECOMMENDATION
		#1, #2, #3 LEFT-TURN LANE WARRANTED ON MAJOR STREET: Yes RIGHT-TURN LANE WARRANTED ON MAJOR STREET: Yes PEDESTRIAN RISK SCORE: 12	**INTERIM:** SINGLE-LANE ROUNDABOUT WITH EASTBOUND LEFT-TURN LANE AND WESTBOUND RIGHT-TURN LANE **ULTIMATE:** MULTI-LANE ROUNDABOUT WITH TWO EASTBOUND AND WESTBOUND THROUGH LANES

TWO WAY STOP CONTROL

NBL	NBT	NBR		EBL	EBT	EBR
-/-	-/-	-/-		24 / 41	0 / 0	-/-
SBL	SBT	SBR		WBL	WBT	WBR
741 / 352	-/-	7 / 460		- / -	0 / 0	0 / 0

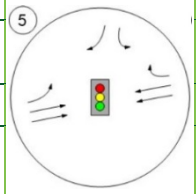
LOS	DELAY (SEC.)	V/C
F / F	>50 / >50	>1 (SBL)/ >1(SBL)

INTERIM SIGNAL

NBL	NBT	NBR		EBL	EBT	EBR
-/-	-/-	-/-		786 / 410	135 / 16	-/-
SBL	SBT	SBR		WBL	WBT	WBR
837 / 365	-/-	0 / 0		-/-	41 / 346	6 / 37

LOS	DELAY (SEC.)	V/C
F / D	>80 / 43	0.91 (SBL) / 0.84 (SBL)

ULTIMATE SIGNAL

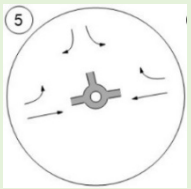
NBL	NBT	NBR		EBL	EBT	EBR
-/-	-/-	-/-		92 / 106	276 / 144	-/-
SBL	SBT	SBR		WBL	WBT	WBR
314 / 128	-/-	64 / 406		-/-	83 / 370	83 / 214

LOS	DELAY (SEC.)[2]	V/C
B / C	14 / 20	0.64 (SBL) / 0.66 (SBR)

CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)

TWO WAY STOP CONTROL	INTERIM SIGNAL	ULTIMATE SIGNAL
3 / 3 / 3 (9) ; N/A	3 / 3 / 3 (9) ; ↓ total crashes (5%), ↓ crash severity (21.8%)	3 / 3 / 3 (9) ; ↓ total crashes (5%), ↓ crash severity (21.8%)

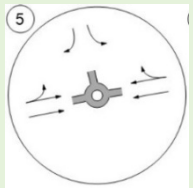
INTERIM ROUNDABOUT (ACCEPTABLE LIFESPAN OF 15-21 YEARS)

NBL	NBT	NBR		EBL	EBT	EBR
-/-	-/-	-/-		5 / 13	1233 / 88	-/-
SBL	SBT	SBR		WBL	WBT	WBR
27 / 29	-/-	4 / 115		-/-	54 / 785	7 / 37

LOS	DELAY (SEC.)	V/C
F / E	>50 / 40	>1 (EBT) / >1 (WBT)

CONFLICT POINTS ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)	2 / 4 / 3 (9) ; ↓ total crashes (44%), ↓ crash severity (78%)

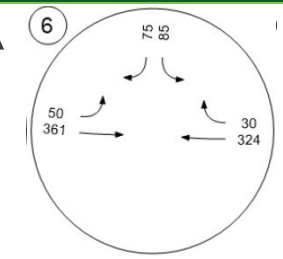
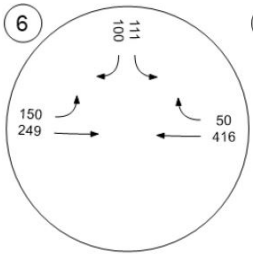
ULTIMATE ROUNDABOUT

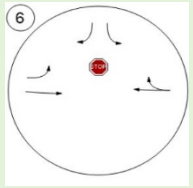
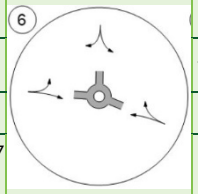
NBL	NBT	NBR		EBL	EBT	EBR
-/-	-/-	-/-		160 / 37	194 / 43	-/-
SBL	SBT	SBR		WBL	WBT	WBR
28 / 28	-/-	5 / 113		-/-	28 / 141	33 / 200

LOS	DELAY (SEC.)	V/C
B / B	12 / 13	0.76 (EBT) / 0.77 (WBR)

CONFLICT POINTS ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)	2 / 4 / 3 (9) ; ↓ total crashes (5-12%), ↓ crash severity (68%)

#6 DOUGHERTY DRIVE & ENGLAND BOULEVARD

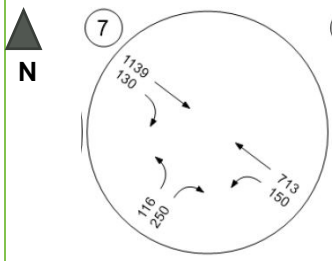
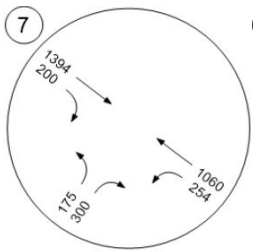
2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)		RECOMMENDATION
		No		**INTERIM: TWO WAY STOP CONTROL WITH EASTBOUND LEFT-TURN LANE** **ULTIMATE: SINGLE-LANE ROUNDABOUT**
		LEFT-TURN LANE WARRANTED ON MAJOR STREET	RIGHT-TURN LANE WARRANTED ON MAJOR STREET	
		Yes	No	
		PEDESTRIAN RISK SCORE		
		7		

TWO WAY STOP CONTROL (ACCEPTABLE LIFESPAN OF 26-30 YEARS)							ROUNDABOUT						
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR
- / -	- / -	- / -		3 / 13	0 / 0	- / -	-/-	-/-	-/-		45 / 42	45 / 42	-/-
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR
30 / 82	- / -	10 / 16		- / -	0 / 0	0 / 0	17 / 27	-/-	17 / 27		-/-	32 / 57	32 / 57

LOS	DELAY (SEC.)	V/C	LOS	DELAY (SEC.)	V/C
C / E	21 / 45	0.30 (SBL)/ 0.59 (SBL)	A / A	6 / 7	0.38 (EBLT) / 0.44 (WBTR)

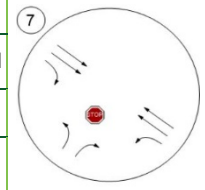
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)	
3 / 3 / 3 (9) ; N/A	2 / 2/ 0 (4) ; ↓ total crashes (44%), ↓ crash severity (78%)

#7 DOUGHERTY DRIVE & WEST BROADWAY STREET

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)	RECOMMENDATION
		Yes LEFT-TURN LANE WARRANTED ON MAJOR STREET: Yes RIGHT-TURN LANE WARRANTED ON MAJOR STREET: Yes PEDESTRIAN RISK SCORE: 13	**RIGHT-IN/RIGHT-OUT/LEFT-IN OR MULTI-LANE ROUNDABOUT**

TWO WAY STOP CONTROL

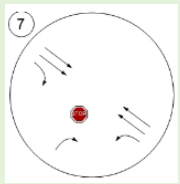
NBL	NBT	NBR	EBL	EBT	EBR
154 / 540	- /-	105 / 241	-/-	0 / 0	0 / 0
SBL	SBT	SBR	WBL	WBT	WBR
-/-	-/-	-/-	35 / 154	0 / 0	-/-



LOS	DELAY (SEC.)	V/C
F / F	>50 / >50	0.92 (NBL)/ >1(NBL)

RIGHT-IN, RIGHT-OUT, LEFT-IN

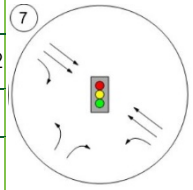
NBL	NBT	NBR	EBL	EBT	EBR
-/-	-/-	258 / 693	-/-	0 / 0	0 / 0
SBL	SBT	SBR	WBL	WBT	WBR
-/-	-/-	-/-	35 / 154	0 / 0	-/-



LOS	DELAY (SEC.)	V/C
F / F	>50 / >50	0.92 (NBR) / >1(NBR)

SIGNAL

NBL	NBT	NBR	EBL	EBT	EBR
147/ 212	-/-	337 / 392	-/-	379 / 637	69 / 145
SBL	SBT	SBR	WBL	WBT	WBR
-/-	-/-	-/-	67 / 204	153 / 280	-/-



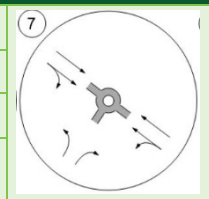
LOS	DELAY (SEC.)[2]	V/C
B / C	19 / 29	0.68 (NBR) / 0.84 (WBL)

CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)

TWO WAY STOP CONTROL	RIGHT-IN, RIGHT-OUT, LEFT-IN	SIGNAL
3 / 3 / 3 (9) ; N/A	2 /2/1(5); ↓ total crashes (5-45%), ↓ crash severity (5%)	3 / 3 / 3 (9) ; ↓ total crashes (5%) ↓ crash severity (21.8%)

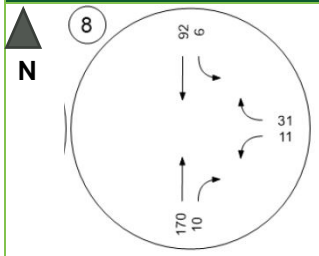
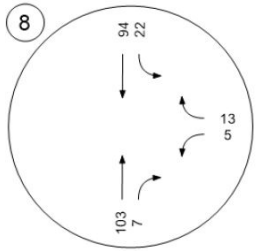
ROUNDABOUT

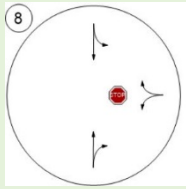
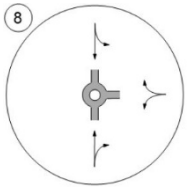
NBL	NBT	NBR	EBL	EBT	EBR
34 / 90	-/-	98 / 211	-/-	94 / 188	123 / 277
SBL	SBT	SBR	WBL	WBT	WBR
-/-	-/--	-/-	47 / 95	60 / 125	-/-



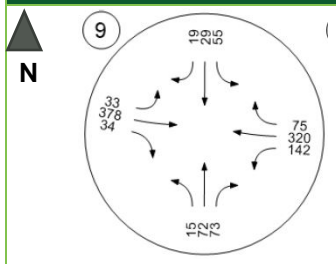
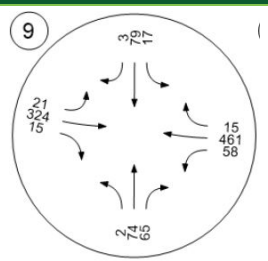
LOS	DELAY (SEC.)	V/C	CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)
B / C	11 / 20	0.64 (EBR) / 0.87 (NBR)	2 / 4 / 2 (8) ; ↓ total crashes (5-12%), ↓ crash severity (68%)

#8 FLYNN LANE & CAMDEN STREET

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)	RECOMMENDATION
		No LEFT-TURN LANE WARRANTED ON MAJOR STREET: No RIGHT-TURN LANE WARRANTED ON MAJOR STREET: No PEDESTRIAN RISK SCORE: 7	**RETAIN TWO WAY STOP CONTROL**

TWO WAY STOP CONTROL							ROUNDABOUT							
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR	
-/-	0 / 0	0 / 0		-/-	-/-	-/-	-/-	12 / 7	12 / 7		-/-	-/-	-/-	
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR	
0 / 1	0 / 1	-/-		4 / 1	-/-	4 / 1	6 / 7	6 / 7	-/-		3 / 1	-/-	3 / 1	
LOS		**DELAY (SEC.)**		**V/C**			**LOS**		**DELAY (SEC.)**		**V/C**			
B / B		10 / 10		0.02 (WBL)/ 0.01 (WBL)			A / A		3 / 3		0.15 (NBTR) / 0.09 (NBTR, SBTL)			
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)														
3 / 3 / 3 (9) ; N/A							3 / 3 / 0 (6) ; ↓ total crashes (44%), ↓ crash severity (78%)							

#9 FLYNN LANE & ENGLAND BOULEVARD

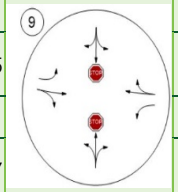
2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)	RECOMMENDATION
		#3	**INTERIM:** TWO WAY STOP CONTROL WITH EASTBOUND AND WESTBOUND LEFT-TURN LANES **ULTIMATE:** ALL WAY STOP CONTROL OR SINGLE-LANE ROUNDABOUT

LEFT-TURN LANE WARRANTED ON MAJOR STREET	RIGHT-TURN LANE WARRANTED ON MAJOR STREET
Yes	No

PEDESTRIAN RISK SCORE
6

INTERIM TWO WAY STOP CONTROL (ACCEPTABLE LIFESPAN OF 14 – 22 YEARS)

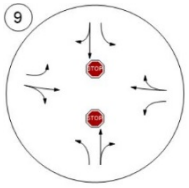
NBL	NBT	NBR		EBL	EBT	EBR
146 / 65	146 / 65	146 / 65		2 / 1	0 / 0	0 / 0
SBL	SBT	SBR		WBL	WBT	WBR
191 / 77	191 / 77	191 / 77		12 / 4	0 / 0	0 / 0



LOS	DELAY (SEC.)	V/C
F / F	>50 / >50	0.94 (SBL)/ 0.16 (SBL)

TWO WAY STOP CONTROL

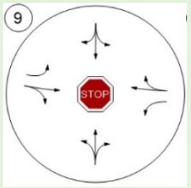
NBL	NBT	NBR		EBL	EBT	EBR
12 / 1	106 / 62	106 / 62		2 / 1	0 / 0	0 / 0
SBL	SBT	SBR		WBL	WBT	WBR
114 / 13	23 / 47	23 / 47		12 / 4	0 / 0	0 / 0



LOS	DELAY (SEC.)	V/C
F / E	>50 / 43	0.95 (SBL) / 0.16 (SBL)

ALL WAY STOP CONTROL

NBL	NBT	NBR		EBL	EBT	EBR
35 / 28	35 / 28	35 / 28		5 / 3	200 / 113	200 / 113
SBL	SBT	SBR		WBL	WBT	WBR
21 / 19	21 / 19	21 / 19		30 / 9	163 / 244	163 / 244



LOS	DELAY (SEC.)[2]	V/C
C / C	22 / 24	0.81 (EBT) / 0.86 (WBT)

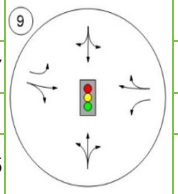
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)
8 / 8 / 16 (32) ; N/A

CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)
8 / 8 / 16 (32) ; N/A

CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)
8/8 / 16 (32) ; ↓ total crashes (68.1%), ↓ crash severity (77%)

SIGNAL

NBL	NBT	NBR		EBL	EBT	EBR
177/157	177/157	177/157		7/4	201/141	201/141
SBL	SBT	SBR		WBL	WBT	WBR
113/105	113/105	113/105		29/10	177/203	177/203

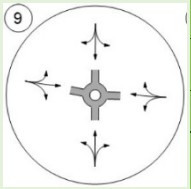


LOS	DELAY (SEC.)	V/C
B / B	14 / 20	0.48 (NBR) /0.46 (NBT)

CONFLICT POINTS ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)	
8 / 8 / 16 (32) ; ↓ total crashes (44%), ↓ crash severity (21.8%)	

ROUNDABOUT

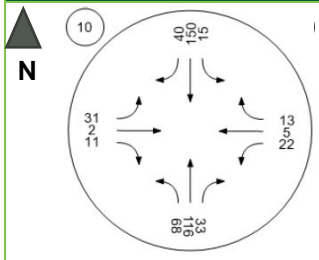
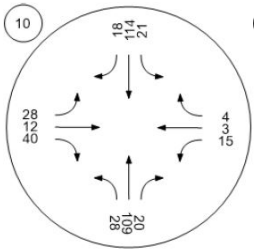
NBL	NBT	NBR		EBL	EBT	EBR
21/15	21/15	21/15		67 / 38	67 / 38	67 / 38
SBL	SBT	SBR		WBL	WBT	WBR
12/12	12/12	12/12		72 / 66	72 / 66	72 / 66



LOS	DELAY (SEC.)	V/C
A / A	8 / 7	0.50 (WBT) / 0.48 (WBT)

CONFLICT POINTS ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)	
4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)	

#10 FLYNN LANE & CHELSEA DRIVE

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)	RECOMMENDATION
		No	**RETAIN TWO WAY STOP CONTROL**

LEFT-TURN LANE WARRANTED ON MAJOR STREET	RIGHT-TURN LANE WARRANTED ON MAJOR STREET
No	No

PEDESTRIAN RISK SCORE
3

TWO WAY STOP CONTROL

NBL	NBT	NBR	EBL	EBT	EBR
4 / 1	4 / 1	4 / 1	8 / 10	8 / 10	8 / 10
SBL	SBT	SBR	WBL	WBT	WBR
0 / 1	0 / 1	0 / 1	6 / 3	6 / 3	6 / 3

LOS	DELAY (SEC.)	V/C
C / B	3 / 3	0.01 (EBT)/ 0.02 (EBT)

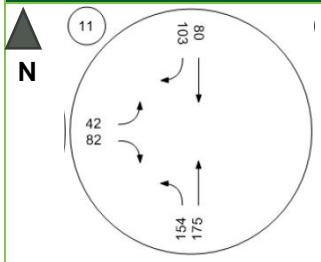
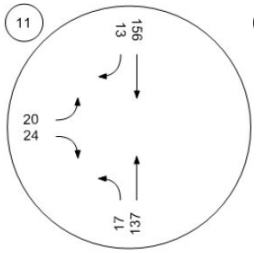
ROUNDABOUT

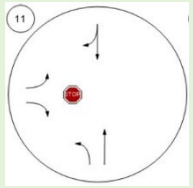
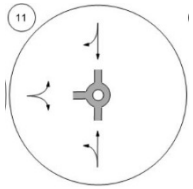
NBL	NBT	NBR	EBL	EBT	EBR
17 / 11	17 / 11	17 / 11	3 / 6	3 / 6	3 / 6
SBL	SBT	SBR	WBL	WBT	WBR
18 / 11	18 / 11	18 / 11	3 / 1	3 / 1	3 / 1

LOS	DELAY (SEC.)	V/C
A / A	4 / 3	0.20 (SBLTR) / 0.14 (NBLTR)

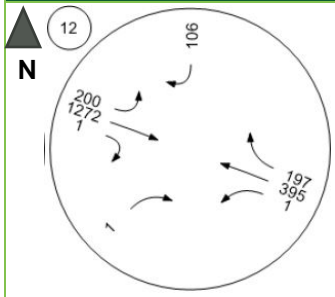
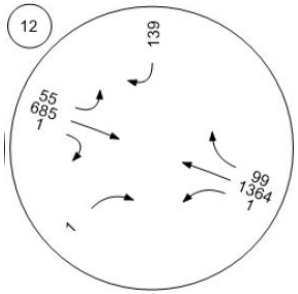
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)
8 / 8 / 16 (32) ; N/A
4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)

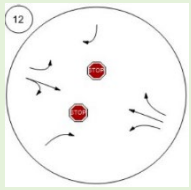
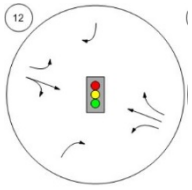
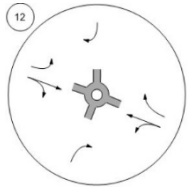
#11 FLYNN LANE & SIREN'S DRIVE

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)		RECOMMENDATION
		No		**RETAIN TWO WAY STOP CONTROL**
		LEFT-TURN LANE WARRANTED ON MAJOR STREET	**RIGHT-TURN LANE WARRANTED ON MAJOR STREET**	
		No	No	
		PEDESTRIAN RISK SCORE		
		4		

TWO WAY STOP CONTROL							ROUNDABOUT							
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR	
10 / 1	0 / 0	- /-		10 / 2	-/-	8 / 2	29 / 11	29 / 11	-/-		9 / 3	-/-	9 / 3	
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR	
-/-	0 / 0	0 / 0		-/-	-/-	-/-	-/-	17 / 12	17 / 12		-/-	-/-	-/-	
LOS		**DELAY (SEC.)**		**V/C**			**LOS**		**DELAY (SEC.)**		**V/C**			
C / B		16 / 11		0.12 (EBL)/ 0.04 (EBL)			A / A		4 / 3		0.20 (NBLT) / 0.14 (SBTR)			
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)														
3 / 3 / 3 (9); N/A							3 / 3 / 0 (6) ; ↓ total crashes (44%), ↓ crash severity (78%)							

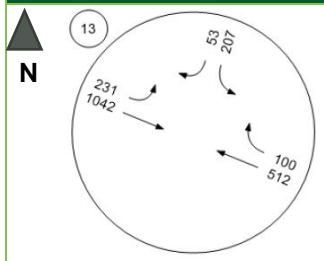
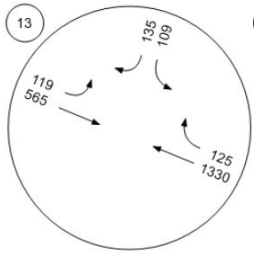
#12 FLYNN LANE & MULLAN ROAD[8]

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)	RECOMMENDATION
		#1, #2, #3 LEFT-TURN LANE WARRANTED ON MAJOR STREET: Yes RIGHT-TURN LANE WARRANTED ON MAJOR STREET: Yes PEDESTRIAN RISK SCORE: 9	**STOP-CONTROLLED RIGHT-IN, RIGHT-OUT, LEFT-IN**

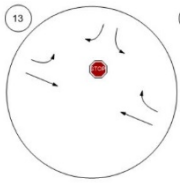
TWO WAY STOP CONTROL (ACCEPTABLE LIFESPAN OF 18-30 YEARS)							SIGNAL							ROUNDABOUT							
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR
-/-	-/-	0/0		22 / 12	0 / 0	0 / 0	-/-	-/-	1 / 1		6 / 4	146 / 18	146 / 18	-/-	-/-	0 / 0		13 / 3	667 / 83	667 / 83
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR
-/-	-/-	16/18 4		0 / 0	0 / 0	0 / 0	-/-	-/-	175 / 219		0 / 0	86 / 1,513	37 / 21	-/-	-/-	11 / 70		48 / 906	17 / 6	17 / 6
LOS		**DELAY (SEC.)**		**V/C**			**LOS**		**DELAY (SEC.)**		**V/C**			**LOS**		**DELAY (SEC.)[2]**		**V/C**		
D / F		25 / >50		0.01 (NBR)/ 0.98 (SBR)			A / D		9 / 46		0.89 (SBR) / >1 (WBT)			D / F		34 / >50		>1 (EBTR) / >1 (WBTL)		
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)																					
4 / 4 / 2 (10) ; ↓ total crashes (5-45%), ↓ crash severity (5%)							4 / 4 / 2 (10) ; ↓ total crashes (5%), ↓ crash severity (21.8%)							4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)							

[8] With the extension of Mary Jane Boulevard to Mullan Road, the Flynn Lane and Mullan Road intersection is expected to be restricted to a right-in / right-out / left-in configuration to improve safety performance at the intersection.

#13 MARY JANE BOULEVARD & MULLAN ROAD

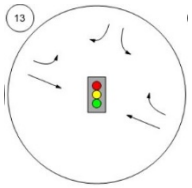
2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)	RECOMMENDATION
		#1, #2, #3 **LEFT-TURN LANE WARRANTED ON MAJOR STREET**: Yes **RIGHT-TURN LANE WARRANTED ON MAJOR STREET**: Yes **PEDESTRIAN RISK SCORE**: 13	**INTERIM: SINGLE-LANE ROUNDABOUT WITH EASTBOUND LEFT-TURN LANE AND WESTBOUND RIGHT-TURN LANE** **ULTIMATE: MULTI-LANE ROUNDABOUT WITH TWO EASTBOUND AND WESTBOUND THROUGH LANES**

TWO WAY STOP CONTROL

NBL	NBT	NBR		EBL	EBT	EBR
-/-	-/-	-/-		27 / 32	0 / 0	-/-
SBL	SBT	SBR		WBL	WBT	WBR
671 / 356	-/-	9 / 164		-/-	0 / 0	0 / 0

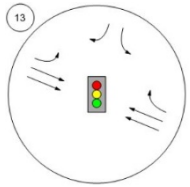
LOS	DELAY (SEC.)	V/C
F / F	>50 / >50	>1 (SBL)/ >1(SBL)

INTERIM SIGNAL

NBL	NBT	NBR		EBL	EBT	EBR
-/-	-/-	-/-		671 / 130	56 / 13	-/-
SBL	SBT	SBR		WBL	WBT	WBR
779 / 384	-/-	0 / 0		-/-	58 / 624	8 / 10

LOS	DELAY (SEC.)	V/C
F / D	>80 / 43	0.76 (SBL) / 0.93 (SBL)

ULTIMATE SIGNAL

NBL	NBT	NBR		EBL	EBT	EBR
-/ -	-/-	-/-		78 / 35	204 / 67	-/-
SBL	SBT	SBR		WBL	WBT	WBR
293 / 158	-/-	70 / 210		-/-	140 / 355	50 / 49

LOS	DELAY (SEC.)[2]	V/C
B / B	13 / 14	0.5 (SBL) / 0.6 (SBR)

CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)

TWO WAY STOP CONTROL	INTERIM SIGNAL	ULTIMATE SIGNAL
3 / 3 / 3 (9) ; N/A	3 / 3 / 3 (9) ; ↓ total crashes (5%), ↓ crash severity (21.8%)	3 / 3 / 3 (9) ; ↓ total crashes (5%), ↓ crash severity (21.8%)

INTERIM ROUNDABOUT (ACCEPTABLE LIFESPAN OF 18-23 YEARS)

NBL	NBT	NBR		EBL	EBT	EBR
-/-	-/--	-/-		21 / 8	618 / 70	-/-
SBL	SBT	SBR		WBL	WBT	WBR
29 / 34	-/-	5 / 47		-/-	80 / 998	8 / 9

LOS	DELAY (SEC.)	V/C
D / F	34 / 60	>1 (EBT) / >1(WBT)

CONFLICT POINTS ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)	4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)

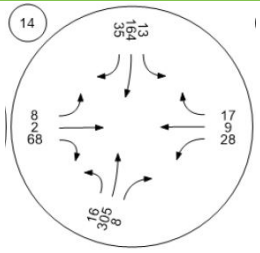
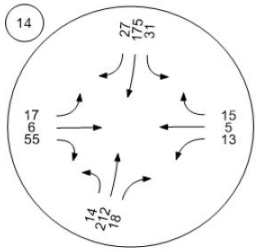
ULTIMATE ROUNDABOUT

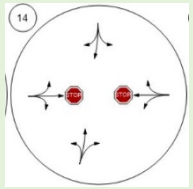
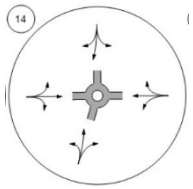
NBL	NBT	NBR		EBL	EBT	EBR
-/-	-/-	-/-		95 / 28	123 / 33	-/-
SBL	SBT	SBR		WBL	WBT	WBR
30 / 39	-/-	6 / 44		-/-	30 / 114	36 / 153

LOS	DELAY (SEC.)	V/C
A / B	9 / 10	0.64 (EBT) / 0.7 (WBR)

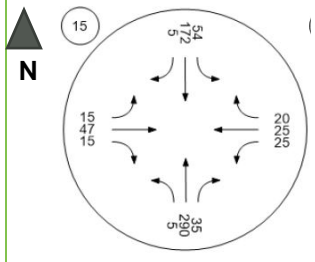
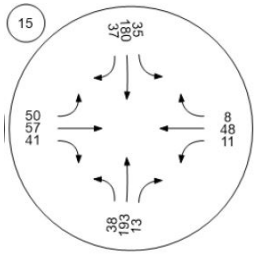
CONFLICT POINTS ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)	2 / 4 / 3 (9) ; ↓ total crashes (5-12%), ↓ crash severity (68%)

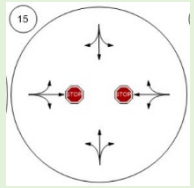
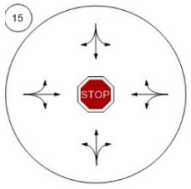
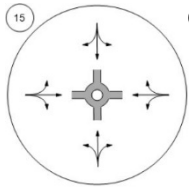
#14 MARY JANE BOULEVARD & O'LEARY STREET

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)		RECOMMENDATION
N 		No		TWO WAY STOP CONTROL
		LEFT-TURN LANE WARRANTED ON MAJOR STREET	RIGHT-TURN LANE WARRANTED ON MAJOR STREET	
		No	No	
		PEDESTRIAN RISK SCORE		
		5		

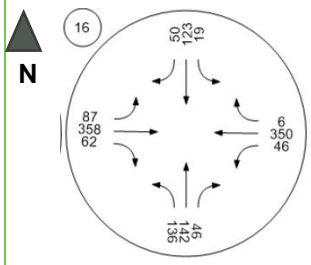
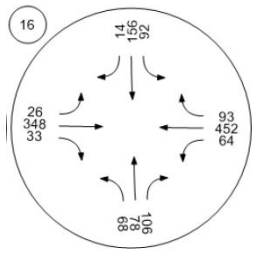
TWO WAY STOP CONTROL							ROUNDABOUT							
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR
0 / 0	0 / 0	0 / 0		9 / 11	9 / 11	9 / 11	28 / 19	28 / 19	28 / 19		6 / 6	6 / 6	6 / 6
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR
0 / 1	0 / 1	0 / 1		11 / 5	11 / 5	11 / 5	16 / 17	16 / 17	16 / 17		4 / 2	4 / 2	4 / 2
LOS		DELAY (SEC.)		V/C			LOS		DELAY (SEC.)		V/C			
C / B		16 / 15		0.09 (WBL)/ 0.04 (WBL)			A / A		4 / 4		0.27 (NBLTR) / 0.14 (NBLTR)			
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)														
8 / 8 / 16 (32) ; N/A							4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)							

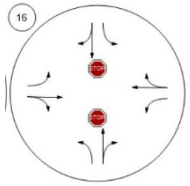
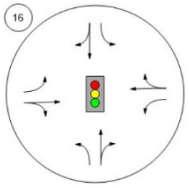
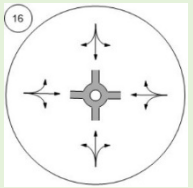
#15 MARY JANE BOULEVARD & MELROSE PLACE

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)		RECOMMENDATION
		No		**TWO WAY STOP CONTROL**
		LEFT-TURN LANE WARRANTED ON MAJOR STREET	**RIGHT-TURN LANE WARRANTED ON MAJOR STREET**	
		No	No	
		PEDESTRIAN RISK SCORE		
		5		

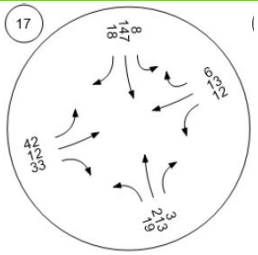
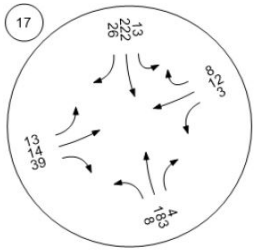
TWO WAY STOP CONTROL							ALL WAY STOP CONTROL							ROUNDABOUT						
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR
0 / 2	0 / 2	0 / 2		19 / 42	19 / 42	19 / 42	61 / 41	61 / 41	61 / 41		10 / 23	10 / 23	10 / 23	32 / 22	32 / 22	32 / 22		6 / 13	6 / 13	6 / 13
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR
3 / 2	3 / 2	3 / 2		17 / 16	17 / 16	17 / 16	37 / 43	37 / 43	37 / 43		9 / 9	9 / 9	9 / 9	18 / 21	18 / 21	18 / 21		6 / 5	6 / 5	6 / 5
LOS		**DELAY (SEC.)**		**V/C**			**LOS**		**DELAY (SEC.)**		**V/C**			**LOS**		**DELAY (SEC.)[2]**		**V/C**		
C / C		19 / 20		0.09 (WBL)/ 0.16 (EBL)			B / B		10 / 10		0.46 (NBT) / 0.37 (NBT)			A / A		5 / 4		0.3 (NBLTR) / 0.23 (NBLTR, SBLTR)		
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)																				
8 / 8 / 16 (32) ; N/A							8 / 8 / 16 (32) ; ↓ total crashes (68.1%), ↓ crash severity (77%)							4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)						

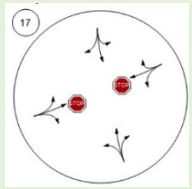
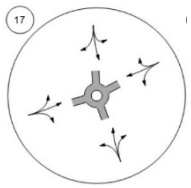
#16 MARY JANE BOULEVARD & ENGLAND BOULEVARD

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)		RECOMMENDATION
		#3		**SINGLE-LANE ROUNDABOUT**
		LEFT-TURN LANE WARRANTED ON MAJOR STREET	**RIGHT-TURN LANE WARRANTED ON MAJOR STREET**	
		Yes	No	
		PEDESTRIAN RISK SCORE		
		6		

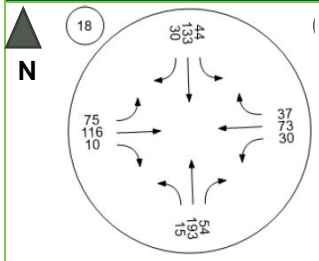
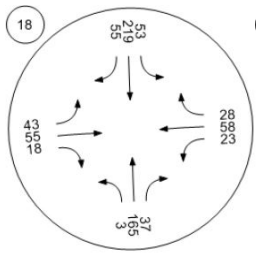
TWO WAY STOP CONTROL						SIGNAL						ROUNDABOUT					
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR
385 / 232	189 / 111	189 / 111		6 / 2	0 / 0	0 / 0	146 / 69	167 / 167	167 / 167		54 / 17	214 / 182	214 / 182	59 / 38	59 / 38	59 / 38		79 / 9	79 / 9	79 / 9
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR
44 / 201	159 / 199	159 / 199		3 / 4	0 / 0	0 / 0	18 / 99	152 / 151	152 / 151		30 / 37	172 / 280	172 / 280	29 / 10	29 / 10	29 / 10		70 / 10	70 / 10	70 / 10
LOS		**DELAY (SEC.)**	**V/C**				**LOS**		**DELAY (SEC.)**	**V/C**				**LOS**		**DELAY (SEC.)[2]**		**V/C**		
F / F		>50 / >50	>1 (NBL)/ >1(NBL)				B / B		18 / 18	0.4 (NBL) / 0.5 (SBL)				B / B		10 / 10		0.53 (EBLTR) / 0.59 (WBLTR)		
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)																				
8 / 8 / 16 (32) ; N/A							8 / 8 / 16 (32) ; ↓ total crashes (44%), ↓ crash severity (21.8%)							4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)						

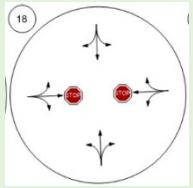
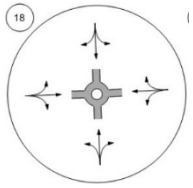
#17 MARY JANE BOULEVARD & CAMDEN STREET

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)		RECOMMENDATION
N 		No		TWO WAY STOP CONTROL
		LEFT-TURN LANE WARRANTED ON MAJOR STREET	RIGHT-TURN LANE WARRANTED ON MAJOR STREET	
		No	No	
		PEDESTRIAN RISK SCORE		
		5		

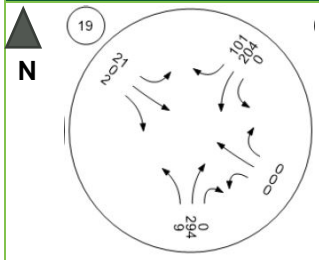
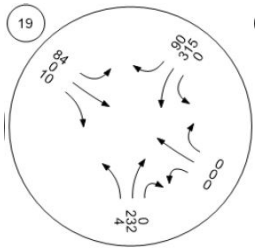
TWO WAY STOP CONTROL							ROUNDABOUT							
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR
1 / 0	1 / 0	1 / 0		14 / 9	14 / 9	14 / 9	19 / 14	19 / 14	19 / 14		6 / 5	6 / 5	6 / 5
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR
0 / 0	0 / 0	0 / 0		5 / 3	5 / 3	5 / 3	12 / 20	12 / 20	12 / 20		2 / 1	2 / 1	2 / 1
LOS			DELAY (SEC.)	V/C			LOS			DELAY (SEC.)	V/C			
B / B			13 / 13	0.10 (EBL) / 0.01 (WBL)			A / A			4 / 4	0.20 (NBLTR) / 0.21 (SBLTR)			
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)														
8 / 8 / 16 (32) ; N/A							4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)							

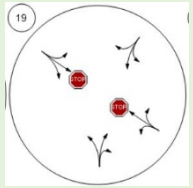
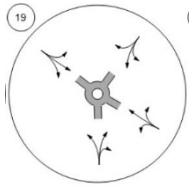
#18 MARY JANE BOULEVARD & FLYNN LANE

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)		RECOMMENDATION
		No		**TWO WAY STOP CONTROL**
		LEFT-TURN LANE WARRANTED ON MAJOR STREET	**RIGHT-TURN LANE WARRANTED ON MAJOR STREET**	
		No	No	
		PEDESTRIAN RISK SCORE		
		6		

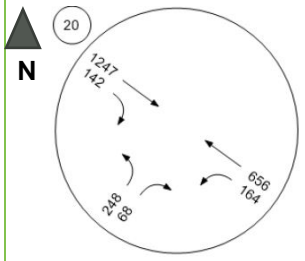
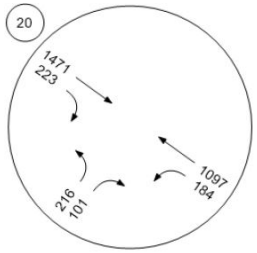
TWO WAY STOP CONTROL							ROUNDABOUT							
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR	
0 / 0	0 / 0	0 / 0		84 / 35	84 / 35	84 / 35	28 / 18	28 / 18	28 / 18		19 / 11	19 / 11	19 / 11	
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR	
2 / 3	2 / 3	2 / 3		38 / 27	38 / 27	38 / 27	17 / 30	17 / 30	17 / 30		13 / 9	13 / 9	13 / 9	
LOS		**DELAY (SEC.)**		**V/C**			**LOS**		**DELAY (SEC.)**		**V/C**			
D / C		27 / 20		0.25 (EBL)/ 0.15 (EBL)			A / A		5 / 5		0.28 (NBLTR) / 0.29 (SBLTR)			
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)														
8 / 8 / 16 (32) ; N/A							4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)							

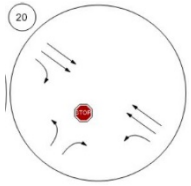
#19 MARY JANE BOULEVARD & VETERAN'S WAY

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)		RECOMMENDATION
		No		TWO WAY STOP CONTROL
		LEFT-TURN LANE WARRANTED ON MAJOR STREET	RIGHT-TURN LANE WARRANTED ON MAJOR STREET	
		No	No	
		PEDESTRIAN RISK SCORE		
		5		

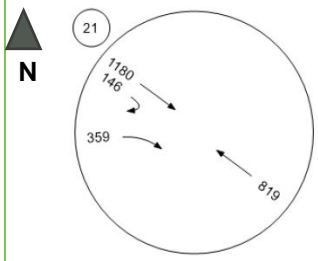
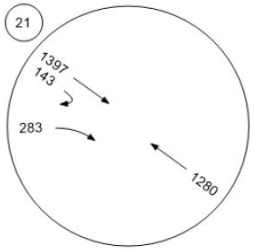
TWO WAY STOP CONTROL							ROUNDABOUT							
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR	
0 / 0	0 / 0	0 / 0		5 / 27	5 / 27	5 / 27	25 / 20	25 / 20	25 / 20		2 / 10	2 / 10	2 / 10	
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR	
0 / 0	0 / 0	0 / 0		0 / 0	0 / 0	0 / 0	24 / 37	24 / 37	24 / 37		0 / 0	0 / 0	0 / 0	
LOS			DELAY (SEC.)	V/C			LOS			DELAY (SEC.)	V/C			
C / C			15 / 18	0.06 (EBL)/ 0.26 (EBL)			A / A			4 / 5	0.25 (NBLTR, SBLTR) / 0.33 (SBLTR)			
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)														
8 / 8 / 16 (32) ; N/A							4 / 4 / 0 (8) ; ↓ total crashes (44%), ↓ crash severity (78%)							

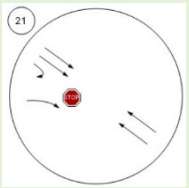
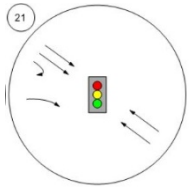
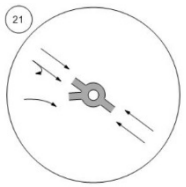
#20 MARY JANE BOULEVARD & WEST BROADWAY STREET

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)		RECOMMENDATION
		#1, #2, #3		**MULTI-LANE ROUNDABOUT**
		LEFT-TURN LANE WARRANTED ON MAJOR STREET	**RIGHT-TURN LANE WARRANTED ON MAJOR STREET**	
		Yes	Yes	
		PEDESTRIAN RISK SCORE		
		13		

TWO WAY STOP CONTROL						SIGNAL						ROUNDABOUT					
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR
586 / 622	-/-	17 / 36		-/-	0 / 0	0 / 0	335 / 300	-/-	86 /137		-/-	405 / 497	71 / 116	163 / 161	-/-	16 / 33		-/-	120 / 186	161 / 275
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR
-/-	-/-	-/-		49 / 97	0 / 0	-/-	-/-	-/-	-/-		72 / 84	122 / 207	-/-	-/-	-/-	-/-		54 / 99	69 / 131	-/-
LOS		**DELAY (SEC.)**	**V/C**				**LOS**		**DELAY (SEC.)**	**V/C**				**LOS**		**DELAY (SEC.)[2]**	**V/C**			
F / F		>50 / >50	>1 (NBL)/ >1(NBL)				B / B		18 / 18	0.71 (NBL) / 0.75 (SBL)				C / C		15 / 18	0.79 (NBL) / 0.85 (EBTR)			
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)																				
3 / 3 / 3 (9) ; N/A							3 / 3 / 3 (9) ; ↓ total crashes (5%), ↓ crash severity (21.8%)							2 / 4 / 3 (9) ; ↓ total crashes (5-12%), ↓ crash severity (68%)						

#21 FLYNN LANE & WEST BROADWAY STREET[9]

2050 TRAFFIC VOLUMES (WEEKDAY AM PEAK HOUR)	2050 TRAFFIC VOLUMES (WEEKDAY PM PEAK HOUR)	SIGNAL WARRANTED (MUTCD)	RECOMMENDATION
		#1, #2, #3	**UNSIGNALIZED RIGHT-IN, RIGHT-OUT**
		LEFT-TURN LANE WARRANTED ON MAJOR STREET: Yes; **RIGHT-TURN LANE WARRANTED ON MAJOR STREET**: Yes	
		PEDESTRIAN RISK SCORE: 13	

TWO WAY STOP CONTROL							SIGNAL							ROUNDABOUT							
NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR	NBL	NBT	NBR		EBL	EBT	EBR
-/-	-/-	262 / 212		-/-	0/0	0/0	-/-	-/-	187 / 154		-/-	157 / 162	25 / 19	-/-	-/-	237 / 43		-/-	76 / 92	97 / 122
SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR	SBL	SBT	SBR		WBL	WBT	WBR
-/-	-/-	-/-		-/-	0/0	-/-	-/-	-/-	-/-		-/-	72 / 135	-/-	-/-	-/-	-/-		37 / 64	45 / 81	-/-
LOS		**DELAY (SEC.)**		**V/C**			**LOS**		**DELAY (SEC.)**		**V/C**			**LOS**		**DELAY (SEC.)[2]**		**V/C**		
F / F		>50 / >50		0.94 (NBR)/ 0.88 (NBR)			B / B		11 / 11		0.75 (NBT) / 0.84 (SBT)			B / B		14 / 11		0.89 (NBT) / 0.81 (NBT)		
CONFLICT POINTS [DIVERGING/MERGING/CROSSING (TOTAL)] ; TOTAL CRASHES (CRF), CRASH SEVERITY (CRF)																				
1 / 1 / 0 (2) ; ↓ total crashes (45%), crash severity (N/A)							1 / 1 / 0 (2) ; ↓ total crashes (5%), ↓ crash severity (21.8%)							1 / 1 / 0 (2) ; ↓ total crashes (5-12%), ↓ crash severity (68%)						

[9] With the extension of Mary Jane Boulevard to W Broadway Street, the Flynn Lane and W Broadway Street intersection is expected to be restricted to a right-in / right-out configuration to improve safety performance at the intersection.

RECOMMENDATIONS

Kittelson identified the following recommendations based on year 2050 traffic conditions and evaluation results including in this memorandum. Table 6 delineates the recommended roadway cross-sections. Table 7 summarizes the recommended intersection controls. Figure 10 displays these recommendations on a project area map.

Table 6 Roadway Cross-Section Recommendations

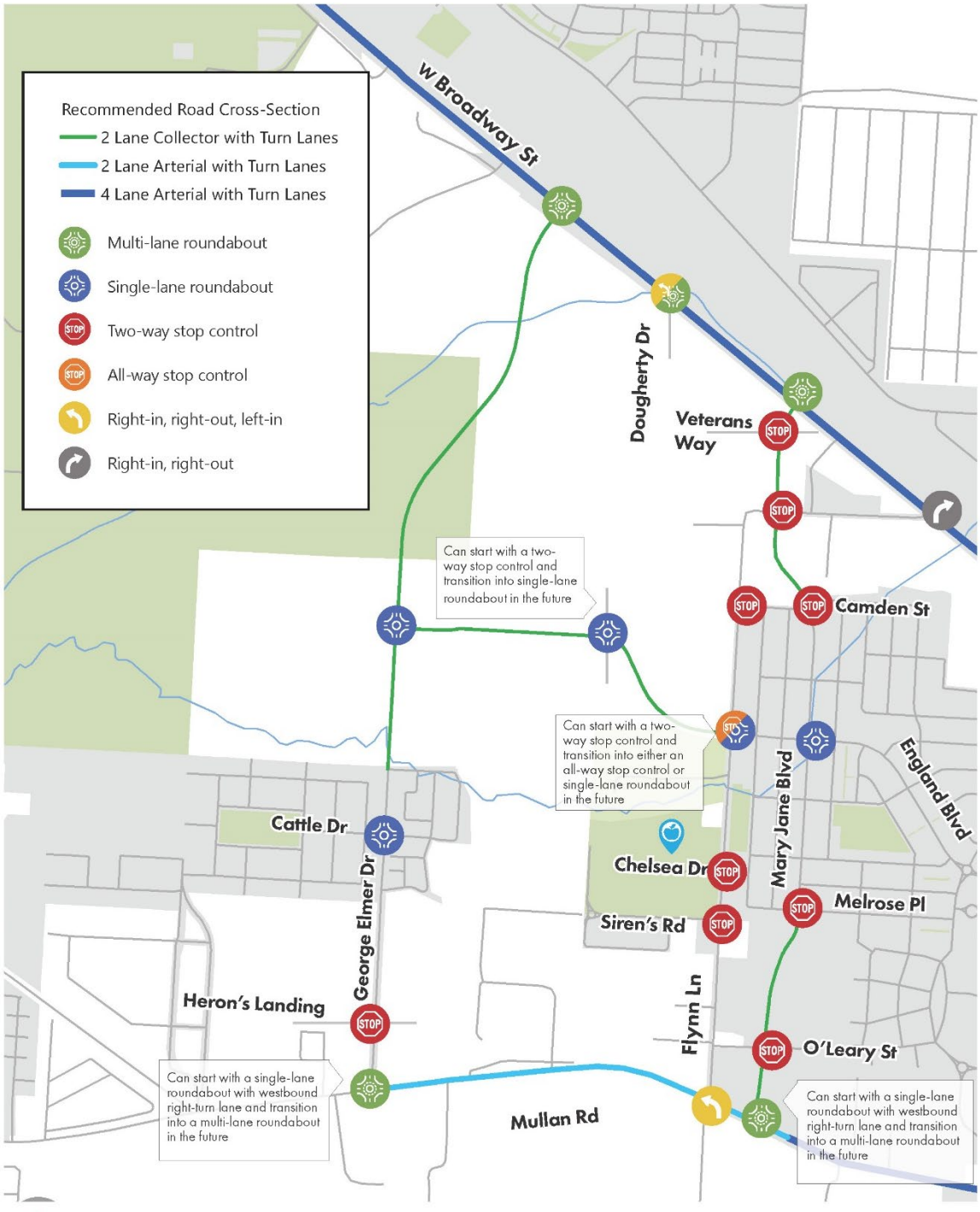
ROADWAY	EXTENTS	FUNCTIONAL CLASSIFICATION & CROSS-SECTION	POSTED SPEED (MPH)
George Elmer Drive	West Broadway Street to England Boulevard	Two Lane Collector with Turn Lanes	30
	England Boulevard to Pius Way	Two Lane Collector with Turn Lanes	30
England Boulevard	George Elmer Drive to Flynn Lane	Two Lane Collector with Turn Lanes	30
Flynn Ln	W Broadway Street to Mullan Rd	Two Lane Local	25
Mary Jane Boulevard	West Broadway Street to Camden Street	Two Lane Collector with Turn Lanes	30
	Melrose Place to Mullan Road	Two Lane Collector with Turn Lanes	30
Mullan Road	George Elmer Drive to Mary Jane Boulevard	Two Lane Arterial with Turn Lanes	45
	Mary Jane Boulevard to Reserve Street	Four Lane Arterial with Turn Lanes	45
West Broadway Street	Aviation Drive to Flynn Lane	Four Lane Arterial with Turn Lanes	55

Table 7 Intersection Control Recommendations

INTERSECTION NUMBER	INTERSECTION	CONTROL RECOMMENDATION
1	George Elmer Drive / W Broadway Street	Multi-lane roundabout
2	George Elmer Drive / England Boulevard	Single-lane roundabout
3	George Elmer Drive / Cattle Drive	Single-lane roundabout
4	George Elmer Drive / Heron's Landing	TWSC[10] with NB & SB left-turn lanes
5	George Elmer Drive / Mullan Rd	Interim: Single-lane roundabout with EB left-turn & WB right-turn lanes *(Lifespan = 15 – 21 years)* Ultimate: Multi-lane Roundabout with two EB and WB through lanes
6	England Boulevard / Dougherty Drive	Interim: TWSC *(Lifespan = 26 – 30 years)* Ultimate: Single-lane roundabout
7	W Broadway Street / Dougherty Drive	Multi-lane roundabout
8	Flynn Ln / Camden Street	Retain TWSC
9	Flynn Ln / England Boulevard	Interim: TWSC *(Lifespan = 14 – 22 years)* Ultimate: AWSC[11] or Single-lane roundabout
10	Flynn Ln / Chelsea Drive	Retain TWSC
11	Flynn Ln / Siren Drive	Retain TWSC
12	Flynn Ln / Mullan Rd	Stop-controlled right-In, right-out, left-In *(Lifespan = 18 – 30 years)*
13	Mary Jane Boulevard / Mullan Rd	Interim: Single-lane roundabout with EB left-turn & WB right-turn lanes *(Lifespan = 18 – 23 years)* Ultimate: Multi-lane roundabout with two EB and WB through lanes
14	Mary Jane Boulevard / O'Leary Street	TWSC
15	Mary Jane Boulevard / Melrose Pl	TWSC
16	Mary Jane Boulevard / England Boulevard	Single-lane roundabout
17	Mary Jane Boulevard / Camden Street	TWSC
18	Mary Jane Boulevard / Flynn Ln	TWSC
19	Mary Jane Boulevard / Veteran's Way	TWSC
20	Mary Jane Boulevard / W Broadway Street	Multi-lane roundabout
21	W Broadway Street / Flynn Ln	Unsignalized right-In, right-out

[10] Two Way Stop Control
[11] All Way Stop Control

Figure 10 Intersection Control & Roadway Cross-Section Recommendations (2050)



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APPENDICES

A. Travel Demand Model Volumes (2050)

B. 2050 Turning Movement Counts

C. 2050 Operational Analysis AM and PM

D. Roadway Level of Service

E. Pedestrian Intersection Risk Analysis

A. Travel Demand Model Volumes (2050)

B. 2050 Turning Movement Counts

C. 2050 Operational Analysis AM and PM

D. Roadway Level of Service

E. Pedestrian Intersection Risk Analysis