

As part of the York Village Master Plan Study a review of the existing conditions of the study area roadway network was performed. As part of this study a thorough examination of the roadway and traffic characteristics was performed for the project study area. This included a review of: existing traffic control at intersections, intersection lay-out and lane-widths; posted speeds, traffic volumes, accident data, intersection sight distances and traffic operations.

The collection of roadway and traffic data was a key component in this phase of the design process. This data helped to educate and inform us all as we considered design options to meet the goals and objectives of this project.

The following topics are addressed in this chapter:

- 2.1 Study Area - Intersections
- 2.2 Study Area - Streets
- 2.3 Study Intersection Traffic Control
- 2.4 Safety/Accident Data
- 2.5 Intersection Sight Distances
- 2.6 Other Safety Concerns
- 2.7 Traffic Counts - Vehicles, Bicycles and Pedestrians
- 2.8 Alternatives Analysis – Rationale for Improvements
- 2.9 Alternatives Analysis – Traffic Operations
- 2.10 Alternatives Analysis – Process and Decisions
- 2.11 Preliminary Recommendations

2.1 STUDY AREA - INTERSECTIONS

The overall project study area included the following intersections.

1. Route 1A (York Street) at Long Sands Road
2. Route 1A at Lindsay Road & Town Hall Drive
3. Route 1A at Lindsay Road #2 & Town Hall Drive
4. Route 1A at Hospital Drive
5. Route 1A at Williams Avenue
6. Long Sands Road at Public Library Drive
7. Long Sands Road at Woodbridge Road

Below is an aerial view of the general York Village Study area.



2.2 STUDY AREA - STREET

York Street (Route 1 A) is a two-lane roadway traversing generally from north to south through the York Village area of the town. It is classified as a major urban collector by Maine DOT. The posted speed limit on this long this section of York Street is 25 mph and available Maine DOT Average Daily Traffic counts indicates there are approximately 12,000 vehicles on this section of York Street. This section of York Street serves as a connection from Route 1 and Interstate 95 to York Harbor and coastal and beach destination.

Long Sands Road: Long Sands Road is a two-lane roadway traversing generally from west to east that connects the York Village area to schools to the east and also to the Long Sands Beach area. It is classified as a minor collector by Maine DOT. The posted speed is 25 mph and available Maine DOT Average Daily Traffic counts indicate there are 6,500 vehicles on this section of Long Sands Road.

2.3 STUDY INTERSECTIONS – TRAFFIC CONTROL

1. Route 1A (York Street) at Long Sands Road: This functions as an atypical complex triangular intersection. There is stop control on the Long Sands approaches to York Street and free-flow traffic on both York Street approaches. The right-turn movement from York onto Long Sands is controlled with a Yield sign. The intersection is comprised of three minor intersections. This causes the intersection to be complex, with lack of clarity and confusion of driver movement. In addition the angles of the three major road approaches can make it unclear to drivers as to which movements should be free flowing and which are stop-controlled.

York Street at Long Sands Road



- 1. Route 1A at Lindsay Road & Town Hall Drive:** This intersection functions with free flowing single lane traffic on York Street and Lindsay Road as an ingress only (in-only).
- 2. Route 1A at Lindsay Road #2 & Town Hall Drive:** This intersection functions with free flowing single lane traffic on York Street and Lindsay Road #2 as egress only (out-only). There is stop-control on the Lindsay Road #2 approach.
- 3. Route 1A at Hospital Drive:** This intersection functions with free flowing single lane traffic on York Street. The Hospital entrance functions as ingress only (in-only).
- 4. Route 1A at Williams Avenue:** This “T” intersection functions with free flowing single lane traffic on York Street and stop-controlled single lane traffic on Williams Avenue.
- 5. Long Sands Road at Public Library Drive:** This “T” intersection functions with free flowing single lane traffic on Long Sands Road and stop-controlled single lane traffic on the Library entrance driveway.
- 6. Long Sands Road at Woodbridge Road:** This “T” intersection functions with free flowing single lane traffic on York Street and stop-controlled traffic on Woodbridge Road.

2.4 SAFETY/ACCIDENT DATA

Accident data was collected for each of the study intersections and evaluated. This was done to determine if any of the intersections were considered to be high crash locations by Maine DOT or if there were any significant accident patterns.

Accident Data from Maine DOT was reviewed for the study area intersections. The overall review indicated that 1 of the intersections was considered to be a high crash location by Maine DOT. Maine DOT considers intersections to be a high crash location (HCL) if it experiences 8 or more accidents in a three-year period and it has a critical rate factor (CRF) of greater than 1.0. This intersection was identified as York Street at its intersection with Long Sands Road. This intersection experienced eight accidents during the time period of 2011 – 2013, and had a CRF of 1.51. A further breakdown of the accidents at this intersection revealed the following:

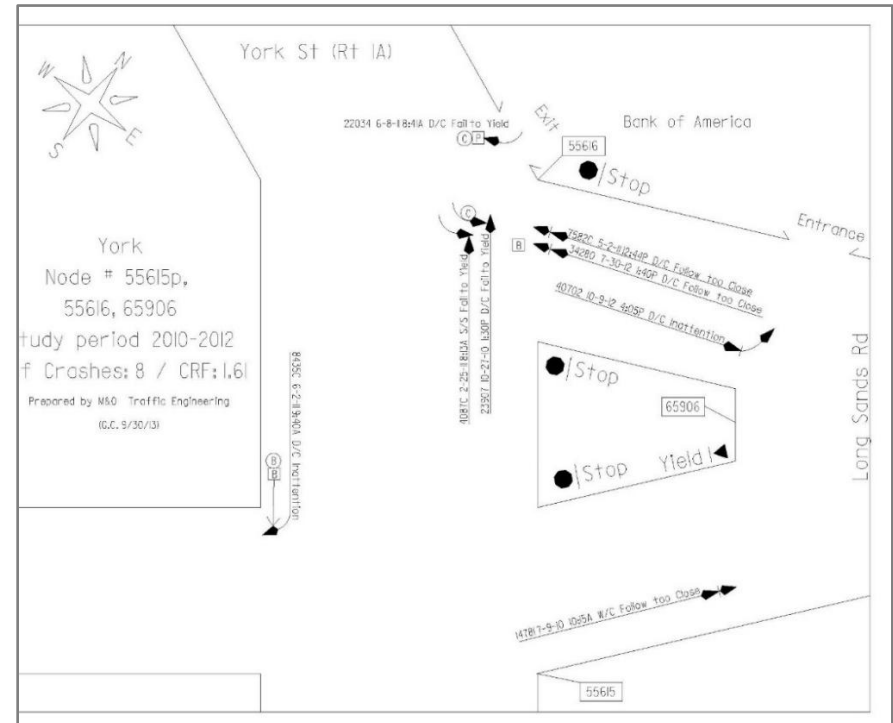
York Street at Long Sands Road (MDOT Nodes 55615 - 16, 65906)

- 8 accidents; 2 in 2011, 4 in 2012, and 2 in 2013.
- Dates of accidents: February – 1 accident, May – 1 accident, June – 2 accidents, July – 2 accidents, October – 2 accidents
- The primary accident patterns included; 4 rear-end/sideswipe type, 2 intersection movement type, 1 pedestrian and 1 bicycle.
- An accident diagram is included for the intersection at the end of this memo.
- 3 out of 8 accidents produced injury, other 5 only property damage.
- Accidents by day of the week; Monday – 2, Tuesday - 1, Wednesday – 2, Thursday – 1, Friday – 2.
- All accidents during daylight hours; 7 in clear conditions and 1 in snow conditions.

An accident diagram for the intersection has been previously prepared by Maine DOT and is included for informational purposes.

Figure 1 - Maine DOT Accident Diagram

York St at Long Sands Road (MDOT Nodes 55615, 55616, 65906)



It should be noted that two of the accidents were rear-end type at the Long Sands Road approach to York Street. Additionally, two other accidents involved vehicles turning left onto Long Sands Road from the York Street southbound approach striking vehicles heading northbound on York Street.

Accident Summaries for the remaining study intersections for the time period (2011-2013) follow:

Lindsay Rd #1 at York Street (MDOT Node #55618)

1 accident; 1 intersection movement; date: 5/2011

Lindsay Road #2 at York Street (MDOT Node #55617)

1 accident; rear-end/sideswipe; date: 6/2010

Williams Avenue at York Street (MDOT Node #55614)

2 accidents; 1 rear-end/sideswipe, 1 intersection movement; dates: 1/2010 & 9/2012

Woodbridge Road at Long Sands Road (MDOT Node #56072)

5 accidents, 1 rear-end/sideswipe, 3 intersection movement 1 off-road; dates: 6/2012, 7/2010, 10/2010, 11/2011, 12/2011.

2.5 INTERSECTION SIGHT DISTANCES

A review of intersection sight distances at each of the study intersections. This was completed based on a posted speed of 25 mph. Maine DOT requires a minimum intersection sight distance (ISD) of 200 ft. Intersection sight distances were checked from each of the study intersection. Based on a 25 mph posted speed limit, Maine DOT requires minimum of 200 ft. of sight distance. We have noted intersections where there was sight distance less than 200 ft. These include:

- **Long Sands Road Looking Left onto York Street**
- **Looking Left from Town Hall Driveway**
- **Looking Left from Library Access onto Long Sands Road**
- **Looking Left from Gas Station/Convenience Store Drives**
- **On-street Parking Restricts Sight Distance Looking Left**
- **Looking Right from Williams Avenue onto York Street**
- **Looking Left from Woodbridge road onto Long Sands Road**

Photographs showing these identified issues follow:

1. Long Sands Road Looking Left onto York Street



Signs Clutter Sight Distance View Looking Left

2. Looking Left from Town Hall Driveway (Opposite Lindsay Rd #2)



On-street Parking Restricts Sight Distance & Utility Pole Obstructs

3. Looking Left from Library Access onto Long Sands Road



On-street Parking Restricts Sight Distance Looking Left

4. Looking Left from Gas Station/Convenience Store Drive 1



On-street parking restricts sight distance

5. Looking Left from Gas Station/Convenience Store Drive 2



Grade difference and on-street parking restricts sight distance

6. Looking Right from Williams Avenue onto York Street



On-street Parking Restricts Sight Distance Looking Right

7. Looking Left from Woodbridge Road onto Long Sands Road



Location of stop bar combined with existing vegetation along south side of Long Sands Road restricts sight distance

2.6 OTHER SAFETY CONCERNS

Additional safety concerns were identified related to fixed objects exposed to traffic. The following two photographs show examples of this. As part of the design solutions, the issues should be addressed.

1. Looking West on Long Sands Road



Looking North on Long Sands Road – Unprotected Utility Poles

2. Looking East on Long Sands Road



Looking South on Long Sands Road – Utility Pole Close to Travel-way

2.7 TRAFFIC VOLUME DATA (Vehicles, Bicycles, Pedestrians)

Collection of vehicle turning movement data including bikes and pedestrians was completed at the study intersections. This was completed on a weekday and Saturday in August; specifically on Tuesday August 12th and Saturday August 16th 2014, these are shown on sheet 1 of 7 at the end of this section. This was done to capture traffic conditions which represent summertime peak conditions in York. These traffic counts were adjusted for the horizon design year of 2035. This was accomplished by increasing the 2014 traffic counts with a background growth rate of 0.5% per year; these traffic volumes are shown on sheet 2 of 7. All of the traffic volume Figures (1 – 7) are shown in the appendix section to this chapter.

Additional design data was extracted from the traffic counts, this included a breakdown of larger trucks. This information would be utilized as part of the design process to ensure intersections were designed to accommodate larger trucks and their turning movements. This information is shown on sheets 3 of 7 (2 or 3 axle trucks) and 4 of 7 (tractor trailers). The bicycle and pedestrian traffic counts are shown on sheet 5 of 7.

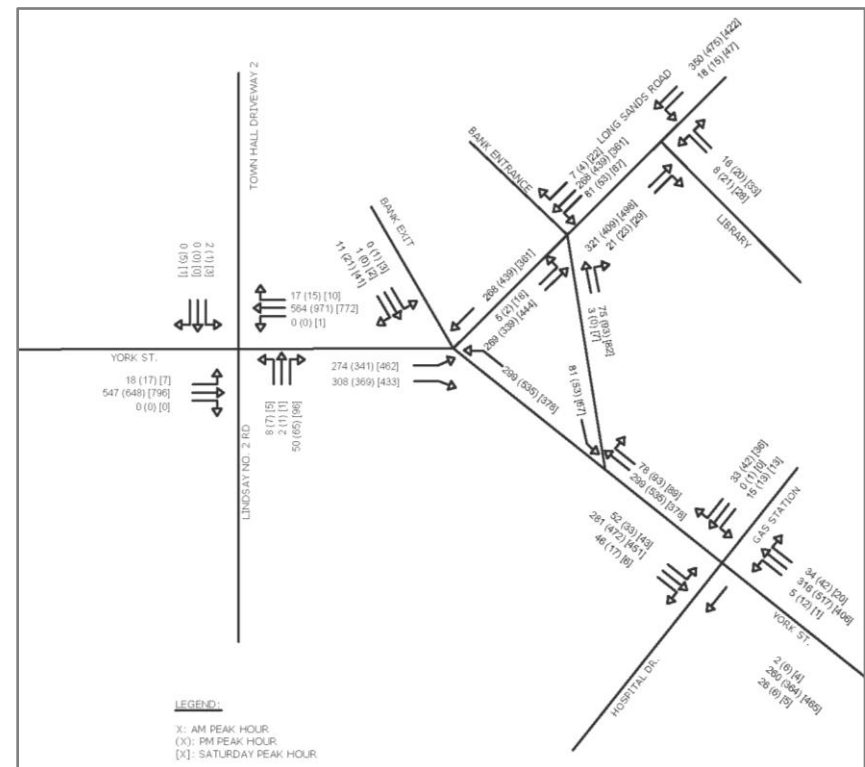
Some items to note from a review of the traffic counts included:

- Of the 3 time periods counted, the Saturday peak hour was the highest, followed closely by the weekday PM peak hour. Based on the traffic counts, we identified the weekday AM peak hour to be 8 to 9AM; the PM peak hour to be 4:30 to 5:30PM; and the Saturday peak hour to be 11 AM to Noon. These traffic volumes are shown on sheet 1 of 2 at the end of this memo.
- Heavy left-turn movement from York Street onto Long Sands Road (AM - 274, PM - 341, Sat - 462). This would tend to

confirm the need for some form of left-turn treatment ranging from a bypass lane to formal turn lane.

- Overall traffic volumes are fairly high for only 1 travel lane in each direction in an area with a high number of side-streets, driveways and on-street parking.
- The Bike and Pedestrian Volumes were highest on Saturday. These combined bike and pedestrian counts are shown below.
- All of the traffic volume Figures (1 – 7) are shown in the appendix section to this chapter.

Figure 2 – August 2014 Peak Hour Traffic Volumes



A summary of the overall goals and objectives of the project from a traffic operations and bike, pedestrian and vehicular safety perspective include:

1. Create a complete streets design throughout study area to balance and create multimodal infrastructure and design elements for bikes pedestrians, and vehicles. Bicycle and Pedestrian elements may include; bike lanes, clearly defined crossing, areas, markings and curbing to separate modes, additional and wider sidewalk/multi-use path areas.
2. Clarify and Simplify Intersection
3. Decrease overall footprint of intersection
4. Improve sightlines
5. Address safety issues (reduce accidents)
6. Provide traffic calming and reduce speed
7. Improve existing congestion and delay issues currently experienced by vehicular traffic
8. Balance congestion and delay improvements with providing multimodal design elements and reducing intersection footprint
9. Ensure design and layout of intersection accounts for larger trailer trucks and Town Fire and Emergency vehicles.

2.9 ALTERNATIVES ANALYSIS – TRAFFIC OPERATIONS

One of the major components of the rationale for improvements to the intersection was to perform traffic operations analysis for potential design alternatives. This involved utilizing our traffic volumes data that was collected. When performing traffic operations analysis we typically look at two key traffic condition indicators, these include; level-of-service (LOS) and congestion which is expressed in queue lengths. LOS is “graded” based on a

scale similar to academic grades, where traffic conditions are assigned a grade from “A” to “F” based on the average delay.

Traffic operations analysis for the weekday PM and Saturday peak hours as they were both higher traffic volume time periods than the weekday AM peak hour. The initial traffic analysis for this phase of the project was focused on the central intersection of York Street at Long Sands Road. Alternative intersection designs were evaluated utilizing the 2035 summer design year condition traffic volumes. During the evaluation process of different intersection design alternatives, once we had focused our analysis on the two remaining design alternatives we also evaluated the alternatives utilizing the 2015 summer traffic volumes. The analysis was performed with the *Synchro/Simtraffic* traffic modeling software. The modeling yields results that indicate:

1. Level of Service (LOS), which is summarized in terms of overall average delay for the intersection and individual movements
2. Queuing (including average and 95th percentile). Typically, the 95th percentile queues are utilized for design purposes

LOS is a measure used by transportation engineers to determine the effectiveness of elements of transportation infrastructure. The *Highway Capacity Manual* defines LOS for unsignalized intersections as a function of the average vehicle delay. The following table indicates the delay (in seconds) with letter designations ranging from A to F. LOS A represents the best operating condition, and LOS F represents the worst operating condition. Table 2 on the next page gives a description of LOS grades for unsignalized intersections.

TABLE 2
LOS and Delay Designation

LOS	Unsignalized Intersection
A	≤ 10 sec
B	10-15 sec
C	15-25 sec
D	25-35 sec
E	35-50 sec
F	≥ 50 sec

2.10 ALTERNATIVES ANALYSIS – PROCESS & DECISIONS

During this phase of the York Village project we started by reviewing and analyzing six (6) different design layouts for the York Street at Long Sands Road Intersection. Each of the alternatives were analyzed and compared to each other based on how each addressed the deficiencies noted in the existing intersection layout and operations and how they met the goals.

The six initial alternatives analyzed included:

1. Alternative 1A – Monument Garden
2. Alternative 1B – Village Park
3. Alternative 2 – “Y” Concept
4. Alternative 2 – York Tee
5. Alternative 4 – Long Sands Tee
6. Alternative 5 – Four-Way Concept

These alternatives were screened and reviewed by our team and at two meetings with the Village Study Committee. It was felt that the best alternatives that should continue to be studied and analyzed in more detail included:

1. “Y” Concept
2. York Tee
3. Long Sands Tee

These were chosen because they best addressed all of the goals and objectives and existing deficiencies of the current intersection layout balanced against the overall footprint of the intersection and its ability to provide opportunities for pedestrians, bicyclist, safety improvements, and to create opportunities for greenspace .

Initial conceptual sketches were prepared for each of the preferred alternatives, these are shown below:

1. “Y” Concept



2. York Tee



3. Long Sands Tee



Each of the chosen alternatives specifically made improvements and addressed the goals and objectives listed below:

1. Clarify and Simplify Intersection
2. Decrease overall footprint of intersection
3. Improve sightlines
4. Address safety issues (reduce accidents)
5. Provide traffic calming and reduce speed

As can be seen in the initial concept sketches, each reduces the overall footprint of the intersection while at the same time creates opportunities to address the additional goals and objectives; such as:

- Create a complete streets design throughout study area to balance and create multimodal infrastructure and design elements for bikes pedestrians, and vehicles. Bicycle and Pedestrian elements may include; bike lanes, clearly defined crossing, areas, markings and curbing to separate modes, additional and wider sidewalk/multi-use path areas.
- Improve existing congestion and delay issues currently experienced by vehicular traffic
- Balance congestion and delay improvements with providing multimodal design elements and reducing intersection footprint
- Ensure design and layout of intersection accounts for larger trailer trucks and Town Fire and Emergency vehicles.

Each of these alternatives were then further analyzed with a preliminary traffic operations analysis to determine, level-of-service (LOS), Average Delay by Approach, and Congestion via calculation of average and 95th percentile queue lengths. The alternatives were

analyzed utilizing the 2035 design traffic volumes previously developed. Each of these alternatives was analyzed with proposed improvements; i.e., turn lanes. For the “Y” concept and York “Tee” concepts, these were analyzed with a proposed left-turn lane on both the Long Sands Road approach and the York Street southbound approach. For both of these alternatives the minor Street was designed to be the Long Sands Road approach which would be controlled via a stop sign. The other two approaches would be “free flowing.” The Long Sands “Tee” was analyzed with a right-turn lane on the York Street northbound approach. For this alternative the minor street was designed to be the York Street northbound approach, with the Long Sands Road and York Street southbound approaches being “free flow.” The results of the analysis are shown below.

TABLE 3 - Traffic Operations Analysis

	“Y” Concept	York Tee	Long Sands Tee
Unsignalized	LOS / Average Delay(s) / 95 th % Queue (ft)		
Overall	E/42	E/39	D/30s
York St SB	B/11/240	A/10/210	A/3/ 30
York St NB	A/3/40	A/3/30	F /172/250
Long Sands Rd SB	F/128/700	F/119/630	A/8/290

As of a result of this analysis and review and discussion with the York Village Study Committee, it was felt that the “Y” and “York Tee” concepts should continue to be evaluated as a potential intersection layout.

The Long Sands Sands Tee concept was eliminated from consideration primarily because it would result in significantly higher delay on the on the York Street northbound approach. Additionally, it would change the intersection layout and operations more significantly than the other two alternatives. Today the York Street northbound approach is “free flowing,” however under the Long Sands Tee concept this would become a minor approach with

stop control. Due to the heavy free-flowing volumes on the other two approaches with this concept, the difficulty and delay experienced by vehicles attempting to exit the York Street northbound approach would more significant than the other concepts cause on their minor street stop controlled approach and could lead to motorists taking chances to exit and potentially causing accidents.

Once the York Tee and “Y” concept were selected for further review it was felt that we may need to provide additional traffic analysis conditions to assist in educating and informing the decision making process as to which alternative would serves the goals and objectives best.

To this end we analyzed them remaining under two additional conditions:

1. **2015 Summertime Peak Condition**
2. **2035 Off-Peak (Non-Summer) Condition**

We also analyzed the Saturday Peak Hour time period in addition to the weekday PM peak hour time period that had been utilized up to this point.

Detailed traffic operations tables are provided in the appendix, in section 4, to this chapter. A summary table for the results of the analysis based on overall intersection performance is provided here.

TABLE 4 - Traffic Operations Analysis

Unsignalized	Overall Intersection Performance [LOS / Average Delay(sec)]	
	York Tee	“Y” Concept
2015 Summer PM Peak Hr	B / 14	C / 17
2015 Summer Sat Peak Hr	B / 11	B /10
2035 Summer PM Peak Hr	E / 39	E / 42
2035 Summer Sat Peak Hr	C / 24	C / 19
2035 Off-Peak PM Peak Hr	A / 4	A / 6

The results of this analysis indicated that generally both of the alternatives will operate similarly from an overall traffic operations (LOS, Delay and Queues) perspective. The York Tee concept does tend to operate slightly better when particular approaches are reviewed. Due to the similar traffic operations results we discussed and reviewed with the York Village Study Committee, Town Emergency staff and the public additional considerations which would inform our.

We analyzed the layout of both the “Y” concept and York Tee. Preliminary design sketches of these alternatives are shown here.

York “Y” Concept
Not to Scale



York Tee Concept
Not to Scale



From an intersection layout perspective the York Tee was preferred over the “Y” concept layout. The York Tee is a more typical intersection layout where the minor street (in this case Long Sands Road) intersects the major street (York Street) at a 90 degree angle. The benefits of the York Tee layout included:

- Balancing the priority of all vehicle movements at the intersection better than the “Y” concept.
- Providing a simpler intersection for motorists, pedestrians and bikes.
- Providing better clarity for priority of movements and motorists right-of-way.
- Balancing the angle of ingress and egress movements between York Street and Long Sands Road which will benefit motorists and the larger emergency vehicles that typically utilize this intersection.

Further Balancing the Preferred Intersection Layout - At this point in the study the York Tee was the preferred alternative. In an effort to further balance the traffic operations of this chosen alternative with other project goals, some of which included; decreasing the footprint of the intersection, provide more room to provide pedestrian and bicycle elements, provide additional room for greenspace and gathering areas and create a sense of place, providing formal bypass lanes on the York Street southbound approach and the Long Sands approach in lieu of formal left-turn lanes was considered.

A benefit from the bypass concept layout was that four feet of roadway width would be removed from both the York Street southbound and Long Sands Road approaches. The additional four feet could then be utilized for sidewalks, bikes, or green space, etc. The formal turn lane concept would require an 11 ft. travel lane and a 10 ft. left-turn lane. The bypass arrangement would require an 11 ft. travel lane and a 6 ft. bypass area. In total the bypass arrangement would provide 17 ft. of pavement width compared to the 21 ft. required with formal left-turn lanes.

The traffic operations would not function quite as well from a delay and queueing perspective but would still be satisfactory. Generally a passenger car could utilize the bypass lane to pass a vehicle stopped to turn left, however if the vehicles were larger or one was a tractor trailer type vehicle then the bypass lane may not function as well. When this was balanced against the greater goals of the project it was decided at this point that the York Tee concept with formal bypass lanes would be the preferred intersection layout option. This was supported by the York Village study committee, the public, stakeholders, and Town staff.

2.11 RECOMMENDATIONS

The recommendations stated here are based on the traffic operations analysis that was performed and discussed in this chapter, in addition to review and input from the York Village Study Committee, stakeholders, the public and staff from the Town of York. The consensus was that the **York Tee concept** with formal bypass lanes provided on the York Street southbound and Long Sand Road approaches would best address in a balanced manner the overall goals and objectives of the York Village Master Plan efforts. A final preliminary design sketch is provided below of the chosen York Tee concept. This conceptual layout will next need to be further, vetted, developed and designed in future phases of the York Village Master Plan project.

York Tee Concept with Formal Bypass Lanes

Not to Scale

