



CITY OF KNOXVILLE
INDYA KINCANNON, MAYOR

Magnolia Avenue/ Rutledge Pike/ Asheville Highway Interchange Study

TDOT Project Update
Tuesday September 8, 2020

By:



Gresham Smith

Today's Agenda

Introduction

Design Concepts

LOS Analysis

Predictive Crash Analysis

Cost

Life Cycle Cost

Interim Improvements

Next Steps

Introduction

Multiple studies since 2009 by:

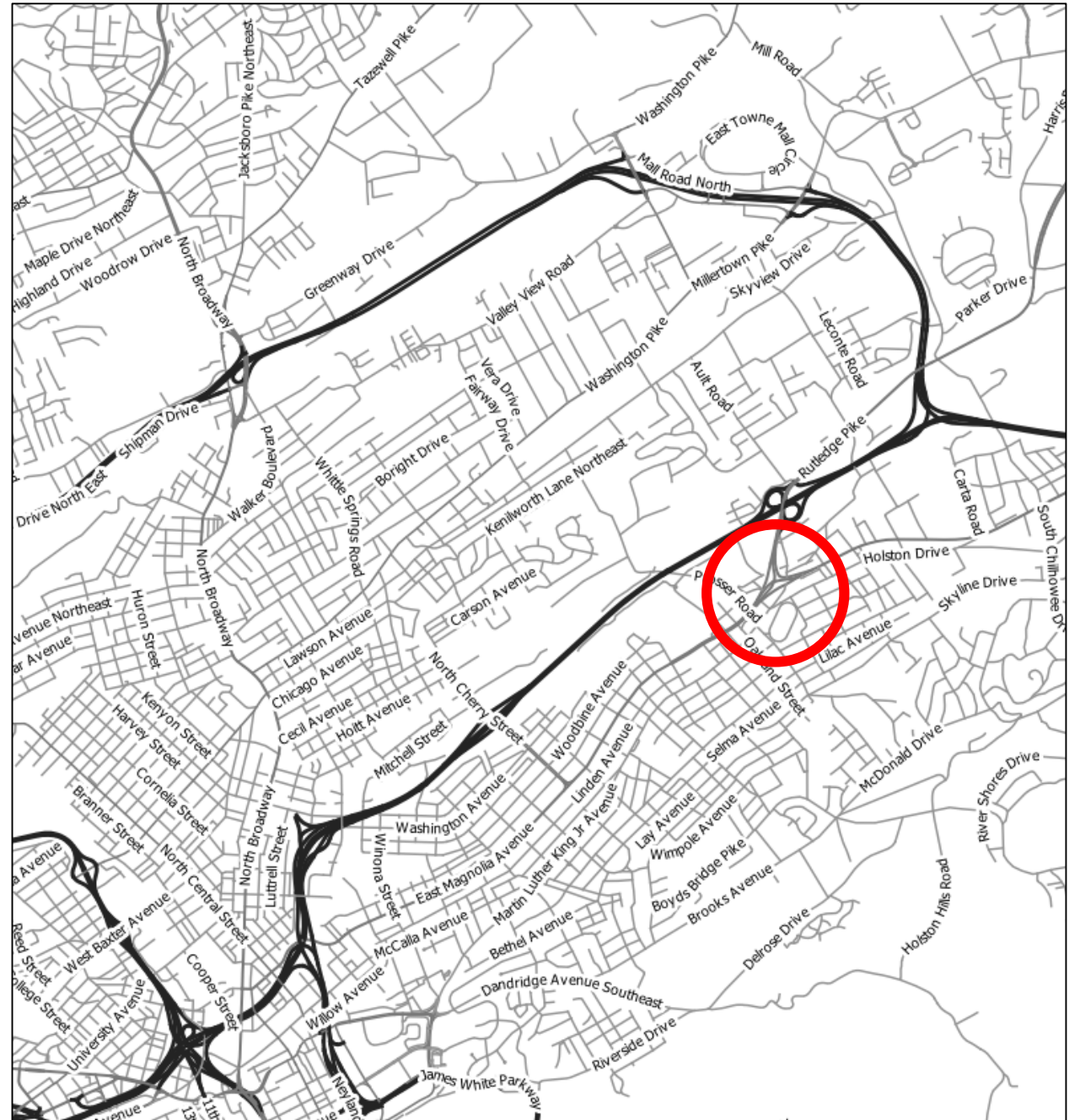
- Knoxville TPO,
- City of Knoxville,
- Private developers

All promote an intersection that compliments an urban, walkable neighborhood

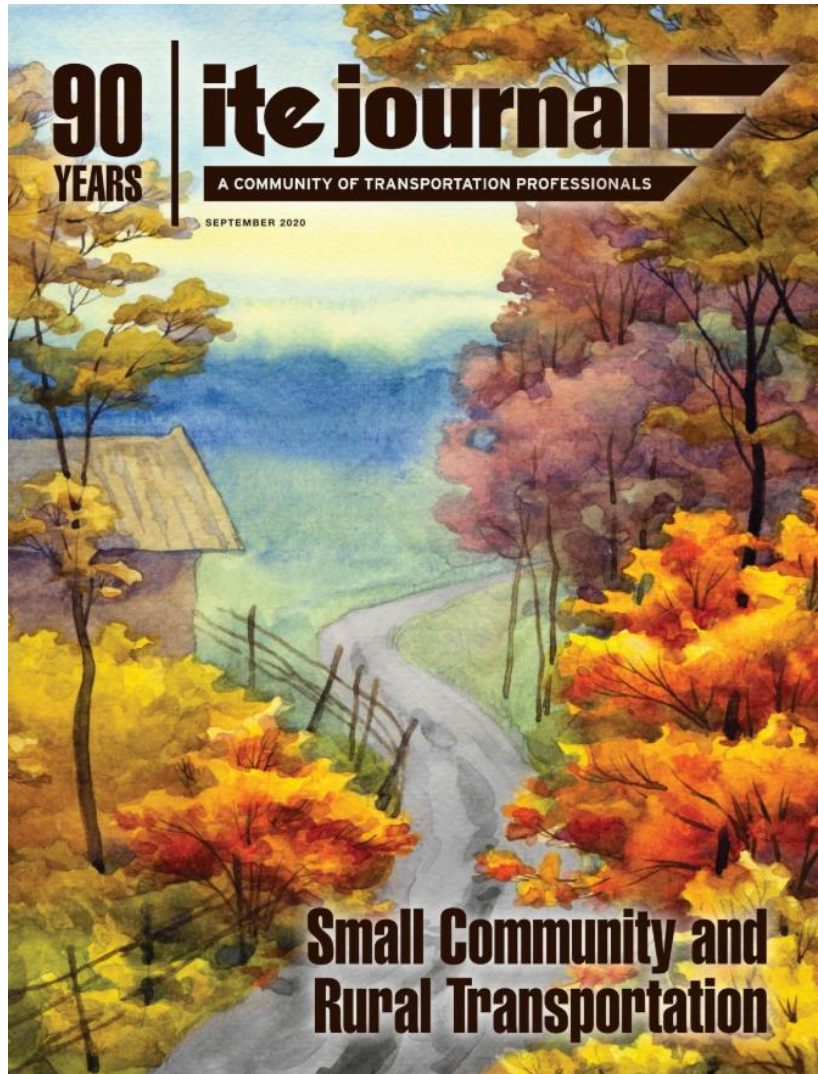
The existing interchange is out of context with its surroundings

It bisects the Burlington Neighborhood

It makes southbound-eastbound movement challenging



Magnolia Avenue Improvements



KNOXVILLE, TN, USA

Magnolia Avenue Streetscapes

Across several **Knoxville, TN, USA** mayoral administrations, revitalization efforts were established for East Knoxville's Magnolia Avenue Corridor. Public engagement was initiated in 2009 and rebooted again, resulting in the city making a \$7 million public investment for streetscape improvements on a model block section in hopes to trigger reinvestment and improve the quality of life for area residents.



Magnolia Avenue, state highway (US 11W) is situated in a predominately African American community east of the city's downtown core. The area is an important gateway linking downtown Knoxville to several adjacent and (most importantly) engaged citizens in the Parkridge, Chilhowee, and Burlington communities.

Presently a complete street, Magnolia Avenue accommodates all transportation users: pedestrians, bicyclists, motorists, and transit riders. However, these new improvements (landscaped center medians, stamped crosswalks, traffic and pedestrian signal upgrades, street trees, wider sidewalks, buffered bike lanes, benches, and bus shelters) now provide a safer and more accessible street network for both neighborhood residents and visitors to the area.

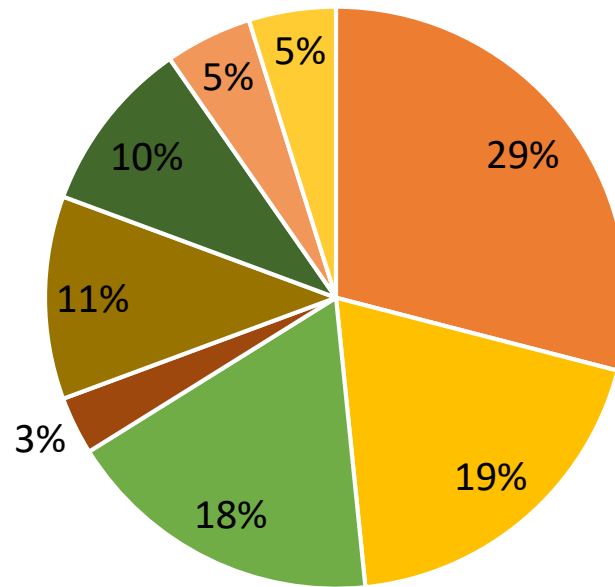


Introduction



Introduction - Public Meeting 10/30/19

Public Comment Topics

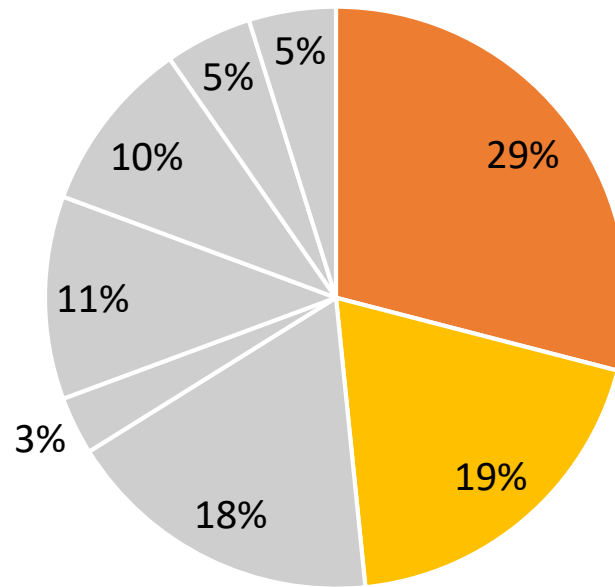


■ Traffic Control ■ Connectivity ■ Bike/ Ped ■ Transit ■ Safety ■ Comm. Input ■ Enhancements ■ ROW Use



Introduction – Public Meeting 10/30/19

Public Comment Topics



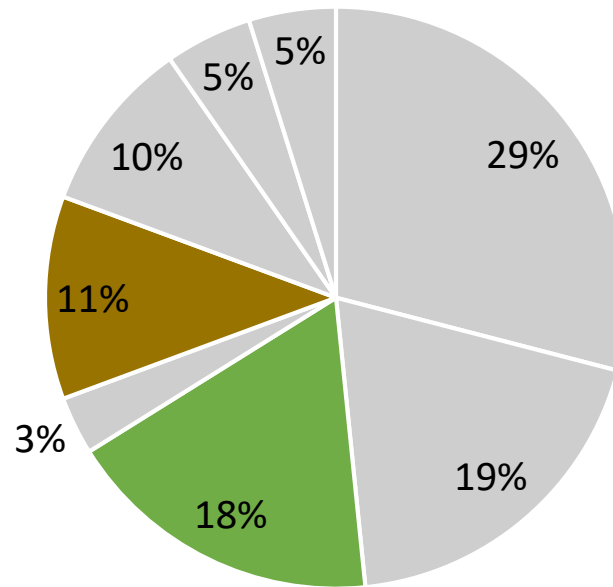
48% of Responses were related to Traffic Control or Connectivity

■ Traffic Control ■ Connectivity ■ Bike/ Ped ■ Transit ■ Safety ■ Comm. Input ■ Enhancements ■ ROW Use



Introduction – Public Meeting 10/30/19

Public Comment Topics



29% of Responses were related to Safety / Multimodal

- Traffic Control
- Connectivity
- Bike/ Ped
- Transit
- Safety
- Comm. Input
- Enhancements
- ROW Use



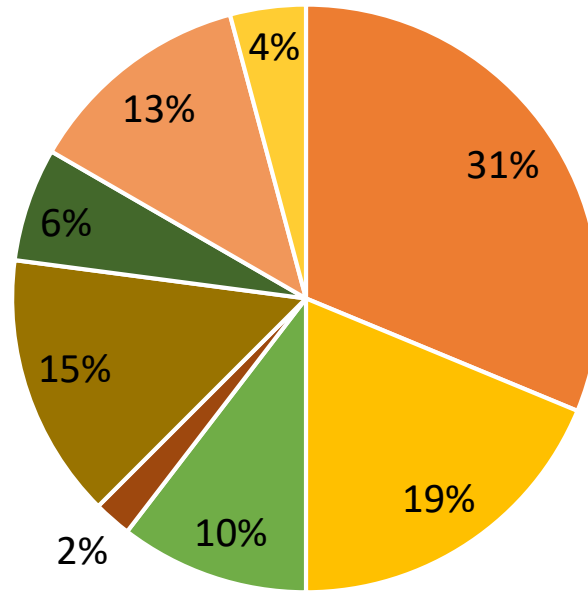
Introduction – Stakeholder Input

Group	Agencies Represented	Location, Date and Time
City of Knoxville Alternative Transportation and TDOT	TDOT Strategic Transportation Investments Division, TDOT Region 1 Traffic, Knox County Schools, Knoxville Area Transit, Knoxville Area TPO	City County Building, 1/29/20, 11:00 AM
Elected Officials	Knoxville City Council, Knox County School Board	City County Building, 1/29/20, 2:30 PM
Neighborhood Associations	Neighborhood Associations	Perk City, 1/29/20, 5:30 PM
City Staff	Knoxville Fire Department, Police Department, Parks and Recreation, Community Development, Traffic Engineering, Housing and Neighborhood Development	City County Building, 2/3/20, 2:00 PM
Architects	East Tennessee Community Design Center	Perk City, 2/4/20, 9:00 AM
Business Representatives	Tennessee Valley Fair, Chilhowee Park (ASM Knoxville), Muse Knoxville, Knoxville Golden Gloves, Zoo Knoxville, Burlington Neighborhood Association, Knoxville ADA Coordinator	Perk City, 2/11/20, 1:30 PM



Introduction - Stakeholder Input

Stakeholder Meetings Comment Topics

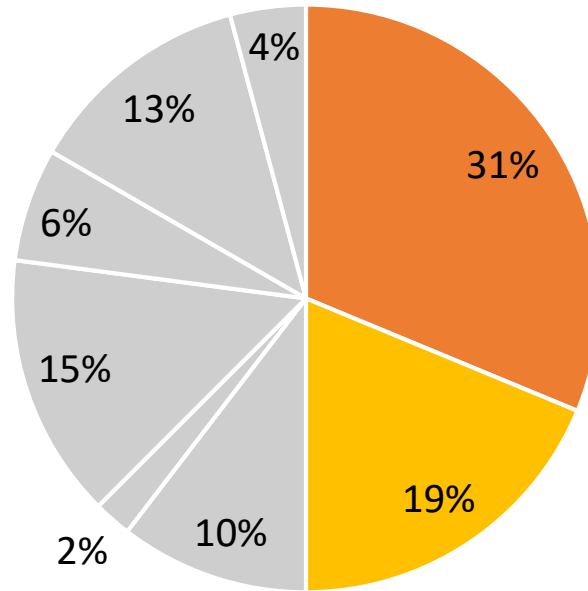


■ Traffic Control ■ Connectivity ■ Bike/ Ped ■ Transit ■ Safety ■ Comm. Input ■ Enhancements ■ ROW Use



Introduction – Stakeholder Input

Stakeholder Meetings Comment Topics



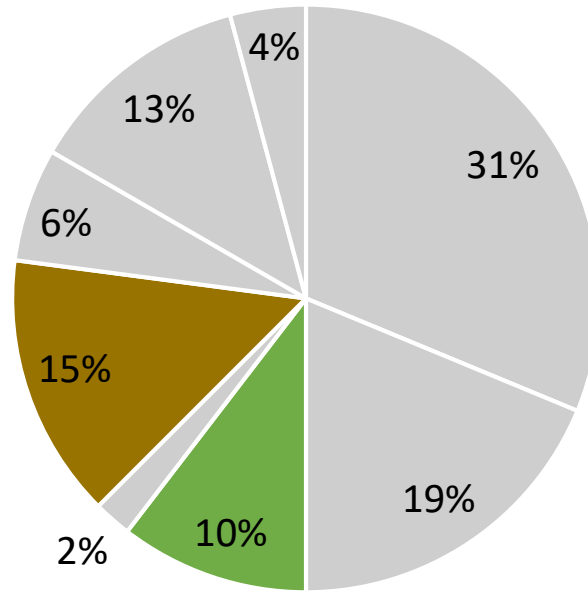
50% of Responses were related to Traffic Control or Connectivity

■ Traffic Control ■ Connectivity ■ Bike/ Ped ■ Transit ■ Safety ■ Comm. Input ■ Enhancements ■ ROW Use



Introduction - Stakeholder Input

Stakeholder Meetings Comment Topics



25% of Responses were related to Safety / Multimodal

■ Traffic Control ■ Connectivity ■ Bike/ Ped ■ Transit ■ Safety ■ Comm. Input ■ Enhancements ■ ROW Use



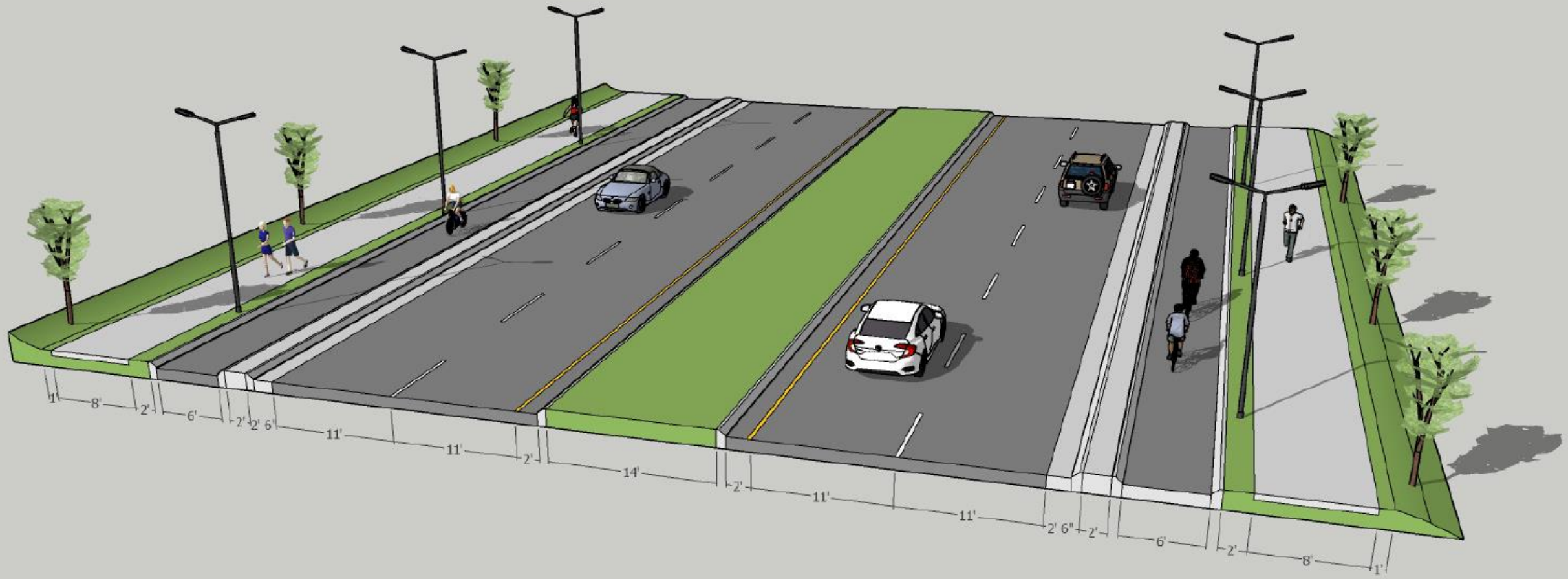
Design Concepts

Two Options Under Consideration

- Signalized “Protected” Intersection
- Multilane Roundabout



Design Concepts - Typical Section



Improvements with Two Concepts

Signalized Intersection and Multilane Roundabout



Improved Connection between Rutledge Pike and Asheville Highway



Community-Desired Connection to Burlington Commercial District



Improved Access Management



Protected Bike Lanes



Improved Sidewalks



Design Concepts - Protected Intersection

Relatively new design

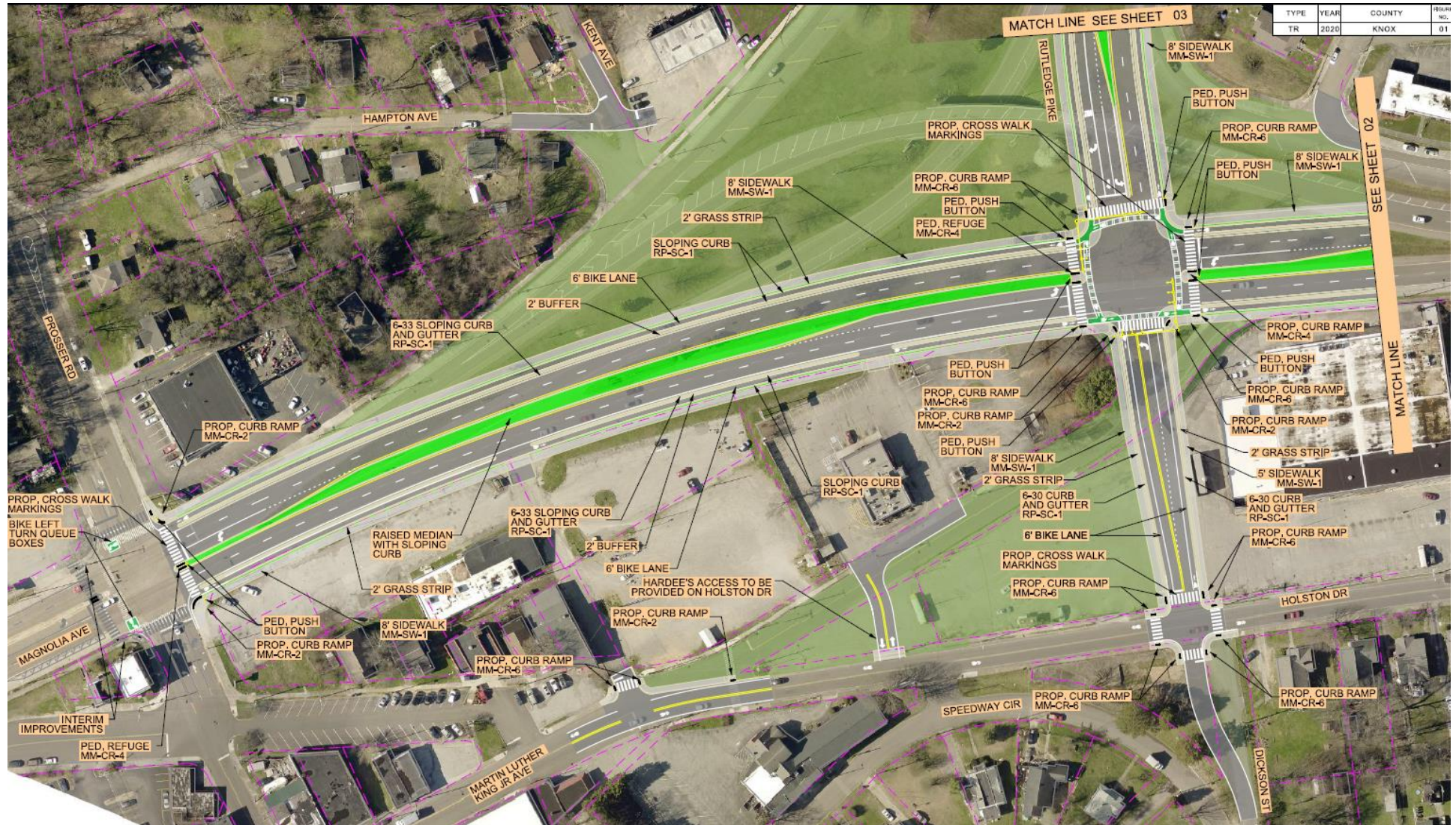
A number of features make this
intersection safer

- Corner refuge islands
- Setback crossing of the pedestrians and cyclists

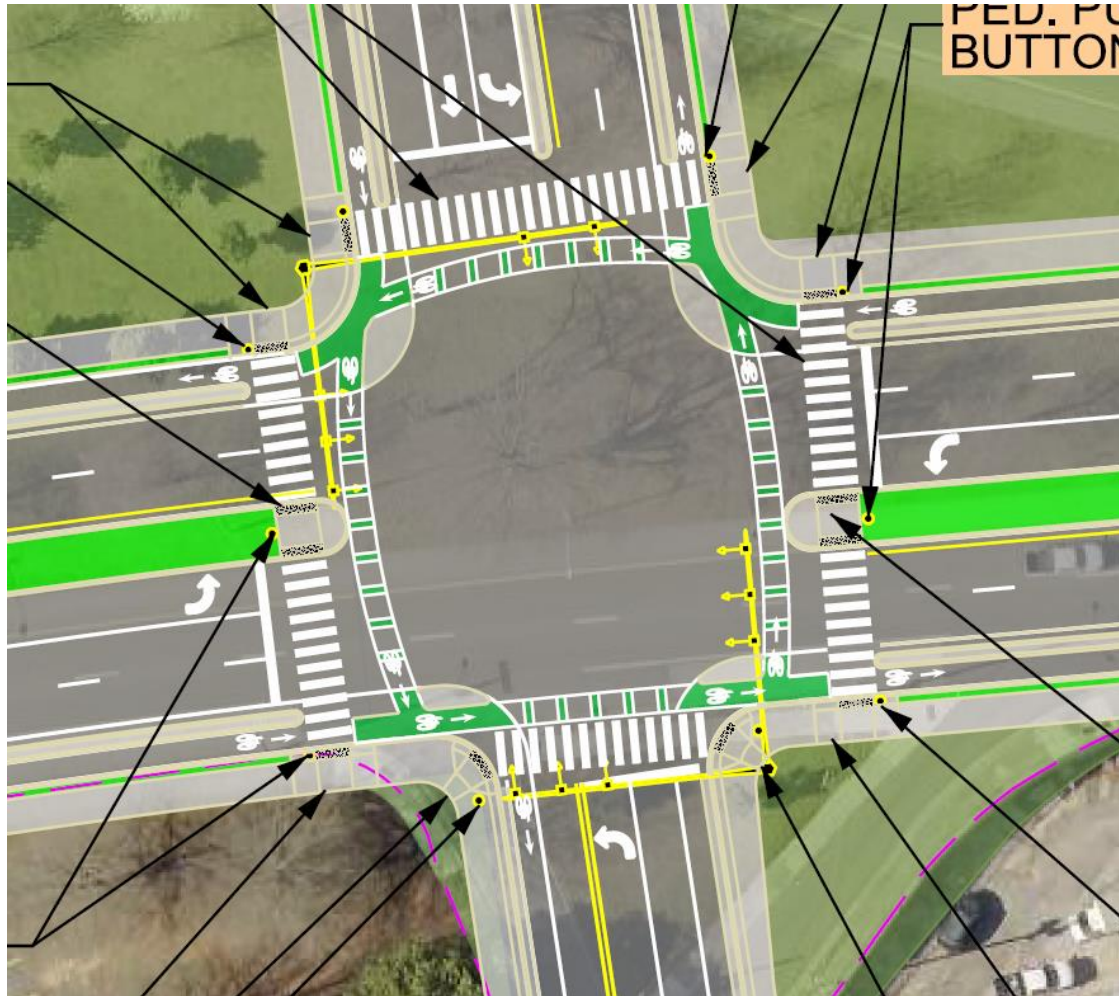
Example Salt Lake City



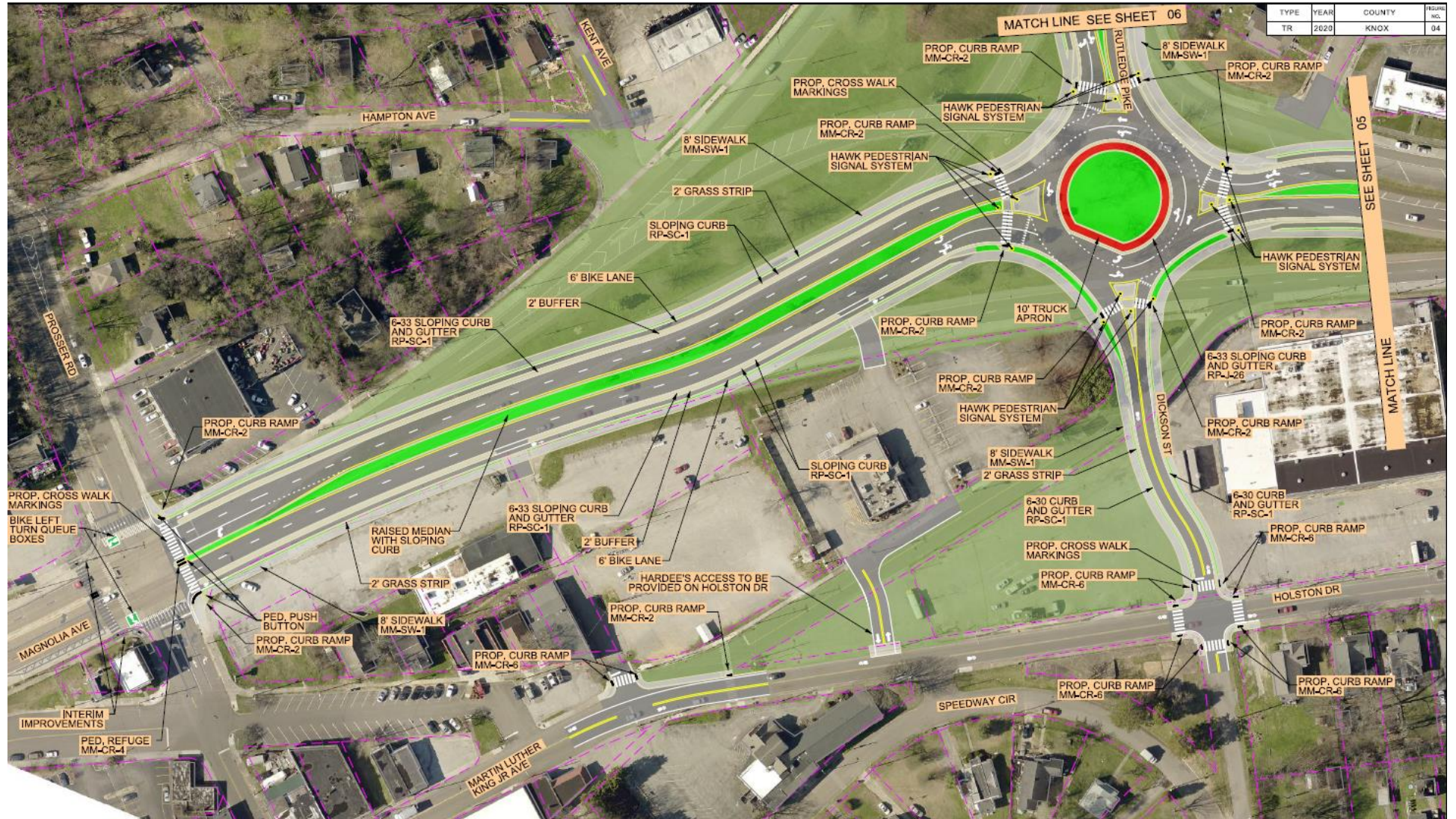
Design Concepts – Protected Intersection



Design Concepts - Protected Intersection



Design Concepts – Multilane Roundabout



Design Concepts

May need to implement design features such as color-contrasting truck aprons to achieve competing goals of tight radii and truck and fire vehicle accommodation

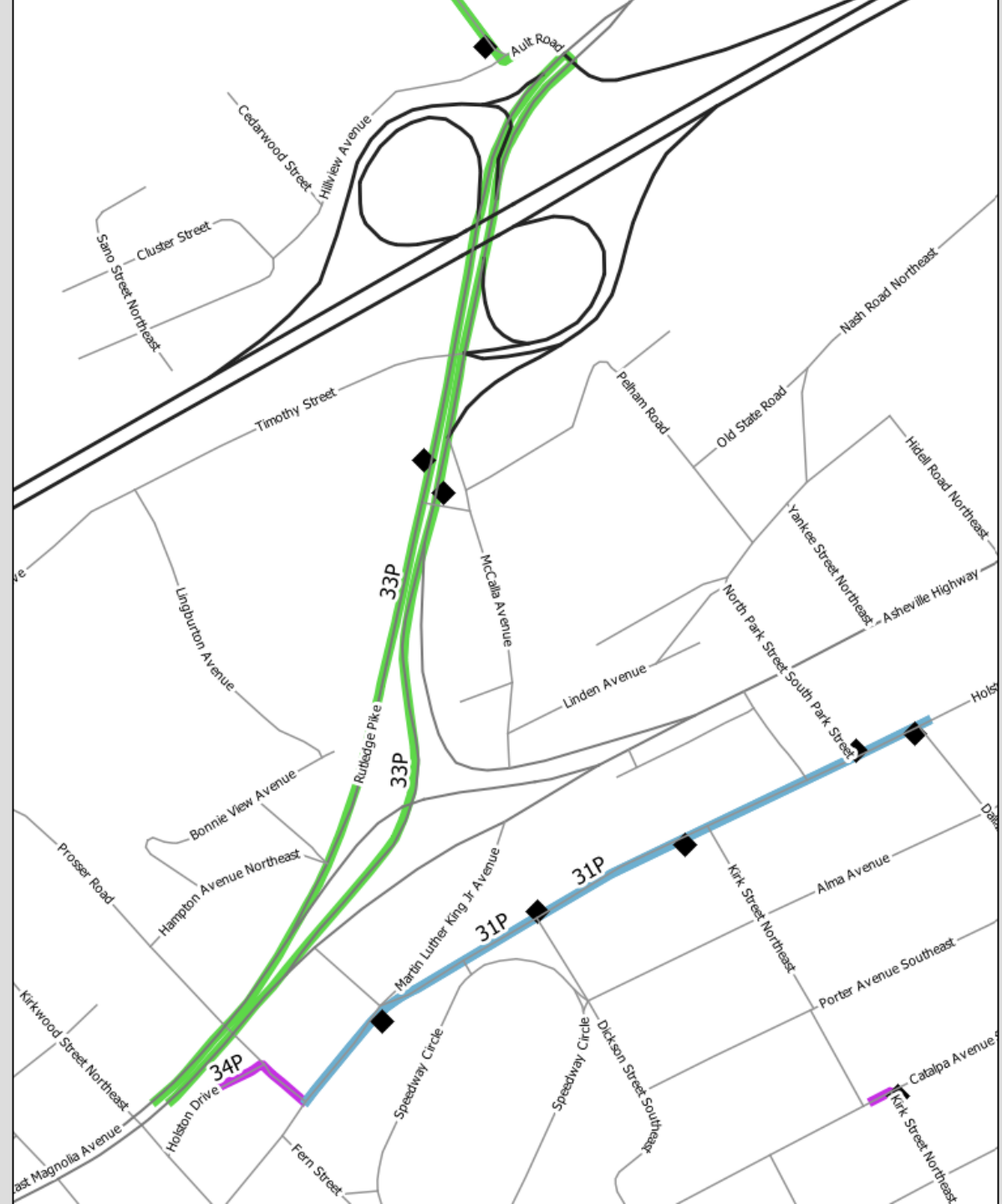


Bus Stop Discussion with Both Concepts

Currently no bus stops along Magnolia Avenue / Asheville Highway

Protected bike lanes would interfere with ADA-compliant stops

Would need to remove curb barrier and allow bus to stop in bike lane to access the sidewalk



LOS Analysis – Existing Geometry

2025			AM						PM							
			Overall Intersection			Approach LOS			Overall Intersection			Approach LOS				
ID	Intersection	Type	LOS	Delay	Max v/c	EB	WB	NB	SB	LOS	Delay	Max v/c	EB	WB	NB	SB
1	Magnolia Ave. (SR 1) at Beaman St.	Signal	A	3.0	0.20	A	A	D	D	A	5.0	0.40	A	A	D	D
2	Magnolia Ave. (SR 1) at Lakeside St.	Signal	A	2.6	0.20	A	A	C	C	A	4.0	0.26	A	A	C	C
3	Magnolia Ave. (SR 1) at Kirkwood St.	Signal	A	3.4	0.24	A	A	C	C	A	3.7	0.28	A	A	C	C
4	Magnolia Ave. (SR 1) at Prosser Rd.	Signal	B	10.2	0.37	A	A	C	C	A	8.4	0.35	A	A	C	C
5	Magnolia Ave. (SR 1) at McCalla Ave.	TWSC	-	1.7	-	-	-	A	-	-	1.5	-	-	-	B	-
6	Asheville Hwy. (SR 168) at Park St.	TWSC	-	2.6	-	-	-	B	C	-	7.9	-	-	-	C	F
7	Rutledge Pike (SR 1) at I-40 EB Ramps	Signal	D	40.7	0.90	D	E	C	B	B	13.9	0.48	C	C	B	B
8	Rutledge Pike (SR 1) at McCalla Ave.	TWSC	-	1.4	-	-	B	-	A	-	1.7	-	-	C	-	A

Note: Signal is signalized intersection; TWSC is Two-Way Stop Sign Control

2045			AM						PM							
			Overall Intersection			Approach LOS			Overall Intersection			Approach LOS				
ID	Intersection	Type	LOS	Delay	Max v/c	EB	WB	NB	SB	LOS	Delay	Max v/c	EB	WB	NB	SB
1	Magnolia Ave. (SR 1) at Beaman St.	Signal	A	3.3	0.27	A	A	D	D	A	5.7	0.47	A	A	D	D
2	Magnolia Ave. (SR 1) at Lakeside St.	Signal	A	2.4	0.25	A	A	D	D	A	3.6	0.36	A	A	D	D
3	Magnolia Ave. (SR 1) at Kirkwood St.	Signal	A	4.5	0.33	A	A	D	D	A	4.7	0.39	A	A	D	D
4	Magnolia Ave. (SR 1) at Prosser Rd.	Signal	B	12.5	0.48	A	A	C	D	A	9.9	0.43	A	A	D	D
5	Magnolia Ave. (SR 1) at McCalla Ave.	TWSC	-	1.7	-	-	-	A	-	-	1.6	-	-	-	B	-
6	Asheville Hwy. (SR 168) at Park St.	TWSC	-	3.5	-	-	-	C	D	-	42.9	-	-	-	F	F
7	Rutledge Pike (SR 1) at I-40 EB Ramps	Signal	E	57.3	0.99	F	F	D	C	B	17.9	0.62	D	D	B	A
8	Rutledge Pike (SR 1) at McCalla Ave.	TWSC	-	1.4	-	-	C	-	A	-	2.1	-	-	D	-	A



LOS Analysis – Proposed Geometry – Both Operate at LOS B in Design Year

2025			AM						PM							
ID	Intersection	Type	Overall Intersection			Approach LOS			Overall Intersection			Approach LOS				
			LOS	Delay	Max v/c	EB	WB	NB	SB	LOS	Delay	Max v/c	EB	WB	NB	SB
1	Magnolia Ave. (SR 1) at Beaman St.	Signal	A	3.0	0.20	A	A	D	D	A	5.0	0.40	A	A	D	D
2	Magnolia Ave. (SR 1) at Lakeside St.	Signal	A	2.6	0.20	A	A	C	C	A	4.0	0.26	A	A	C	C
3	Magnolia Ave. (SR 1) at Kirkwood St.	Signal	A	4.5	0.24	A	A	C	C	A	4.4	0.28	A	A	C	C
4	Magnolia Ave. (SR 1) at Prosser Rd.	Signal	B	10.3	0.37	A	A	C	C	A	8.3	0.33	A	A	C	C
5	Magnolia Ave. (SR 1) at Rutledge Pike	Signal	B	14.0	0.44	B	B	B	B	B	14.6	0.63	A	B	C	C
5	Magnolia Ave. (SR 1) at Rutledge Pike	Round.	A	7.5	0.46	A	A	A	B	A	8.8	0.71	A	A	B	A
6	Asheville Hwy. (SR 168) at Park St.	TWSC	-	1.7	-	-	-	B	C	-	3.9	-	-	-	C	E
7	Rutledge Pike (SR 1) at I-40 EB Ramps	Signal	D	40.7	0.90	D	E	C	B	B	13.9	0.48	C	C	B	B
8	Rutledge Pike (SR 1) at McCalla Ave.	TWSC	-	0.4	-	-	A	-	A	-	0.8	-	-	C	-	A
9	New Connector Rd. at Holston Dr. / MLK	AWSC	A	8.1	-	A	A	A	A	A	8.8	-	A	A	A	A

: Improvement Option (Signal = Signalized Intersection; Round. = Multilane Roundabout; AWSC = All-Way Stop Sign Control)

2045			AM						PM							
ID	Intersection	Type	Overall Intersection			Approach LOS			Overall Intersection			Approach LOS				
			LOS	Delay	Max v/c	EB	WB	NB	SB	LOS	Delay	Max v/c	EB	WB	NB	SB
1	Magnolia Ave. (SR 1) at Beaman St.	Signal	A	3.3	0.27	A	A	D	D	A	5.7	0.47	A	A	D	D
2	Magnolia Ave. (SR 1) at Lakeside St.	Signal	A	2.4	0.25	A	A	D	D	A	3.6	0.36	A	A	D	D
3	Magnolia Ave. (SR 1) at Kirkwood St.	Signal	A	5.6	0.33	A	A	D	D	A	5.5	0.39	A	A	D	D
4	Magnolia Ave. (SR 1) at Prosser Rd.	Signal	B	12.7	0.48	A	A	C	D	A	9.9	0.40	A	A	D	D
5	Magnolia Ave. (SR 1) at Rutledge Pike	Signal	B	15.7	0.55	B	B	B	C	B	18.7	0.84	B	C	C	C
5	Magnolia Ave. (SR 1) at Rutledge Pike	Round.	B	10.4	0.64	A	A	A	C	B	12.6	0.96	B	B	C	B
6	Asheville Hwy. (SR 168) at Park St.	TWSC	-	2.2	-	-	-	C	C	-	12.7	-	-	-	E	F
7	Rutledge Pike (SR 1) at I-40 EB Ramps	Signal	E	57.3	0.99	F	F	D	C	B	17.9	0.62	D	D	B	A
8	Rutledge Pike (SR 1) at McCalla Ave.	TWSC	-	0.4	-	-	C	-	A	-	0.9	-	-	C	-	A
9	New Connector Rd. at Holston Dr. / MLK	AWSC	A	8.6	-	A	A	A	A	A	9.9	-	B	A	A	A



Predictive Crash Analysis – FHWA SPICE Tool

Safety Performance for Intersection Control Evaluation Tool

Results

Summary of crash prediction results for each alternative

Project Information

Project Name:	Magnolia Ave. Interchange Study	Intersection Type	At-Grade Intersections
Intersection:	Magnolia Ave. at Rutledge Pike	Opening Year	2025
Agency:	City of Knoxville / Gresham Smith	Design Year	2045
Project Reference:	44321	Facility Type	On Urban and Suburban Arterial
City:	Knoxville	Number of Legs	4-leg
State:	TN		
Date:	7/11/2020		
Analyst:	JHS		


Crash Prediction Summary

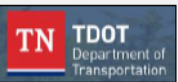
Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	AADT Within Prediction Range?
2-lane Roundabout	Total	1.79	2.34	43.36	N/A
	Fatal & Injury	0.29	0.39	7.15	
Traffic Signal	Total	2.32	3.19	57.73	Yes
	Fatal & Injury	0.85	1.16	21.12	

Note: Predictive crash analysis for auto mode only



Cost –Signal 84% cost of Roundabout (\$10.3 M vs. 12.2 M)

Route:	US 11			
Description:	Magnolia Avenue / Rutledge Pike / Asheville Hwy Interchange			
				
Project Type of Work:	Intersection Improvements and Signals			
County:	Knox			
Length:	0.69 Miles			
Date:	July 1, 2020			
Estimate Type:	Concept			
DESCRIPTION	LOCAL	STATE	FEDERAL	TOTAL
	0%	0%	0%	
Construction Items				
Removal Items	\$0	\$0	\$0	\$1,070,000
Asphalt Paving	\$0	\$0	\$0	\$1,530,000
Concrete Pavement	\$0	\$0	\$0	\$0
Drainage	\$0	\$0	\$0	\$532,000
Appurtenances	\$0	\$0	\$0	\$588,000
Structures	\$0	\$0	\$0	\$81,600
Fencing	\$0	\$0	\$0	\$0
Signalization & Lighting	\$0	\$0	\$0	\$250,000
Railroad Crossing	\$0	\$0	\$0	\$0
Earthwork	\$0	\$0	\$0	\$1,300,000
Clearing and Grubbing	\$0	\$0	\$0	\$0
Seeding & Sodding	\$0	\$0	\$0	\$11,200
Rip-Rap or Slope Protection	\$0	\$0	\$0	\$0
Guardrail	\$0	\$0	\$0	\$47,900
Signing	\$0	\$0	\$0	\$5,400
Pavement Markings	\$0	\$0	\$0	\$13,600
Maintenance of Traffic	\$0	\$0	\$0	\$108,000
Mobilization	5%	\$0	\$0	\$277,000
Other Items	10%	\$0	\$0	\$581,000
Const. Contingency	30%	\$0	\$0	\$1,890,000
Const. Eng. & Inspec.	10%	\$0	\$0	\$829,000
Construction Estimate	\$0	\$0	\$0	\$9,110,000
Interchanges & Unique Intersections				
Roundabouts	\$0	\$0	\$0	\$0
Interchanges	\$0	\$0	\$0	\$0
Right-of-Way & Utilities				
	LOCAL	STATE	FEDERAL	TOTAL
	0%	0%	0%	
Right-of-Way	\$0	\$0	\$0	\$313,000
Utilities	\$0	\$0	\$0	\$0
Preliminary & Construction Engineering and Inspection				
Prelim. Eng.	10%	\$0	\$0	\$911,000
Total Project Cost (2018)	\$0	\$0	\$0	\$ 10,300,000

Route:	US 11			
Description:	Magnolia Avenue / Rutledge Pike / Asheville Hwy Interchange			
				
Project Type of Work:	Roundabout			
County:	Knox			
Length:	0.69 Miles			
Date:	August 14, 2020			
Estimate Type:	Concept			
DESCRIPTION	LOCAL	STATE	FEDERAL	TOTAL
	0%	0%	0%	
Construction Items				
Removal Items	\$0	\$0	\$0	\$1,070,000
Asphalt Paving	\$0	\$0	\$0	\$1,530,000
Concrete Pavement	\$0	\$0	\$0	\$0
Drainage	\$0	\$0	\$0	\$532,000
Appurtenances	\$0	\$0	\$0	\$588,000
Structures	\$0	\$0	\$0	\$81,600
Fencing	\$0	\$0	\$0	\$0
Signalization & Lighting	\$0	\$0	\$0	\$500,000
Railroad Crossing	\$0	\$0	\$0	\$0
Earthwork	\$0	\$0	\$0	\$1,310,000
Clearing and Grubbing	\$0	\$0	\$0	\$0
Seeding & Sodding	\$0	\$0	\$0	\$11,200
Rip-Rap or Slope Protection	\$0	\$0	\$0	\$0
Guardrail	\$0	\$0	\$0	\$47,900
Signing	\$0	\$0	\$0	\$5,700
Pavement Markings	\$0	\$0	\$0	\$13,600
Maintenance of Traffic	\$0	\$0	\$0	\$110,000
Mobilization	5%	\$0	\$0	\$290,000
Other Items	10%	\$0	\$0	\$609,000
Const. Contingency	30%	\$0	\$0	\$1,990,000
Const. Eng. & Inspec.	10%	\$0	\$0	\$989,000
Construction Estimate	\$0	\$0	\$0	\$9,680,000
Interchanges & Unique Intersections				
Roundabouts	\$0	\$0	\$0	\$1,200,000
Interchanges	\$0	\$0	\$0	\$0
Right-of-Way & Utilities				
	LOCAL	STATE	FEDERAL	TOTAL
	0%	0%	0%	
Right-of-Way	\$0	\$0	\$0	\$313,000
Utilities	\$0	\$0	\$0	\$0
Preliminary & Construction Engineering and Inspection				
Prelim. Eng.	9%	\$0	\$0	\$1,000,000
Total Project Cost (2018)	\$0	\$0	\$0	\$ 12,200,000

Life Cycle Cost – Roundabout 93% cost of Signal over 20 Year Design Life

NCHRP 03-110 Life-Cycle Cost of Intersection Designs	Alternative 1 - Signal	Alternative 2 - Roundabout
Planning & Construction Costs	\$ 10,300,000	\$ 12,200,000
Post-Opening Costs	\$ -	\$ -
Auto Passenger Time	\$ 28,415,276	\$ 22,562,562
Auto Passenger Reliability	--	--
Truck Time	\$ 676,721	\$ 537,336
Truck Reliability	--	--
Transit Passenger Time	--	--
Transit Passenger Reliability	--	--
Bicyclist Time	--	--
Pedestrian Time	--	--
Safety	\$ 14,831,008	\$ 16,139,222
Greenhouse Gases	--	--
Criteria Pollutants	--	--
Total cost	\$54,223,005	\$50,539,120

NOTE:
Updated from Draft PowerPoint New Fatal vs. Injury Crash Data received from TDOT



Next Steps

City Concurrence

TDOT Concurrence

Public Engagement

Final Document



Questions?