

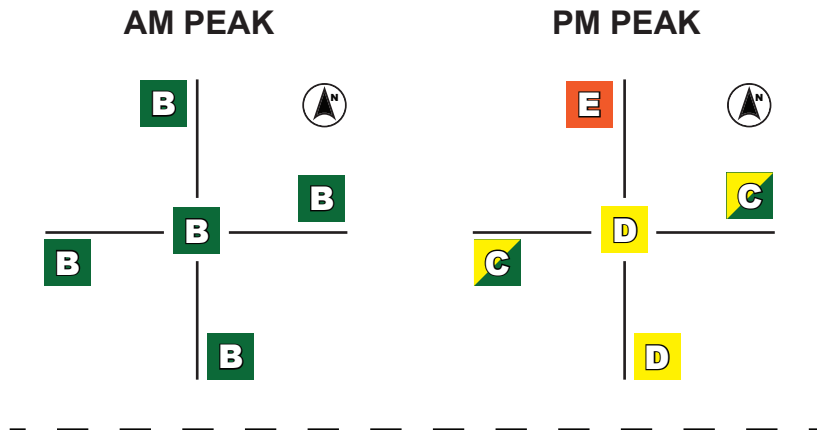
2015-2019 CRASH DATA

CRASHES	INJURIES			
	FATALITIES	TYPE A	TYPE B	TYPE C
13 ANGLE	0	1	2	6
2 HEAD-ON				

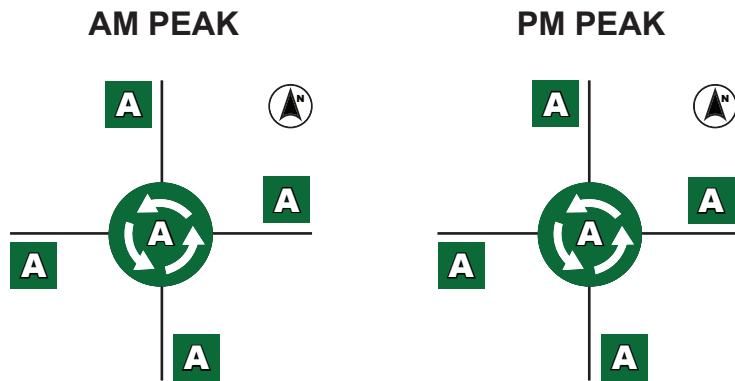
2045 OPERATIONS

LEVEL OF SERVICE
A
B
C
D
E
F

NO BUILD



ROUNDAABOUT



Opinion of probable cost for single-lane roundabout

\$1.25 MILLION

H. Lapeer Road and S. Genesee Road

The intersection of Lapeer Road and S. Genesee Road was included in the early preliminary engineering phase with support from the City of Burton due to intersection operations and safety concerns. This intersection is included in the 153 intersections that passed the skim analysis for experiencing crashes correctable by a roundabout and is a secondary analysis Tier Two intersection.

During the skim analysis, it was observed that there were 13 angle crashes and two head on left turn crashes over the 5-year period. These crashes resulted in zero fatalities, one type A injury, two type B injuries, and six type C injuries at the intersection.

No-Build Conditions

The intersection of Lapeer Road and S. Genesee Road is a four-way stop controlled intersection. Lapeer Road is an east/west road with two lanes in each direction. S. Genesee Road is a north/south road also with two lanes in each direction. All approaches of the intersection widen out from a single-lane to have a right-turn only lane and a shared through/left-turn lane. There are overhead flashing traffic signals (red) for traffic control for all approaches.

In the southeast quadrant of the intersection is the Lapeer Market. The northwest and southwest quadrants present an area of fields near residential homes. The northeast quadrant presents a residential home and a sidewalk going north and east. No other quadrants at the intersections have sidewalks. There are overhead utilities crossing the south and east legs. For utilities present at ground level, there is a fire hydrant in the northwest quadrant, drainage structures in the northeast, northwest, and southeast quadrants, and gas line markers in the southeast and south west quadrant.

An aerial of the existing intersection can be seen in Figure 9.

Figure 9: Aerial view of Lapeer Road and S. Genesee Road



An operational analysis of the no-build condition was completed for the intersection using the 2045 forecast traffic volumes. The results of the analysis for the future no-build condition reveals all approaches and movements of the intersection operate at LOS B during the AM peak hour. During the PM peak hour, the east and westbound approaches operate at LOS C and northbound operates at LOS D and southbound at LOS E.

The 95th percentile queue lengths were reviewed at the intersection and the results showed all approaches experienced a maximum queue length of 84 feet (5 vehicles) during the AM peak hour and 152 feet (10 vehicles) during the PM peak hour.

The operational analysis results for the future no-build conditions are presented in Table 20.

Table 20: Operational Analysis for 2045 No-Build Condition

Intersection	Approach	AM Peak		PM Peak	
		Delay/LOS	Queue (veh)*	Delay/LOS	Queue (veh)*
Lapeer Road and S. Genesee Road	Eastbound	13.4/B	3 (55 ft)	20.2/C	5 (83 ft)
	Westbound	12.1/B	4 (60 ft)	17.4/C	4 (71 ft)
	Northbound	14.1/B	4 (65 ft)	30.9/D	8 (127 ft)
	Southbound	14.9/B	5 (84 ft)	41.9/E	10 (152 ft)
	Overall	13.8/B		29.9/D	

* 95th percentile queue length.

Roundabout Conditions

The proposed roundabout configuration for the intersection of Lapeer Road and S. Genesee Road is a single lane circulating. The proposed single-lane roundabout configuration will not fit inside the existing right-of-way. Based on the concept design, additional right-of-way may be required in the northeast, southeast, and southwest. The proposed inscribed diameter for the concept roundabout is 110 feet. The driveway configuration for the Lapeer Road Market should be investigated due to the existing driveways closeness to the proposed roundabout entry/exit radius. A concept plan for the single-lane roundabout is to follow the recommendations.

An operational analysis for the single-lane roundabout (build) condition was completed for the intersection using 2045 forecast traffic volumes. The results of the analysis for the roundabout (build) condition reveals all approaches and movements of the intersection operate at LOS A during the AM and PM peak hours.

The 95th percentile queue lengths were reviewed at the intersection and the results showed all approaches experienced a maximum queue length of one (1) vehicle during the AM peak hour and two (2) vehicles during the PM peak hour.

The operation analysis for the future roundabout (build) conditions are presented in Table 21.

Table 21: Operational Analysis for 2045 Roundabout (Build) Condition

Intersection	Approach	AM Peak		PM Peak	
		Delay/LOS	Queue (veh)*	Delay/LOS	Queue (veh)*
Lapeer Road and S. Genesee Road	Eastbound	5.2/A	0.5	7.0/A	1.0
	Westbound	6.1/A	0.8	6.7/A	0.9
	Northbound	5.6/A	0.7	7.7/A	1.5
	Southbound	6.9/A	1.2	8.2/A	2.1
	Overall	6.1/A		7.6/A	

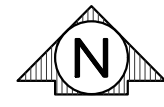
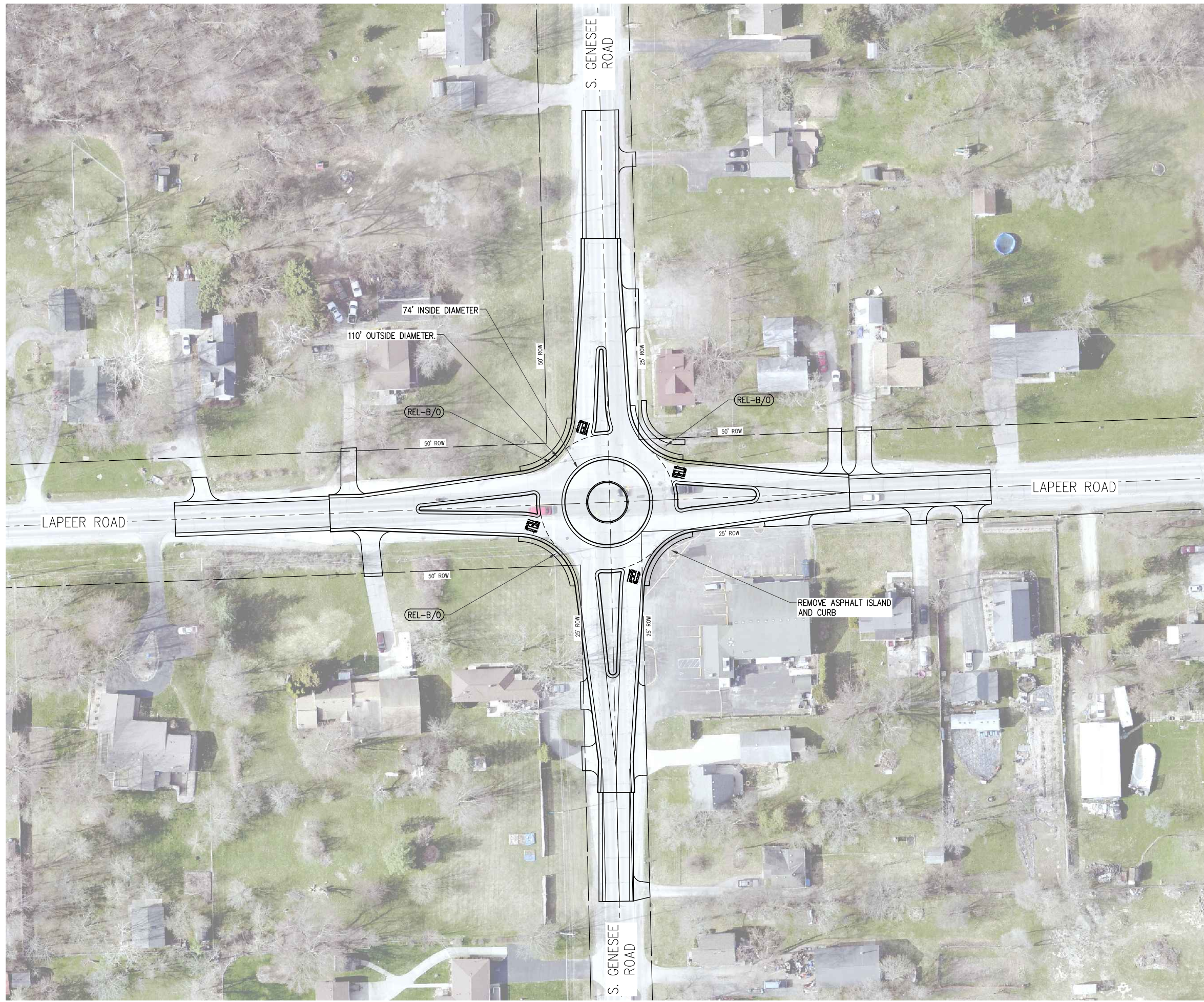
* 95th percentile queue length.

Opinion of probable cost were developed for a single-lane roundabout. The total probable cost is \$1.25 million in year 2025 dollars. The probable cost includes a 20 percent contingency and 3 percent inflation. Not included in this fee are the potential costs to relocate any utilities to accommodate the proposed layout. A full breakdown along with all the assumptions can be found in Appendix 3.

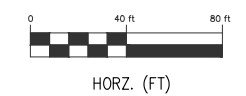
Potential funding sources for this improvement could include regular road improvement funding, safety funds, CMAQ, or an earmark. A TOR was computed with a result of 10.66.

Recommendation

A roundabout would be feasible at this location, although it may be costly due to the necessary relocation of the utilities. There also should be coordination with the Lapeer Road Market about their driveway configuration.



LAPEER ROAD AND
GENESEE ROAD
ROUNDBOUT CONCEPT
SCALE: 1" = 80'



CONCEPT PLAN – FOR DISCUSSION PURPOSES ONLY

PLAN DATE: MAY 27, 2021

ROWE PROFESSIONAL SERVICES COMPANY



The Rowe Building
540 S. Saginaw St., Suite 200
Flint, MI 48502

O: (810) 341-7500
F: (810) 341-7573
www.rowepsc.com

PREPARED FOR
GENESEE COUNTY ROAD COMMISSION
ROUNDBOUT CONCEPTS
LAPEER ROAD AND GENESEE ROAD
ROUNDBOUT CONCEPT

FIGURE NO.
41

JOB No: 19C0262

PLotted: 6/3/2021 3:03 PM R:\Projects\19C0262\Draw\Measures\Draw_Concepts\Layer_Genesee_Concept.dwg

Lapeer Road & South Genesee Road - TMC

Tue Mar 9, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817409, Location: 43.010534, -83.615019



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Lapeer Rd Eastbound						Lapeer Rd Westbound						S Genesee Rd Northbound						S Genesee Rd Southbound						Int
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	
2021-03-09 7:00AM	3	8	1	0	12	0	2	12	7	0	21	0	5	13	1	0	19	0	4	12	10	0	26	0	78
7:15AM	7	10	5	0	22	0	2	23	1	0	26	0	3	21	1	0	25	0	3	8	2	0	13	0	86
7:30AM	13	16	3	0	32	0	5	21	16	0	42	0	7	19	3	0	29	0	6	18	4	0	28	0	131
7:45AM	5	17	4	0	26	0	5	24	17	0	46	0	6	30	3	0	39	0	5	37	18	0	60	0	171
Hourly Total	28	51	13	0	92	0	14	80	41	0	135	0	21	83	8	0	112	0	18	75	34	0	127	0	466
8:00AM	25	14	1	0	40	1	2	29	16	0	47	0	10	22	3	0	35	0	14	34	33	0	81	0	203
8:15AM	3	16	5	0	24	0	8	17	10	0	35	0	7	22	4	0	33	0	8	32	14	0	54	0	146
8:30AM	5	10	5	1	21	0	4	20	15	0	39	0	7	37	3	0	47	0	8	29	6	0	43	0	150
8:45AM	8	11	2	0	21	0	7	10	13	0	30	0	5	24	3	0	32	0	7	38	5	0	50	0	133
Hourly Total	41	51	13	1	106	1	21	76	54	0	151	0	29	105	13	0	147	0	37	133	58	0	228	0	632
4:00PM	8	26	5	0	39	0	6	36	12	0	54	0	5	65	4	0	74	0	19	57	16	0	92	0	259
4:15PM	16	26	9	0	51	0	6	27	11	0	44	0	4	47	6	0	57	0	20	48	11	0	79	0	231
4:30PM	10	32	7	0	49	0	5	23	18	0	46	0	5	45	5	0	55	0	22	49	6	0	77	0	227
4:45PM	14	33	5	0	52	0	9	20	7	0	36	0	6	58	11	0	75	0	21	52	18	0	91	0	254
Hourly Total	48	117	26	0	191	0	26	106	48	0	180	0	20	215	26	0	261	0	82	206	51	0	339	0	971
5:00PM	19	37	8	0	64	0	6	22	10	0	38	0	12	46	7	0	65	0	13	56	12	0	81	0	248
5:15PM	10	45	10	0	65	0	5	24	14	0	43	0	6	49	1	0	56	0	22	38	4	0	64	0	228
5:30PM	16	30	9	0	55	0	4	20	14	0	38	0	4	42	4	0	50	0	17	24	7	0	48	0	191
5:45PM	13	27	5	0	45	0	12	30	10	0	52	1	3	43	2	0	48	0	11	44	14	0	69	0	214
Hourly Total	58	139	32	0	229	0	27	96	48	0	171	1	25	180	14	0	219	0	63	162	37	0	262	0	881
Total	175	358	84	1	618	1	88	358	191	0	637	1	95	583	61	0	739	0	200	576	180	0	956	0	2950
% Approach	28.3%	57.9%	13.6%	0.2%	-	-	13.8%	56.2%	30.0%	0%	-	-	12.9%	78.9%	8.3%	0%	-	-	20.9%	60.3%	18.8%	0%	-	-	-
% Total	5.9%	12.1%	2.8%	0%	20.9%	-	3.0%	12.1%	6.5%	0%	21.6%	-	3.2%	19.8%	2.1%	0%	25.1%	-	6.8%	19.5%	6.1%	0%	32.4%	-	-
Lights	171	355	81	1	608	-	88	352	185	0	625	-	91	575	60	0	726	-	195	572	172	0	939	-	2898
% Lights	97.7%	99.2%	96.4%	100%	98.4%	-	100%	98.3%	96.9%	0%	98.1%	-	95.8%	98.6%	98.4%	0%	98.2%	-	97.5%	99.3%	95.6%	0%	98.2%	-	98.2%
Single-Unit Trucks	0	2	0	0	2	-	0	5	2	0	7	-	1	6	0	0	7	-	3	0	0	0	3	-	19
% Single-Unit Trucks	0%	0.6%	0%	0%	0.3%	-	0%	1.4%	1.0%	0%	1.1%	-	1.1%	1.0%	0%	0%	0.9%	-	1.5%	0%	0%	0%	0.3%	-	0.6%
Articulated Trucks	0	0	0	0	0	-	0	1	1	0	2	-	0	0	0	0	0	-	0	0	0	0	0	-	2
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0.3%	0.5%	0%	0.3%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.1%
Buses	4	1	3	0	8	-	0	0	1	0	1	-	2	2	1	0	5	-	2	4	8	0	14	-	28
% Buses	2.3%	0.3%	3.6%	0%	1.3%	-	0%	0%	0.5%	0%	0.2%	-	2.1%	0.3%	1.6%	0%	0.7%	-	1.0%	0.7%	4.4%	0%	1.5%	-	0.9%
Bicycles on Road	0	0	0	0	0	-	0	0	2	0	2	-	1	0	0	0	1	-	0	0	0	0	0	-	3
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0%	1.0%	0%	0.3%	-	1.1%	0%	0%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0.1%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Lapeer Road & South Genesee Road - TMC

Tue Mar 9, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

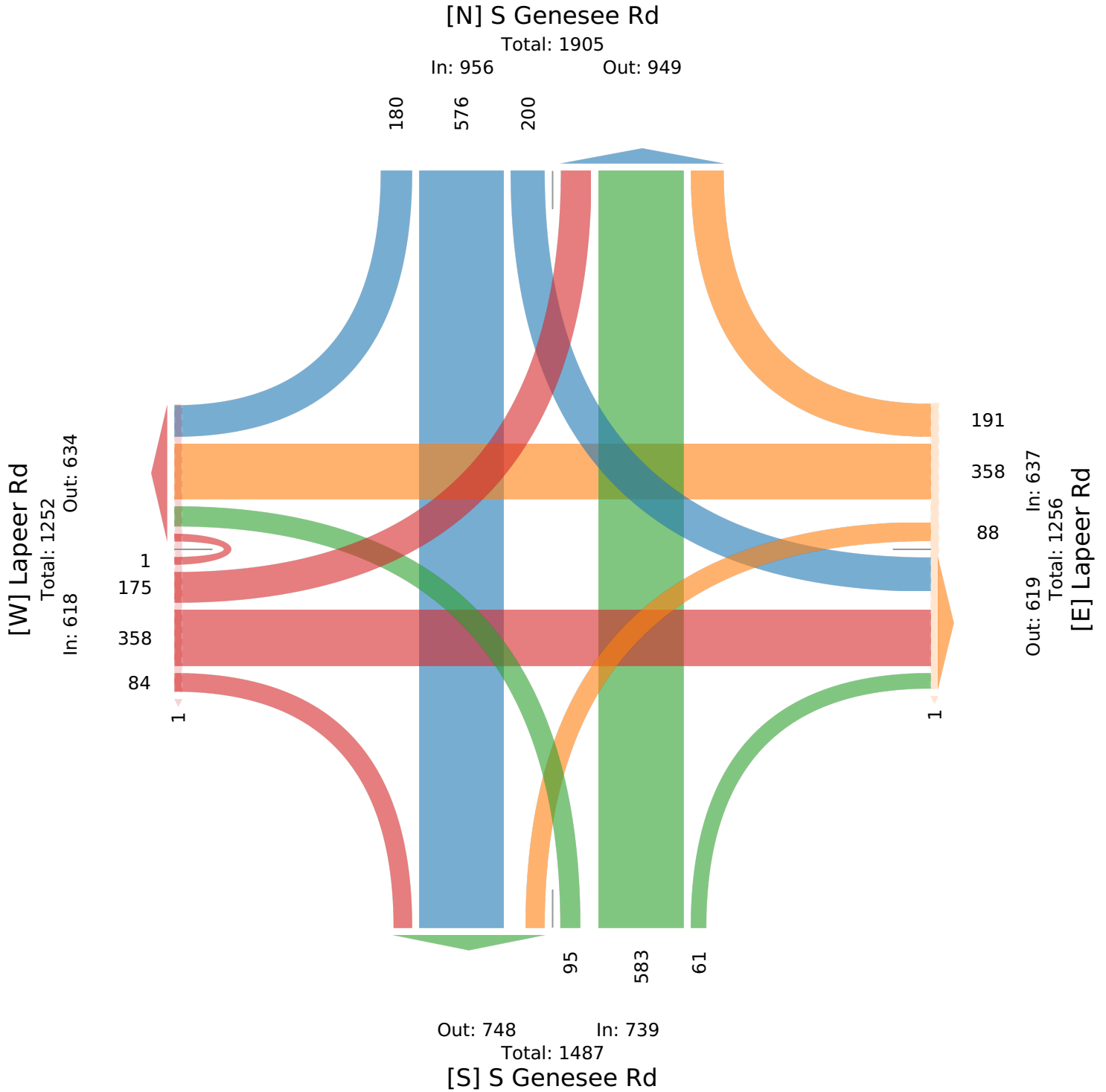
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817409, Location: 43.010534, -83.615019



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Lapeer Road & South Genesee Road - TMC

Tue Mar 9, 2021

AM Peak (7:45 AM - 8:45 AM)

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817409, Location: 43.010534, -83.615019



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Lapeer Rd Eastbound						Lapeer Rd Westbound						S Genesee Rd Northbound						S Genesee Rd Southbound												
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2021-03-09 7:45AM	5	17	4	0	26	0	5	24	17	0	46	0	6	30	3	0	39	0	5	37	18	0	60	0							171
8:00AM	25	14	1	0	40	1	2	29	16	0	47	0	10	22	3	0	35	0	14	34	33	0	81	0							203
8:15AM	3	16	5	0	24	0	8	17	10	0	35	0	7	22	4	0	33	0	8	32	14	0	54	0							146
8:30AM	5	10	5	1	21	0	4	20	15	0	39	0	7	37	3	0	47	0	8	29	6	0	43	0							150
Total	38	57	15	1	111	1	19	90	58	0	167	0	30	111	13	0	154	0	35	132	71	0	238	0							670
% Approach	34.2%	51.4%	13.5%	0.9%	-	-	11.4%	53.9%	34.7%	0%	-	-	19.5%	72.1%	8.4%	0%	-	-	14.7%	55.5%	29.8%	0%	-	-							-
% Total	5.7%	8.5%	2.2%	0.1%	16.6%	-	2.8%	13.4%	8.7%	0%	24.9%	-	4.5%	16.6%	1.9%	0%	23.0%	-	5.2%	19.7%	10.6%	0%	35.5%	-							-
PHF	0.380	0.838	0.750	0.250	0.694	-	0.594	0.776	0.853	-	0.888	-	0.750	0.750	0.813	-	0.819	-	0.625	0.892	0.538	-	0.735	-							0.825
Lights	37	56	14	1	108	-	19	89	56	0	164	-	30	110	13	0	153	-	33	129	68	0	230	-							655
% Lights	97.4%	98.2%	93.3%	100%	97.3%	-	100%	98.9%	96.6%	0%	98.2%	-	100%	99.1%	100%	0%	99.4%	-	94.3%	97.7%	95.8%	0%	96.6%	-							97.8%
Single-Unit Trucks	0	1	0	0	1	-	0	1	0	0	1	-	0	1	0	0	1	-	1	0	0	0	1	-							4
% Single-Unit Trucks	0%	1.8%	0%	0%	0.9%	-	0%	1.1%	0%	0%	0.6%	-	0%	0.9%	0%	0%	0.6%	-	2.9%	0%	0%	0%	0.4%	-							0.6%
Articulated Trucks	0	0	0	0	0	-	0	0	1	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-							1
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	1.7%	0%	0.6%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-							0.1%
Buses	1	0	1	0	2	-	0	0	1	0	1	-	0	0	0	0	0	-	1	3	3	0	7	-							10
% Buses	2.6%	0%	6.7%	0%	1.8%	-	0%	0%	1.7%	0%	0.6%	-	0%	0%	0%	0%	0%	-	2.9%	2.3%	4.2%	0%	2.9%	-							1.5%
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-							0
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-							0%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0							
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0							
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Lapeer Road & South Genesee Road - TMC

Tue Mar 9, 2021

AM Peak (7:45 AM - 8:45 AM)

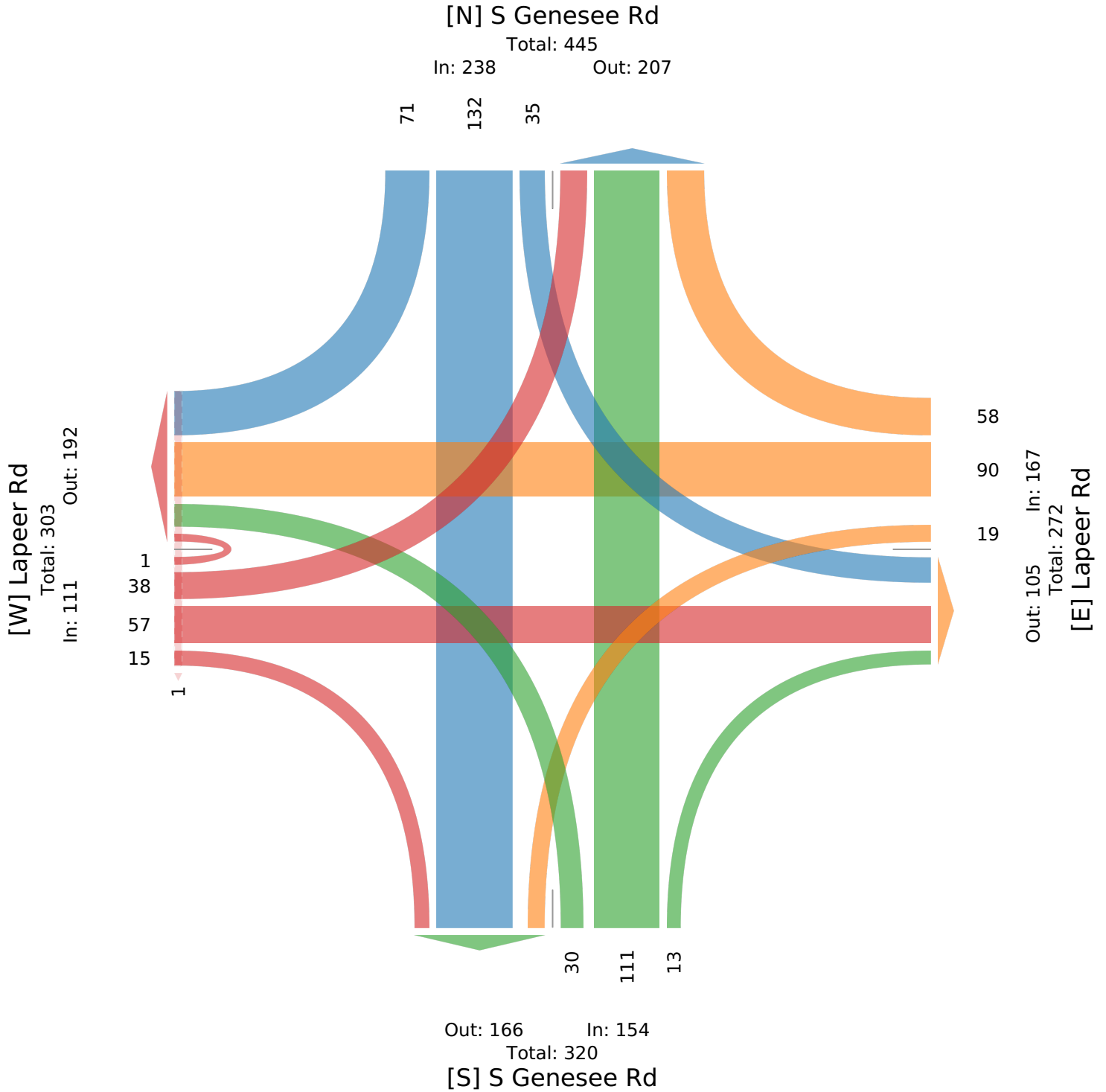
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817409, Location: 43.010534, -83.615019



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625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Lapeer Road & South Genesee Road - TMC

Tue Mar 9, 2021

PM Peak (4 PM - 5 PM) - Overall Peak Hour

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817409, Location: 43.010534, -83.615019



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Lapeer Rd Eastbound						Lapeer Rd Westbound						S Genesee Rd Northbound						S Genesee Rd Southbound						Int
	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	
2021-03-09 4:00PM	8	26	5	0	39	0	6	36	12	0	54	0	5	65	4	0	74	0	19	57	16	0	92	0	259
4:15PM	16	26	9	0	51	0	6	27	11	0	44	0	4	47	6	0	57	0	20	48	11	0	79	0	231
4:30PM	10	32	7	0	49	0	5	23	18	0	46	0	5	45	5	0	55	0	22	49	6	0	77	0	227
4:45PM	14	33	5	0	52	0	9	20	7	0	36	0	6	58	11	0	75	0	21	52	18	0	91	0	254
Total	48	117	26	0	191	0	26	106	48	0	180	0	20	215	26	0	261	0	82	206	51	0	339	0	971
% Approach	25.1%	61.3%	13.6%	0%	-	-	14.4%	58.9%	26.7%	0%	-	-	7.7%	82.4%	10.0%	0%	-	-	24.2%	60.8%	15.0%	0%	-	-	-
% Total	4.9%	12.0%	2.7%	0%	19.7%	-	2.7%	10.9%	4.9%	0%	18.5%	-	2.1%	22.1%	2.7%	0%	26.9%	-	8.4%	21.2%	5.3%	0%	34.9%	-	-
PHF	0.750	0.886	0.722	-	0.918	-	0.722	0.736	0.667	-	0.833	-	0.833	0.827	0.591	-	0.870	-	0.932	0.904	0.708	-	0.921	-	0.937
Lights	47	117	26	0	190	-	26	104	48	0	178	-	20	212	26	0	258	-	81	206	50	0	337	-	963
% Lights	97.9%	100%	100%	0%	99.5%	-	100%	98.1%	100%	0%	98.9%	-	100%	98.6%	100%	0%	98.9%	-	98.8%	100%	98.0%	0%	99.4%	-	99.2%
Single-Unit Trucks	0	0	0	0	0	-	0	2	0	0	2	-	0	2	0	0	2	-	1	0	0	0	1	-	5
% Single-Unit Trucks	0%	0%	0%	0%	0%	-	0%	1.9%	0%	0%	1.1%	-	0%	0.9%	0%	0%	0.8%	-	1.2%	0%	0%	0%	0.3%	-	0.5%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Buses	1	0	0	0	1	-	0	0	0	0	0	-	0	1	0	0	1	-	0	0	1	0	1	-	3
% Buses	2.1%	0%	0%	0%	0.5%	-	0%	0%	0%	0%	0%	-	0%	0.5%	0%	0%	0.4%	-	0%	0%	2.0%	0%	0.3%	-	0.3%
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Lapeer Road & South Genesee Road - TMC

Tue Mar 9, 2021

PM Peak (4 PM - 5 PM) - Overall Peak Hour

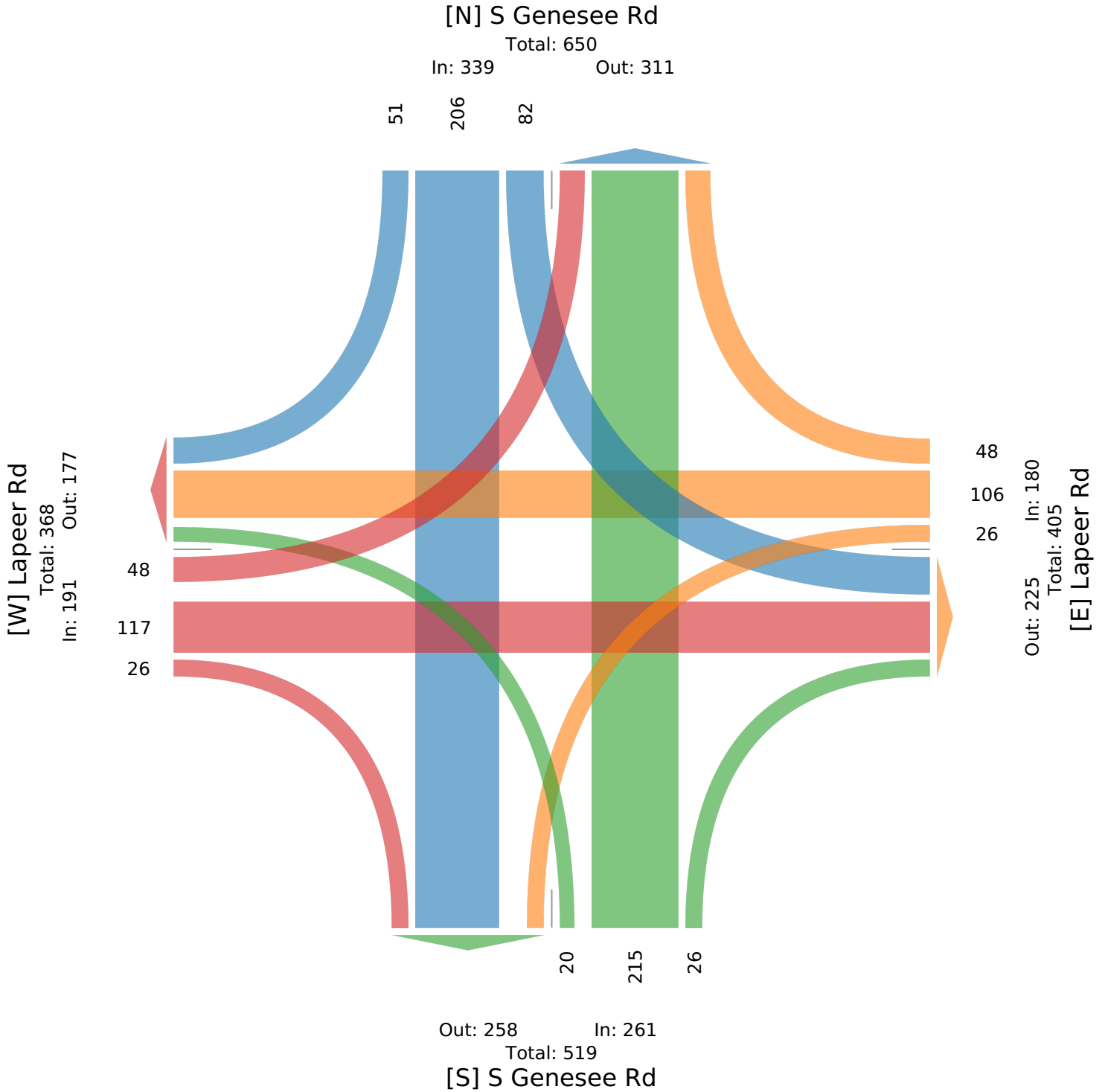
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 817409, Location: 43.010534, -83.615019



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Intersection	
Intersection Delay, s/veh	13.8
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations			↔	↔		↔	↔		↔	↔		↔
Traffic Vol, veh/h	1	49	74	20	25	117	75	39	144	17	46	172
Future Vol, veh/h	1	49	74	20	25	117	75	39	144	17	46	172
Peak Hour Factor	0.69	0.69	0.69	0.69	0.89	0.89	0.89	0.82	0.82	0.82	0.74	0.74
Heavy Vehicles, %	3	3	3	3	2	2	2	1	1	1	3	3
Mvmt Flow	1	71	107	29	28	131	84	48	176	21	62	232
Number of Lanes	0	0	1	1	0	1	1	0	1	1	0	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	13.4	12.1	14.1	14.9
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	21%	0%	40%	0%	18%	0%	21%	0%
Vol Thru, %	79%	0%	60%	0%	82%	0%	79%	0%
Vol Right, %	0%	100%	0%	100%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	183	17	124	20	142	75	218	92
LT Vol	39	0	49	0	25	0	46	0
Through Vol	144	0	75	0	117	0	172	0
RT Vol	0	17	0	20	0	75	0	92
Lane Flow Rate	223	21	180	29	160	84	295	124
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.427	0.035	0.363	0.05	0.315	0.148	0.537	0.198
Departure Headway (Hd)	6.891	6.068	7.277	6.377	7.112	6.307	6.677	5.857
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	524	593	496	565	507	571	545	617
Service Time	4.603	3.78	4.997	4.077	4.824	4.019	4.377	3.557
HCM Lane V/C Ratio	0.426	0.035	0.363	0.051	0.316	0.147	0.541	0.201
HCM Control Delay	14.6	9	14.1	9.4	13.1	10.1	16.9	10
HCM Lane LOS	B	A	B	A	B	B	C	A
HCM 95th-tile Q	2.1	0.1	1.6	0.2	1.3	0.5	3.2	0.7

Intersection

Intersection Delay, s/veh
Intersection LOS

Movement SBR

Lane Configurations	7
Traffic Vol, veh/h	92
Future Vol, veh/h	92
Peak Hour Factor	0.74
Heavy Vehicles, %	3
Mvmt Flow	124
Number of Lanes	1

Approach

Opposing Approach
Opposing Lanes
Conflicting Approach Left
Conflicting Lanes Left
Conflicting Approach Right
Conflicting Lanes Right
HCM Control Delay
HCM LOS

Intersection: 1: Genesee Road & Lapeer Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	ULT	R	LT	R	LT	R	LT	R
Maximum Queue (ft)	71	49	85	48	77	25	105	62
Average Queue (ft)	32	10	34	20	38	8	47	24
95th Queue (ft)	55	32	60	37	65	24	84	45
Link Distance (ft)	608		717		594		609	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		140		165		175		145
Storage Blk Time (%)								
Queuing Penalty (veh)								

Network Summary

Network wide Queuing Penalty: 0

Intersection	
Intersection Delay, s/veh	29.9
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗		↖	↗		↖	↗
Traffic Vol, veh/h	62	152	34	34	138	62	26	280	34	107	268	66
Future Vol, veh/h	62	152	34	34	138	62	26	280	34	107	268	66
Peak Hour Factor	0.92	0.92	0.92	0.83	0.83	0.83	0.87	0.87	0.87	0.92	0.92	0.92
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	67	165	37	41	166	75	30	322	39	116	291	72
Number of Lanes	0	1	1	0	1	1	0	1	1	0	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	20.2	17.4	30.9	41.9
HCM LOS	C	C	D	E

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	8%	0%	29%	0%	20%	0%	29%	0%
Vol Thru, %	92%	0%	71%	0%	80%	0%	71%	0%
Vol Right, %	0%	100%	0%	100%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	306	34	214	34	172	62	375	66
LT Vol	26	0	62	0	34	0	107	0
Through Vol	280	0	152	0	138	0	268	0
RT Vol	0	34	0	34	0	62	0	66
Lane Flow Rate	352	39	233	37	207	75	408	72
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.775	0.078	0.555	0.079	0.493	0.161	0.89	0.139
Departure Headway (Hd)	7.937	7.171	8.593	7.716	8.568	7.738	7.859	6.99
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	457	499	419	464	421	463	461	512
Service Time	5.69	4.923	6.349	5.471	6.325	5.495	5.608	4.739
HCM Lane V/C Ratio	0.77	0.078	0.556	0.08	0.492	0.162	0.885	0.141
HCM Control Delay	33.2	10.5	21.6	11.1	19.4	12	47.3	10.9
HCM Lane LOS	D	B	C	B	C	B	E	B
HCM 95th-tile Q	6.7	0.3	3.3	0.3	2.7	0.6	9.6	0.5

Intersection: 1: Genesee Road & Lapeer Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	R	LT	R
Maximum Queue (ft)	95	30	96	52	166	34	187	90
Average Queue (ft)	50	14	41	20	70	13	84	24
95th Queue (ft)	83	31	71	41	127	31	152	59
Link Distance (ft)	608		717		594		609	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		140		165		175		145
Storage Blk Time (%)					1		2	
Queuing Penalty (veh)					0		1	

Network Summary

Network wide Queuing Penalty: 1

Lapeer Road and S. Genesee Road – AM Peak

Rodel - C:\Users\902JAM\OneDrive - ROWE PSC\19C0262_GeneseeCountyRAB\RODEL\Lapeer_Genesee.rod

File View Help



Project: Lapeer Road and Genesee Ro Date: 4-Jun-2021 Model: Rodel 2017 Timeslice: 7.5 Full Geometry Peak: AM Feet **RHD**
 Name: 2045 Flows: 2045 Delay: Control Results: Veh Peak60/15m Synthetic Flow Profile Conf: 50 Light 33

Approach Geometry						
	Leg Name	Bearing	G	V	n	
1	SB-Genesee Roa	0	0	12.00	1	
2	EB-Lapeer Road	90	0	11.00	1	
3	NB-Genesee R...	180	0	11.00	1	
4	WB-Lapeer Road	270	0	11.00	1	

Entry Geometry						Circ Geom		
E	n	L'	R	Φ	D	C	n	
15.00	1	160.00	50.00	27.00	110.00	18.00	1	
15.00	1	165.00	50.00	27.00	110.00	18.00	1	
15.00	1	165.00	50.00	27.00	110.00	18.00	1	
15.00	1	145.00	50.00	27.00	110.00	18.00	1	

Exit Geometry			
Ex	n	Vx	n
15.00	1	12.00	1
15.00	1	11.00	1
15.00	1	11.00	1
15.00	1	11.00	1

Entry Capacity Mods	
-+ Cap (v/h)	Xwalk Fact
0	1.000
0	1.000
0	1.000
0	1.000

Volume Modifiers		
Leg Name	%Truck	Factor
1 SB-Genesee Roa	3.0	1.00
2 EB-Lapeer Road	3.0	1.00
3 NB-Genesee R...	1.0	1.00
4 WB-Lapeer Road	2.0	1.00

Turning Volumes (veh/hr)					
	U-Turn	Exit-3	Exit-2	Exit-1	Bypass
	0	46	172	92	0
	1	49	74	20	0
	0	39	144	17	0
	0	25	117	75	0

Arrival Volume Ratios			Arrival Volume Times (min)			PHF
Ratio1	Ratio2	Ratio3	Time1	Time2	Time3	
0.750	1.125	0.750	0	30	60	
0.750	1.125	0.750	0	30	60	
0.750	1.125	0.750	0	30	60	
0.750	1.125	0.750	0	30	60	

Calibration
 Accidents
 Economics
 Bypass

	Peak 60min Results	Bypass Type	Flow Rate (veh/hr)		Opp Rate (veh/hr)		Capacity (veh/hr)		Ave VCR		Ave Del (sec/veh)		Max Q (veh)		Max Q95% (veh)		LOS A-F		
			Entry	Bypass	Entry	Bypass	Entry	Bypass	Entry	Bypass	Entry	Bypass	Leg	Entry	Bypass	Entry	By	Leg	
1	SB-Genesee Road	None	310		182		1082		0.2864		6.86		6.86	0.46	1.20		A		A
2	EB-Lapeer Road	None	144		243		1042		0.1382		5.24		5.24	0.18	0.48		A		A
3	NB-Genesee Road	None	200		170		1124		0.1779		5.62		5.62	0.25	0.66		A		A
4	WB-Lapeer Road	None	217		233		1068		0.2032		6.07		6.07	0.29	0.77		A		A
All	Intersection												6.11						A

Results 60
 Results 15
 Int / Slope - 60
 Int / Slope - 15
 Economics
 Global Results

Lapeer Road and S. Genesee Road – PM Peak

Rodel - C:\Users\902JAM\OneDrive - ROWE PSC\19C0262_GeneseeCountyRAB\RODEL\Lapeer_Genesee.rod

File View Help

Project: Lapeer Road and Genesee Ro Date: 4-Jun-2021 Model: Rodel 2017 Timeslice: 7.5 Full Geometry: Full Geometry Peak: PM Feet: RHD

Name: 2045 Flows: 2045 Delay: Control Results: Veh Peak60/15m Synthetic Flow Profile Conf: 50 Light: 34

Approach Geometry						Entry Geometry					Circ Geom			Exit Geometry				Entry Capacity Mods	
Leg Name	Bearing	G	V	n		E	n	L'	R	Φ	D	C	n	Ex	n	Vx	n	-> Cap (w/h)	Xwalk Fact
1 SB-Genesee Roa	0	0	12.00	1		15.00	1	160.00	50.00	27.00	110.00	18.00	1	15.00	1	12.00	1	0	1.000
2 EB-Lapeer Road	90	0	11.00	1		15.00	1	165.00	50.00	27.00	110.00	18.00	1	15.00	1	11.00	1	0	1.000
3 NB-Genesee R...	180	0	11.00	1		15.00	1	165.00	50.00	27.00	110.00	18.00	1	15.00	1	11.00	1	0	1.000
4 WB-Lapeer Road	270	0	11.00	1		15.00	1	145.00	50.00	27.00	110.00	18.00	1	15.00	1	11.00	1	0	1.000

Volume Modifiers			Turning Volumes (veh/hr)						Arrival Volume Ratios			Arrival Volume Times (min)			PHF
Leg Name	%Truck	Factor	U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Ratio1	Ratio2	Ratio3	Time1	Time2	Time3		
1 SB-Genesee Roa	1.0	1.00	0	107	268	66	0	0.750	1.125	0.750	0	30	60		
2 EB-Lapeer Road	1.0	1.00	0	62	152	34	0	0.750	1.125	0.750	0	30	60		
3 NB-Genesee R...	1.0	1.00	0	26	280	34	0	0.750	1.125	0.750	0	30	60		
4 WB-Lapeer Road	1.0	1.00	0	34	138	62	0	0.750	1.125	0.750	0	30	60		

Calibration Accidents Economics Bypass Run

	Peak 60min Results	Bypass Type	Flow Rate (veh/hr)		Opp Rate (veh/hr)		Capacity (veh/hr)		Ave VCR		Ave Del (sec/veh)		Max Q (veh)		Max Q95% (veh)		LOS A-F			
			Entry	Bypass	Entry	Bypass	Entry	Bypass	Entry	Bypass	Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Entry	By	Leg
1	SB-Genesee Road	None	441		198		1118		0.3946		8.22		8.22	0.80		2.06		A		A
2	EB-Lapeer Road	None	248		409		994		0.2495		7.01		7.01	0.40		1.04		A		A
3	NB-Genesee Road	None	340		321		1043		0.3261		7.69		7.69	0.59		1.53		A		A
4	WB-Lapeer Road	None	234		368		1015		0.2305		6.68		6.68	0.36		0.93		A		A
All	Intersection												7.56							A

Results 60 Results 15 Int / Slope - 60 Int / Slope - 15 Economics Global Results

Intersection
 Lapeer Road and S. Genesee Road

Opinion of Probable Cost By: Rowe PSC
Date: 5/24/2021

PAY ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	AMOUNT
Mobilization (10%)	1	LSUM	\$99,500.00	\$99,500.00
Sidewalk, Rem	24	Syd	\$10.00	\$240.00
Pavt, Rem	6700	Syd	\$10.00	\$67,000.00
Curb and Gutter, Rem	1385	Ft	\$10.00	\$13,850.00
Embankment, CIP	3000	Cyd	\$15.00	\$45,000.00
Excavation, Earth	2000	Cyd	\$10.00	\$20,000.00
Aggregate Base	2500	Ton	\$21.00	\$52,500.00
Shoulder, CI II	130	Ton	\$25.00	\$3,250.00
HMA, 4E10	700	Ton	\$85.00	\$59,500.00
HMA Approach	175	Ton	\$50.00	\$8,750.00
Conc Pavt, Nonrein, 9 inch	3000	Syd	\$45.00	\$135,000.00
Joint, Contraction, Cp	3000	Ft	\$10.00	\$30,000.00
Joint, Expansion, E2	200	Ft	\$25.00	\$5,000.00
Joint, Expansion, E3	1300	Ft	\$15.00	\$19,500.00
Curb and Gutter, Conc, Det B1	2200	Ft	\$25.00	\$55,000.00
Curb and Gutter, Conc, Det D1	220	Ft	\$25.00	\$5,500.00
Curb, Conc, Det E1	100	Ft	\$25.00	\$2,500.00
Sidewalk, Conc, 4 inch	220	Sft	\$5.00	\$1,100.00
Conc Pavt, Decorative Colored, 9 inch	6000	Sft	\$12.50	\$75,000.00
Turf Establishment, Performance	5000	Syd	\$5.00	\$25,000.00
MOT	1	LSUM	\$70,000.00	\$70,000.00
Pavement Markings	1	LSUM	\$15,000.00	\$15,000.00
Signing	1	LSUM	\$20,000.00	\$20,000.00
Drainage	1	LSUM	\$100,000	\$100,000.00
TOTAL				\$928,190

CONTINGENCY (20%)	\$185,638.0
ESTIMATED TOTAL CONSTRUCTION COST (YEAR 2021)	\$1,113,828.0
<i>3% ANNUAL INFLATION 2021 TO 2025</i>	\$139,795.23
ESTIMATED TOTAL CONSTRUCTION COST (YEAR 2025)	\$1,253,623.23

* Notes

6" Agg base used for driveways and shoulders, 8" used for roadway, 12" used for islands (10% of total added)
 Asphalt shoulder gravel thickness was calculated using a 5" depth
 Assumed 5" HMA thickness for approach and 8" thick for HMA roadway

B1 curb was calculated by adding the splitter islands along with the roadways, minus the radius for the roundabout
 E1 curb was calculated for the inner roundabout curb
 E2 joint expansion was calculated for the outer radius of the roundabout

E3 joint expansion was calculated using the radius of curves from the B/C of the roundabout and splitter islands
 D1 curb was calculated for the truck apron
 Drainage includes enclosed storm for all curbed areas, spillways, and underdrain

MOT taken as approximately ~8% of total before mobilization; based on previous roundabout projects
 ROW acquisition costs not included
 Joints assumed for central island/splitter islands

Pavement and curb removals include the assumption the south east island at the intersection will be removed.

NUMBER OF CRASHES OR INJURED PERSONS.

YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
2015	2016	2017	2018	2019

Fatal and A-Injury Reduction	%REDUCTION	78%	Roundabout		
Number of Crashes	0	0	0	0	1

A-Injured or Killed Persons	0	0	0	0	1
-----------------------------	---	---	---	---	---

Minor Crash Reduction	%REDUCTION	57%	0		
Number of Crashes	0	0	0	0	23
	0	0	0	0	20
	0	0	0	0	2

	%REDUCTION	0%			
Number of Crashes	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
A-Injured or Killed Persons	0	0	0	0	0

	%REDUCTION	0%			
Number of Crashes	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
A-Injured or Killed Persons	0	0	0	0	0

	%REDUCTION	0%			
Number of Crashes	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
A-Injured or Killed Persons	0	0	0	0	0

# of A-injuries:	1	For reference only
# of Fatalities:	0	For reference only; "Q" accounts

		for the risk of a fatality.
PROJECT COST ESTIMATE :	\$1,253,623	If unknown, enter "0" (zero).
ADTb (before-volume)	1.0	You may change these
ADTa (after-volume)	1.1	default ADT values.
# OF YEARS OF DATA:	5.00	3 to 5 years should be used.
RATE OF INFLATION:	2.50%	
AREA TYPE:	Urban	"Rural", "Urban", or "Between"

REMARKS:

Lapeer Road and Genesee Road
 Genesee County Roundabout Study
 1495003, 1520305
 3.5075757, 4.5148824
 Roundabout

COMPUTED BENEFITS DERIVED THROUGH CRASH REDUCTION

TOR 2021

Date **9-Jul-21**

Project: **Lapeer Road and Genesee Road**

City/Twp. **City of Burton**

Prepared By: **ROWE Professional Services Company**

County **Genesee County**

PR: **1495003, 1520305**

PR MP Range: **3.5075757, 4.5148824**

The method of evaluating crash costs, used below, is given on page 67 of Roy Jorgensen's report of Highway Safety Improvement Criteria, 1966 edition. This same method is given in the Bureau of Public Roads IM21-3-67. In 1994 we have adapted the Q formula to blend Fatalities and A-injuries only.

In the following analysis the costs provided by the National Safety Council are :

2019 NSC VALUES:

Death	\$1,659,000	=FATCOST
Disabling (A) injury:	\$96,200	=ACOST
B-injury:	\$27,800	=BCOST
PDO and/or Minor Injury Crash:	\$12,200	=PDOCOST

$$BTOTAL = ADTa / ADTb \times [(Q \times R1) + (BCOST \times R2) + (PDOCOST \times R3)]$$

WHERE:

BTOTAL =	Total Benefit in Dollars Over Years Used	\$459,320
ADTa =	Average traffic volume after the improvement	1.1
ADTb =	Average traffic volume before the improvement	1.0
R1 =	Reduction in fatalities and A-Injuries Combined.	0.8
R2 =	Reduction in B-Injury crashes:	1.1
R3 =	Reduction in PDO and C-injury crashes:	11.4
Q =	$[FATCOST + ((I/F) \times INJCOST)] / [1 + (I/F)]$	
=	$[1,659,000 + (6.10 \times 96,200)] / [1 + 6.10]$	\$316,400
	for AREA TYPE "Urban"	
I/F =		6.10

Q-Reference	Q	A-Injuries	Fatalities	I/F
RURAL	\$363,900	6,072	1,255	4.84
URBAN	\$316,400	9,902	1,624	6.10
BETWEEN	\$334,900	15,974	2,879	5.55

Data from Safety Programs Unit
5-Year Statewide Non-Trunkline Crash Figures Used.
(*From 1-1-2015 Through 12-31-2019).

Time of Return (T.O.R.) is based on 5 years of data.

NOINFB = No-Inflation Annual Benefit = BTOTAL / years \$91,864

With an inflation rate of 2.50%

B = Annual Benefit = Present Value (with Inflation) \$117,594

C = Project Cost \$1,253,623

TOR = C / B = COST / ANNUAL BENEFIT = **10.66**

H. Lapeer and S. Genesee

1. [2045 AM Peak Hour No Build](#)
2. [2045 PM Peak Hour No Build](#)
3. [2045 AM Peak Hour Roundabout](#)
4. [2045 PM Peak Hour Roundabout](#)