4.0 Intersection Alternatives

4.1 Design Criteria

Table 2 presents the applicable design criteria for this intersection and each of its approaches. Main Street and the Causeway (US Route 5) in Newport City are both classified by VTrans as an urban principal arterial. Because both Main Street and the Causeway are part of the state and federal route system, they are also Class 1 town highways. Railroad Square, which is a federal aid urban street and a Class 2 town highway, is classified as an urban collector. The design criteria shown in Table 2 are largely determined by these classifications.

Future traffic annual average daily traffic volumes (AADT)) were estimated using an urban area growth factor of 1.10 for projecting traffic volumes from 2006 to 2030. From that, corresponding future design hour volumes (DHV) were estimated using a K-factor (DHV/ AADT ratio) of 10.4%. By definition, the DHV is the 30th highest hour of traffic that occurs annually, and is used to determine the capacity and corresponding level of service on highways and intersections.

Table 2 - Design Criteria

Parameter	Main Street	Causeway	Railroad Square
Design Year	2030		
Design Vehicle	WB-67		
2030 AADT (vpd)	17,600	12,500	6,500
2030 DHV (vph)	1,830	1,300	680
Design Level of Service	LOS D for two-way stop controlled, LOS C otherwise		
Design Speed	25 mph		
Safe Stopping Sight Distance (ft)	150		
Intersection Sight Distance (ft)	275		
Travel Lane Width (ft)			
Minimum	11	11	10
Existing	12	12	11
Proposed	12	12	11
Shoulder Width (ft)			
Min. w/ Bicycles	2	2	2
Min. w/o Bicycles	2	2	2
Existing	2	1	1
Proposed	2	2	2
Clear Zone (ft)			
w/ Vertical Curb	1.5	1.5	1.5
w/o Vertical Curb	10	10	10

4.2 Alternatives

Based on the existing issues and conditions, three alternatives were identified for further evaluation. They are:

- Alternative A - Signalization,
- Alternative B - Roundabout, and
- Alternative C - One-Way Traffic Circulation

Alternative A- Signalization

This alternative includes installing a traffic signal at this intersection. The Alternative A plan is shown in Figure 5.

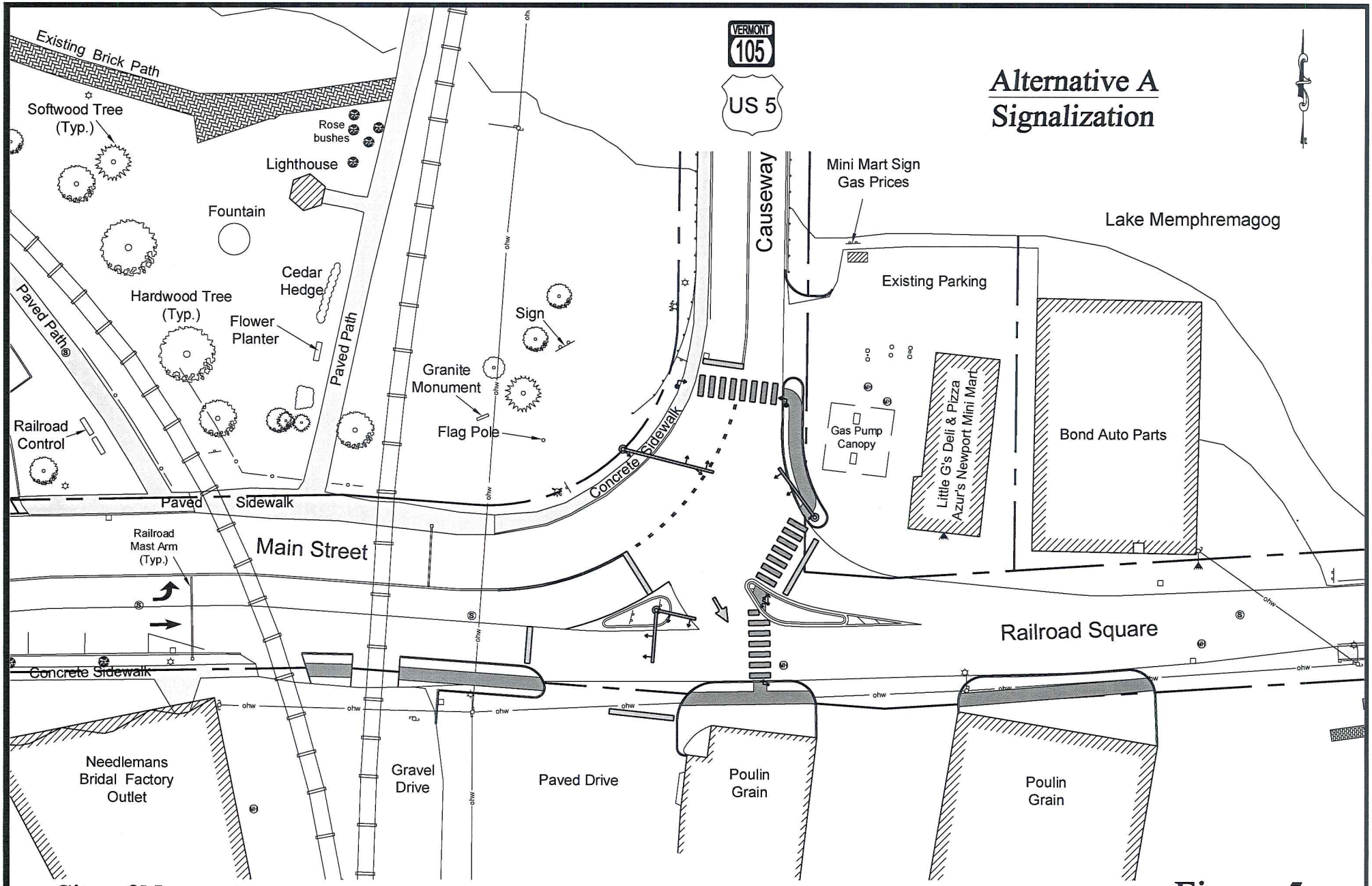
The proposed Alternative A improvement includes the following features:

- Adds a traffic signal that includes a pedestrian phase for protected pedestrian crossings
- Provides protected pedestrian crossings on the north, east and south approaches.
- Maintains the existing channelized islands and lane geometry.
- Provides access management and sidewalks across the frontage of the Azur's and Poulin Grain parcels.
- Provides for reduced delays and queuing for Railroad Square traffic.
- Has limited right-of-way, drainage and utility impacts.

Analyzing the future operation at this intersection under 2030 peak hour volumes with a traffic signal indicates that the overall level of service would improve to B during both morning and afternoon time periods. This alternative also maintains a minimum level of service C on each approach. Table 3 summarizes the anticipated performance of this intersection under traffic signal control.

Table 3 - 2030 Signalized Intersection Performance

Parameter	Main Street	Causeway	Railroad Sq.	Overall
AM Peak Hour				
Avg. Delay (sec/veh)	12.2	12.6	26.0	14.0
LOS	B	B	C	B
v/c ratio	0.47	0.51	0.53	0.44
95% Max. Queue (ft)	253	276	141	--
DHV (PM Peak Hour)				
Avg. Delay (sec/veh)	12.9	21.1	25.8	17.5
LOS	B	C	C	B
v/c ratio	0.51	0.81	0.51	0.63
95% Max. Queue (ft)	273	632	137	--



City of Newport

Figure 5

GRAPHIC SCALE

50 0 25 50 100

(IN FEET)

1 inch = 50 ft.

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Several concerns are also associated with this alternative. The first is that operating this as a signalized intersection will create additional queuing on the Main Street and Causeway approaches; compared to existing conditions. Queuing on Main Street is of particular concern due to the proximity of the existing railroad crossing located less than 100 ft to the west. This could be alleviated, however, by linking the railroad crossing signals with the traffic signal so that eastbound Main Street traffic would be released upon on the approach of a train. This feature is known as railroad preemption.

The second concern is that queuing on the Causeway and Railroad Square approaches created by signalized operation will make it more difficult for vehicles to make left-turns entering and exiting Azur's Convenience Store. The last concern is balancing improved access management and pedestrian safety along the south side of Railroad Square with the need to maintain adequate truck access for Poulin Grain.

Alternative B - Roundabout

This alternative consists of a single lane roundabout at this intersection. The Alternative B plan is shown in Figure 6.

The proposed Alternative B improvement includes the following features:

- Provides a single lane roundabout that offers a much improved gateway to the City's downtown.
- Provides pedestrian crossings on the north, east and south approaches.
- Provides access management and sidewalks across the frontage of the Azur's and Poulin Grain parcels.
- Provides for reduced delays and queuing for Railroad Square traffic.

An analysis of the future operation of a roundabout at this intersection under 2030 peak hour volumes was performed using draft *Highway Capacity Manual* procedures[7, 8]. The results of these analyses indicate that a single lane roundabout will be able to maintain level of service C or better on each approach. Table 4 summarizes the anticipated performance of this intersection with this alternative.

Table 4 - 2030 Roundabout Performance

Parameter	Main Street	Causeway	Railroad Sq.
AM Peak Hour			
Avg. Delay (sec/veh)	15.9	8.5	7.2
LOS	C	A	A
v/c ratio	0.82	0.55	0.29
95% Max. Queue (ft)	263	97	34

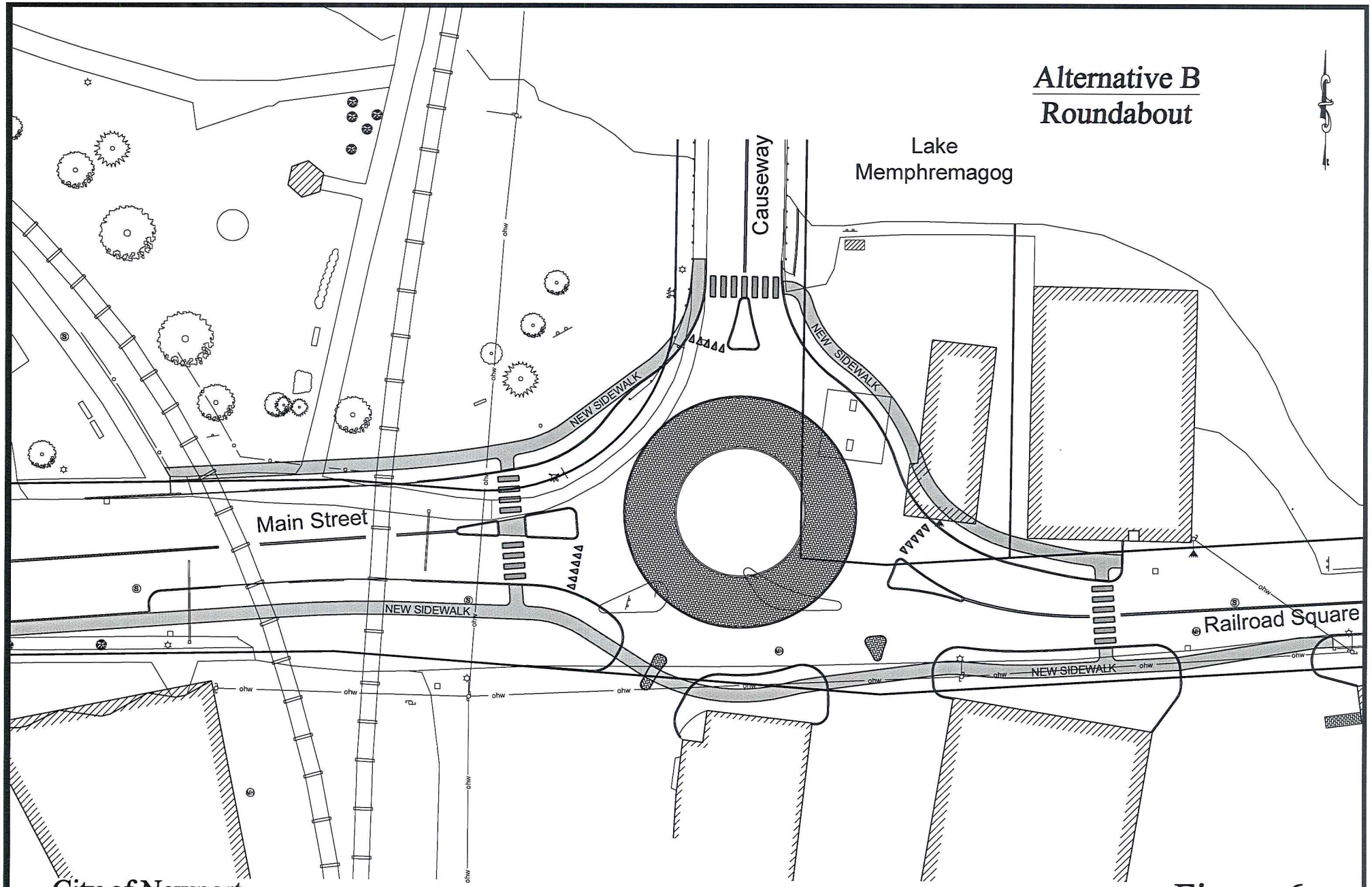

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Figure 6

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Parameter	Main Street	Causeway	Railroad Sq.
DHV (PM Peak Hour)			
Avg. Delay (sec/veh)	19.7	20.2	7.4
LOS	C	C	A
v/c ratio	0.86	0.84	0.28
95% Max. Queue (ft)	319	265	31

Although a roundabout will create queues on the Main Street and Causeway approaches, projected queue lengths will generally be less than with signalized operation. The queues themselves will also be more fluid (more or less constantly moving).

The primary concerns associated with the roundabout alternative include its larger area (which will necessitate additional right-of-way) and the effect that it will have on adjacent parcels. As the conceptual design in Figure 6 illustrates, the existing Azur's Convenience Store parcel would need to be acquired in order to construct a roundabout at this intersection. The Bond Auto parcel would also lose almost all of the parking that presently occurs in front of its building (although it should also be noted that this parking is presently utilizing the existing public right-of-way).

The conceptual design shown in Figure 6 also provides for access management along the south side of Railroad Square along Poulin Grain's parcel. Access via the modified west and center accesses would have to conform to the new roundabout traffic circulation patterns. To maintain adequate truck access, the center splitter islands shown in those two accesses would be a slightly raised textured pavement or concrete pavers that could be driven over.

Alternative C - One-Way Traffic Loop

An alternative advanced by city representatives at the project kick-off meeting was to establish a one-way traffic flow pattern involving Railroad Square, Long Bridge and the portion of Mount Vernon Street west of Western Avenue and Glen Road.

This concept could be implemented by making Long Bridge one-way eastbound so that all westbound traffic originating from Mount Vernon Street and Glen Road would have to instead use Western Avenue to travel north to the I-91 Access Road in order to reach the Causeway and ultimately Main Street. Western Avenue between Mount Vernon Street and the I-91 Access Road would remain two-way.

Depending on the City's preferences, there are also several options associated with Alternative C. One would be to retain two-way traffic flow on the portion of Railroad Square west of the Long Bridge for the convenience of local businesses. Another might be to restrict Long Bridge to one-way only during peak hours (using variable message signs and signals) in order to maintain the convenience of two-way traffic for local residents and businesses during off-peak times.

Figure 7 illustrates the changed traffic patterns and street segments affected by Alternative C. Proposed intersection modifications, based on Railroad Square becoming entirely one-way eastbound, are shown in Figure 8.

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Main Street / Causeway / Railroad Square Intersection Study
One Way Traffic Alternative

Figure 7

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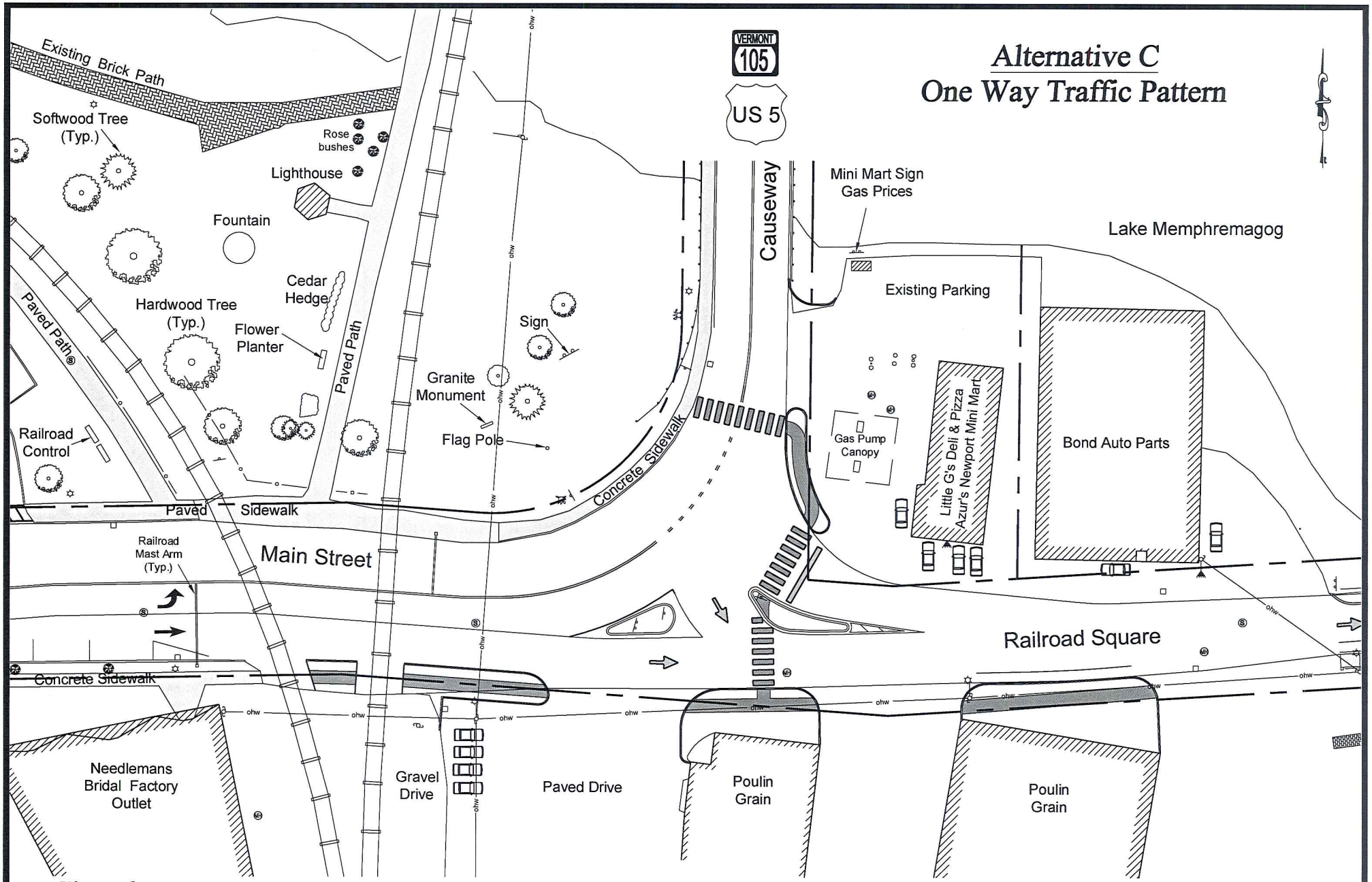
Alternative C
One Way Traffic Pattern



City of Newport

GRAPHIC SCALE

50 0 25 50 100

(IN FEET)

1 inch = 50 ft.

Figure 8

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Interestingly, of the westbound peak hour volumes traveling across the Long Bridge and approaching this intersection on Railroad Square, 74% and 68% during the am and pm peak hours, respectively, originate from the southbound right-turn movement off from Western Avenue at its intersection with Mount Vernon Road. In comparison, a relatively small volume of traffic (50-60 vph) originates from Mount Vernon and Glen Roads. Thus, the extra travel created by this change would be a minor portion of the existing westbound traffic stream across Long Bridge.

The primary impact of this change, with respect to traffic congestion conditions, will be felt at the Causeway / I-91 Access Road intersection where the westbound left-turn movement volumes from the I-91 Access Road will increase by 182 vph during the 2030 am peak hour and by 175 vph during the 2030 pm peak hour. The impact of this increase on future levels of service experienced by the I-91 Access Road left-turn movement was determined by performing capacity analyses of future pm peak hour volumes. The results of those analyses indicate that this movement will experience level of service C even with the added volumes. Overall, that intersection will continue to operate at level of service B.

4.3 Alternate Evaluation Matrix

To facilitate the comparison of the foregoing alternatives, the following evaluation matrix is provided.

	Alternative		
	A Traffic Signal	**B Roundabout**	**C One-Way Traffic Pattern**
Project Costs			
Construction Costs	$ 500,000	$ 2,000,000	$ 50,000
Engineering Design (20%)	$ 100,000	$ 400,000	$ 10,000
Project Management (10%)	$ 50,000	$ 200,000	$ 5,000
ROW Costs (est.)	$ 100,000	$ 500,000	$ 0
Construction Engineering (15%)	$ 75,000	$ 300,000	$ 7,500
Approx. Project Costs	$ 825,000	$ 3,400,000	$ 75,000
Impacts			
Adjacent Properties	major	greatest	minor
Streams/Floodplain	none	none	none
Wetlands (acres)	none	none	none
Wildlife/Conservation Areas	none	none	none
Endangered Species	none	none	none
Agricultural Lands	none	none	none
Historic Resources	none	none	none
Archeological Sensitivity	none	likely	none
Public Lands - Section 4(f)	none	minor	none
LWCF - Section 4(f)	none	none	none
Hazardous Waste	none	possible	none
Drainage & Utility Relocation	minor	major	none
Right-of-Way (acres)	0.5	1.0	0.0

	Alternative		
	A Traffic Signal	**B Roundabout**	**C One-Way Traffic Pattern**
Purpose and Need			
US Route 5 Mobility & Operation	improved	improved	improved
Overall Intersection Safety	improved	improved	improved
Pedestrian / School Crossings	improved	improved	improved
Railroad Square Queuing	reduced	reduced	reduced
Main St. / Causeway Queuing	increased	minor increase	no change
Access Management	improved	improved	improved
Downtown Gateway	no improvement	improved	no improvement
Permits			
Act 250	no	no	no
401 Water Quality	no	no	no
404 COE Permit	no	no	no
CUD (ANR Wetlands)	no	no	no
Stream Alteration	no	no	no
Stormwater Discharge (≥ 1 acre?)	no	no	no
Lakes and Ponds	no	no	no
Archeological Phase 1	possibly	yes	no
Section 106 - Historic	no	no	no
NEPA	CE	CE	CE
NEPDES	no	CGP	no

CE = Categorical Exclusion
CGP = Construction General Permit

4.4 Public Meetings / Participation

(To be completed after Alternatives Presentation Meeting)

4.5 Preferred Alternative

(To be completed after Alternatives Presentation Meeting)

5.0 Bibliography

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