Traffic Impact Study

PROPOSED ROAD IMPROVEMENTS AND TRAFFIC FLOW CHANGES RIVER ROAD

Providence, Rhode Island

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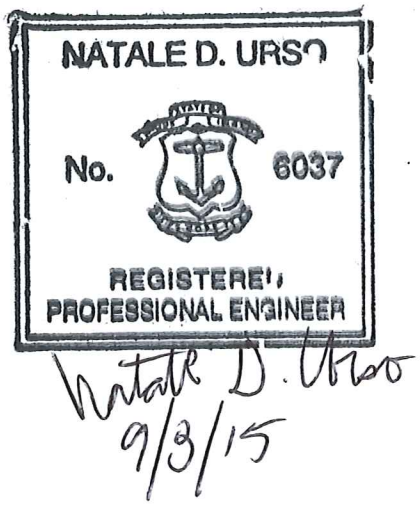

September 8, 2015

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INTRODUCTION

This traffic impact report is being prepared by the Providence Department of Public Works Engineering Division (PDPWE) to access the impacts on area roads from proposed road and traffic improvements on River Road in Providence, RI. The site location relative to the area roadway network is shown in **Figure 1**. The traffic impact study includes existing traffic operations in the study area and assesses incremental impacts on area roadways under future year conditions with and without the proposed improvements on River Road.

1.1 PROPOSED IMPROVEMENTS

The proposed road and traffic improvements include changing River Road to one-way travel southbound from Waterman St. to Irving Avenue installing a bike lane, additional sidewalks and shoreline improvements along River Road. The proposed road improvements are illustrated in **Figure 2**.

1.2 STUDY METHODOLOGY

This Traffic Impact Study (TIS) involves a number of steps to properly evaluate the impacts of the proposed improvements to area roads. The first step documents existing conditions in the transportation study area including an inventory of roadway geometry, traffic volumes, accident history along River Road and study intersections. Next, future year traffic conditions are forecast that account for other planned area developments, normal area growth, and project-related traffic increases. The third step quantifies operating characteristics of primary study intersections with and without the proposed project traffic.

1.3 STUDY AREA

This TIS evaluates transportation characteristics of roadways and intersections that may sustain a measurable level of traffic impact from the proposed project. The study area includes the following intersections, as shown on **Figure 1**:

- Butler Ave. at Pitman St.
- Butler Ave. at Waterman St.
- Butler Ave. at South Angell St.
- Wayland Ave. at Pitman St.
- Wayland Ave. at Waterman St.
- Wayland Ave. at South Angell St.

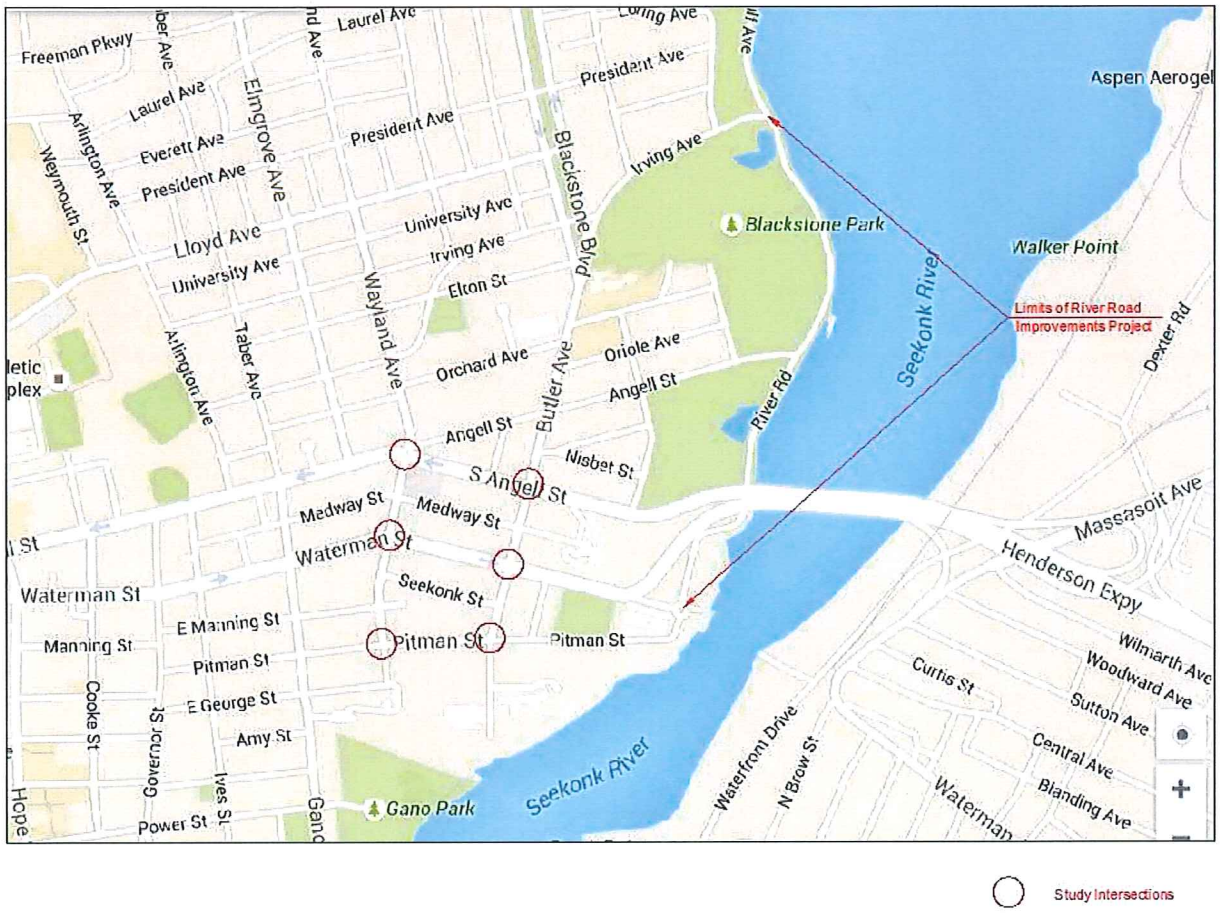
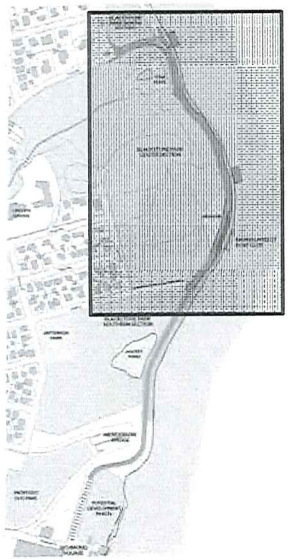


FIGURE 1 - SITE LOCATION MAP

Figure 2

SEEKONK RIVERBANK REVITALIZATION ALLIANCE

The Vision



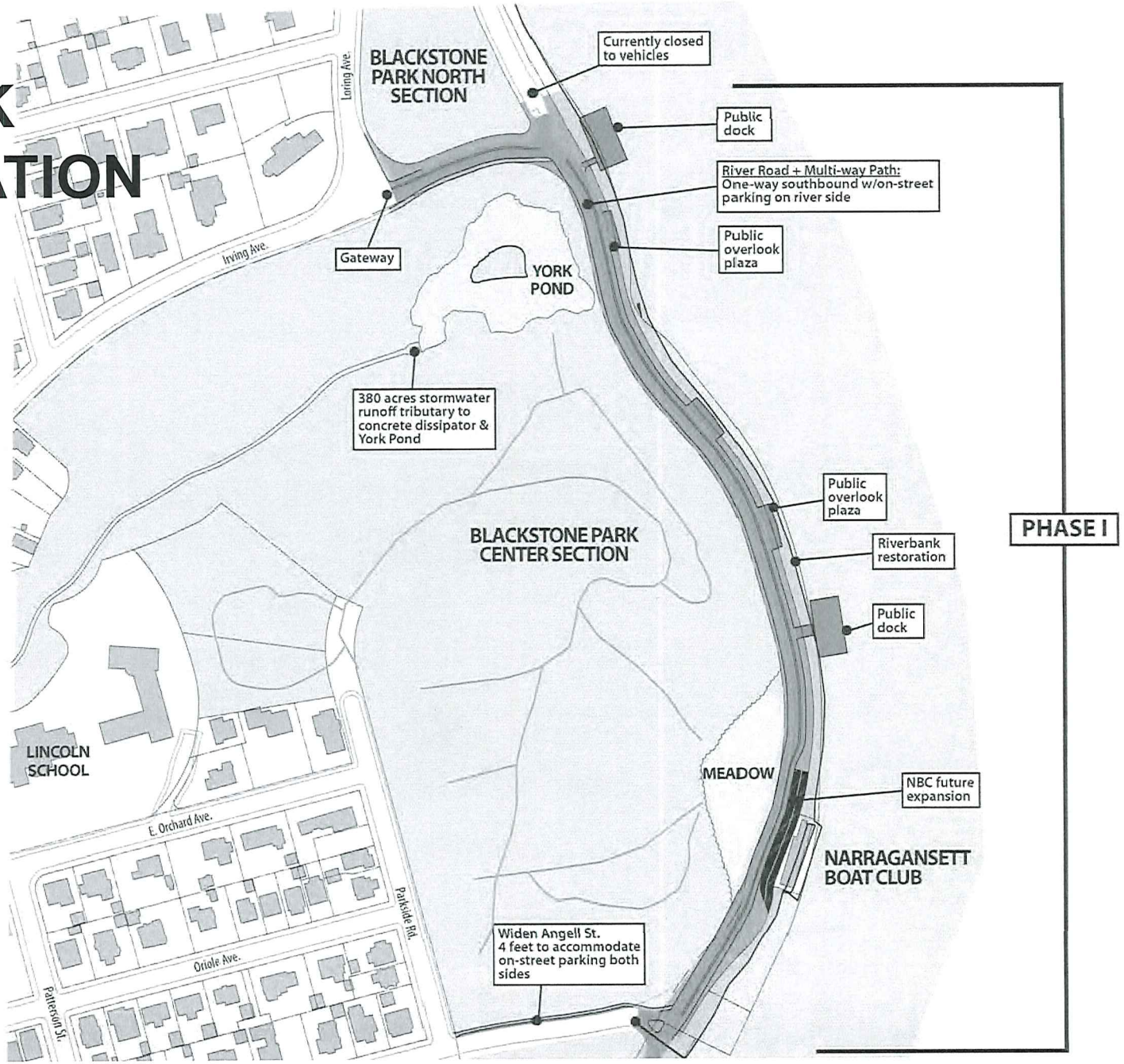
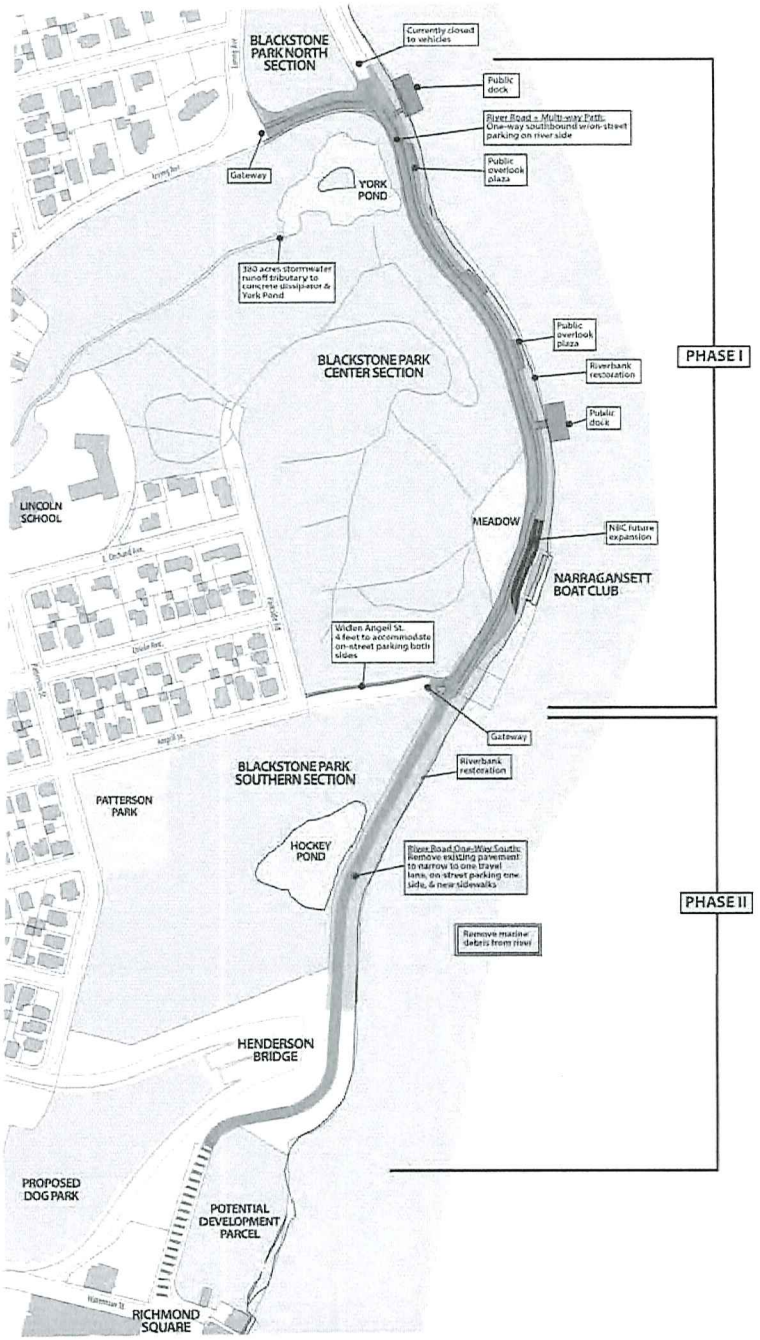


Figure 2 (continued)

SEEKONK RIVERBANK REVITALIZATION ALLIANCE

1. Public access to the water
2. Riverbank restoration
3. Balanced River Road



2 EXISTING CONDITIONS

In order to provide a basis for quantifying the traffic impacts from the proposed project, the existing traffic operations of study intersections were reviewed. This section describes the existing traffic characteristics and operations of roadways and intersections within the study area. Specifically, this section presents an overview of the traffic data collection program, existing traffic volumes, and safety data.

2.1 EXISTING TRAFFIC VOLUMES

Traffic-volume data used in this study were obtained by manual and mechanical methods. Automatic Traffic Recorder (ATR) counters were deployed on River Road between October 18, 2013 and October 24, 2013. Manual turning movement counts (TMCs) were conducted at study area intersections during April, May and June of this year. The TMCs were conducted during the weekday morning peak hour (7AM to 9PM) and afternoon peak hour (4 to 6 PM). These hours represent the peak periods of residential activity and adjacent street traffic. The traffic count data is included in **Appendix 1 and 2.**

Table 1
EXISTING ROADWAY TRAFFIC VOLUME SUMMARY
RIVER ROAD

Average Daily Volume (vpd)[1]	Peak Hour SB Volume (vph)[2]	Peak Hour SB PeakHour Flow Direction(3)	PeakHour NB Volume (vph)	PeakHour NB Peak Hour Flow Direction(3)
1,066	119	74% SB[4]	71	52% NB[4]

[1]Two-way daily traffic expressed in vehicles per day.
[2]One-direction peak-hour volume expressed in vehicles per hour.
[3]The percent of total peak hour traffic in one direction.
[4]NB = northbound; SB = southbound

As summarized in **Table 1**, average daily traffic volume on River Road was recorded as 1,066 vehicles per day (vpd). Peak hour Southbound traffic flow on River Road was recorded as 119 vehicles per hour during the weekday hour starting at 3PM with a primary directional flow of 74% SB. Peak hour Northbound traffic flow on River Road was recorded as 71 vehicles per hour during the weekday hour starting at 5PM with a primary directional flow of 52% NB.

2.2 SAFETY

Reported accidents were collected from the Providence Police Department during the period of May 2012 to August 2015 at the study intersections. The results are indicated below in **Table 2.**

Table 2
INTERSECTION ACCIDENT SUMMARY — 2012 THROUGH 2015

Data Category	Butler at Pitman	Butler at Waterman	Butler at S. Angell	Wayland at Pitman	Wayland at Waterman	Wayland at Angell
Type:						
Angle	3	10	4	4	6	3
Rear-End	2	4	6	1	1	1
Head-On		1	1	1		
Parked	1	1				1
Fixed Object					2	
Ped/Bicyclist		1				1
Unknown/Other						2
Total	**6**	**16**	**11**	**6**	**9**	**8**

As summarized in **Table 2,** a total of between six (6) to sixteen (16) accidents were reported at each of the study intersections over the 3 year period from May 2012 to August 2015. The results indicate that an appreciable number of accidents were reported at only 3 of the intersections – Butler/Waterman, Butler/S.Angell and Wayland/Waterman. Of those 3 intersections only the 10 angle accidents at the Butler/Waterman intersection indicate a possible pattern. Considering the results in **Appendix 3** indicate an increase in traffic due to the proposed project improvements of 2.5 to 4% at the Butler/Waterman intersection, we don't believe the proposed project improvements will worsen any existing safety deficiencies at the study intersections.

3.0 FUTURE CONDITIONS

Evaluation of the proposed development impacts requires the establishment of a future baseline analysis condition. This section estimates future roadway and traffic conditions with and without the proposed project. A five-year planning horizon was selected.

To determine the impact of new project-generated traffic volumes on the roadway network under future conditions, baseline traffic volumes in the study area were projected to a future year condition. Traffic volumes on the roadway network at that time (the No-Build condition), would include existing traffic, new traffic due to general background traffic growth, and traffic related to specific development by others that is currently under review. Consideration of these factors resulted in the development of No-Build traffic volumes. Anticipated project-generated traffic volumes were then superimposed upon these No-Build traffic-flow networks to develop future Build conditions.

3.1 BACKGROUND TRAFFIC GROWTH

Background traffic includes demand generated by other planned developments in the area as well as demand increases caused by external factors. External factors are general increases in traffic not attributable to a specific development and are determined using historical data.

3.1.1 Historical Area Growth

Historical traffic volumes were derived by comparing traffic counts on the study intersections in 2008 with the traffic counts at those intersections this year. The traffic volumes and growth rate calculation are provided in the **Appendix 4**. The comparison of the traffic counts indicated a 0.06% decrease in the study area intersections. To be conservative, a 0.5 percent annual growth rate was applied to the existing traffic volumes.

3.1.2 Background Development-Related Growth

Development of future No-Build traffic volumes also considers traffic generated from specific area developments. Based on review of current projects under review by the city the only proposed project under review is a mixed use development at Wayland Ave..

- **Mixed Use Development Wayland Ave.** The Wayland Ave. Development is a 42,072 square foot 3 story development. Each floor is comprised of 14,084 sf. Two floors are proposed as office use while a third floor is proposed as a combination bank, restaurant and retail use. Traffic associated with this development was computed based on trip generation rates published in the 2012 Institute of Transportation Engineers (ITE) Trip Generation. These calculations are included in the **Appendix 5.**

Traffic associated with the above specific projects has been considered in determining the future year traffic volumes. Specific trip estimates are provided in the **Appendix 5** and illustrated in **Figures 3 and 4.**

3.2 NO-BUILD TRAFFIC VOLUMES

To account for future traffic growth along the corridor, the 0.5 percent annual growth rate was applied to existing traffic volumes over a five-year period and this was added to traffic associated with the Wayland Ave. Mixed Use Development to determine the Future 2020 No-Build Traffic Volumes. Future 2020 No-Build Traffic Volumes are displayed in **Figure 5** and **Figure 6.**

3.3 PROJECT-GENERATED TRAFFIC

The traffic changes from the proposed project were assumed to be derived from the traffic change to one-way southbound on River Road and the traffic generated by the improvements to River Road. The proposed change to one way southbound will redirect the River Road northbound traffic to other area roads and intersections. The peak hour NB traffic was determined from the ATR counts indicated in **Appendix 1** to be 22 vph during the AM peak hour and 71 vph during the PM Peak. These peak hour volumes were distributed to area roadways as indicated in **Figures 7 and 8.** It was also assumed the project road improvements would generate additional traffic. This additional traffic was based on the proposed on-street parking spaces as determined from the conceptual design. This additional traffic was determined to be 68 vehicles/hour for both the morning and afternoon peak hour. These calculations are included in the **Appendix 6.** These peak hour volumes were distributed to area roadways as indicated in **Figures 9 through 11.** The total peak hour traffic generated by the project was determined by adding the peak hour traffic from the proposed change of River Road to one-way southbound to the traffic generated by the general project improvements. The total project traffic distributed to area roadways is indicated in **Figure 12.**

3.4 BUILD TRAFFIC VOLUMES

Future Build condition traffic volumes are derived by adding total project traffic volumes to the 2020 No-Build conditions. **Figure 13** and **14** present the 2020 Build condition traffic-volume networks for the weekday morning and evening peak hours.

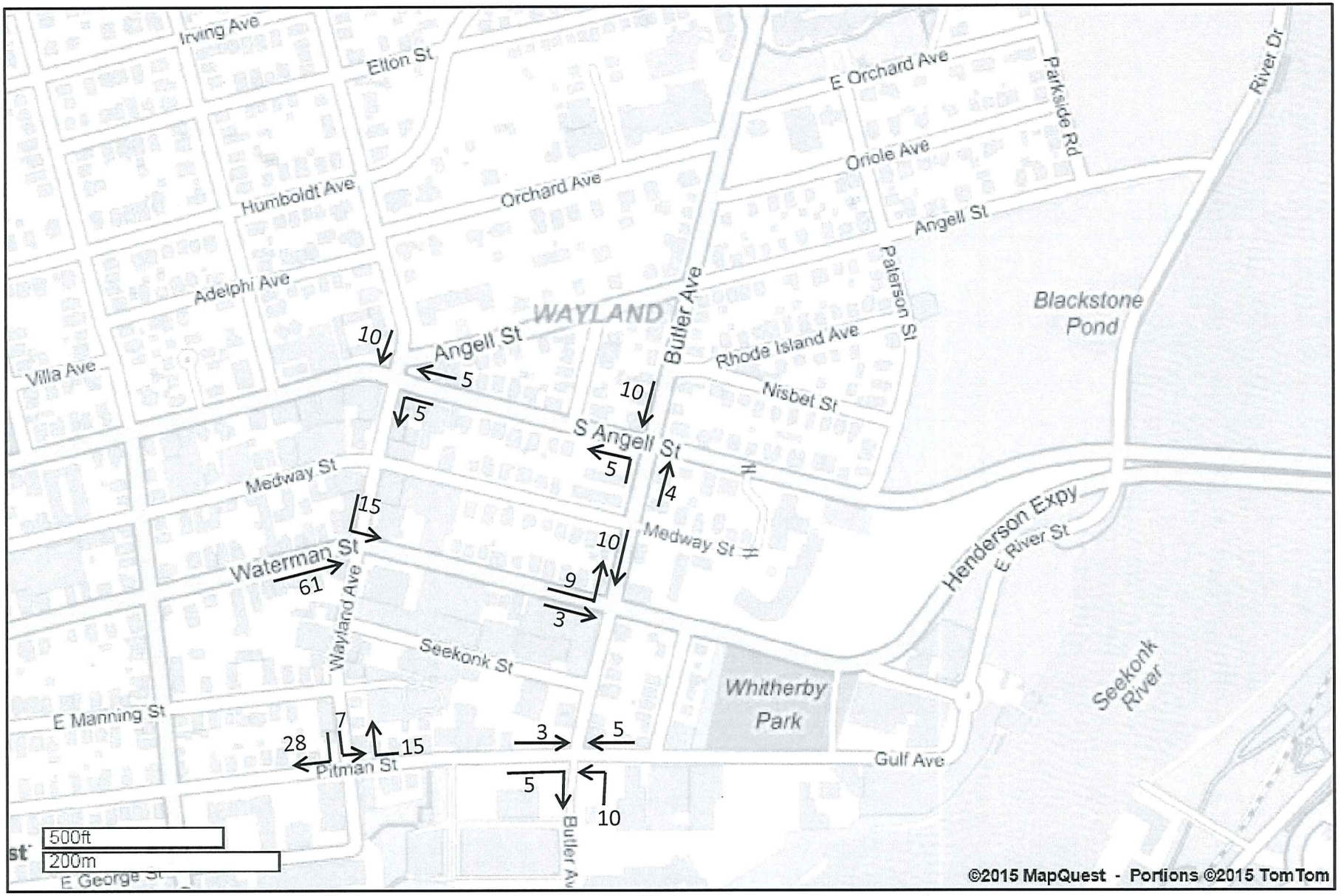


Figure 3 – AM Peak Trip Distribution To/From Proposed Multiuse Development
@ SE corner Wayland Ave / Waterman St

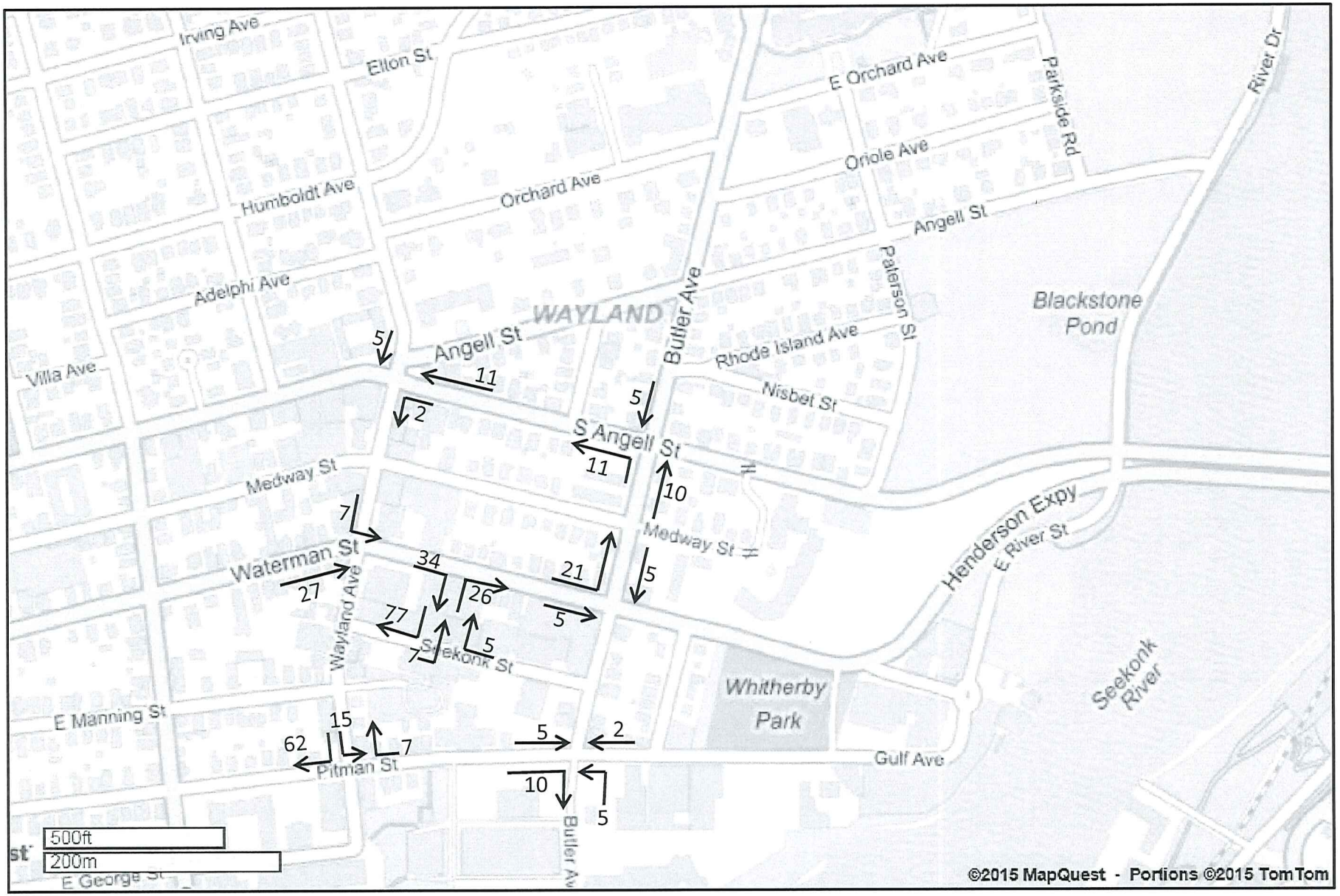


Figure 4 – PM Peak Trip Distribution To/From Proposed Multiuse Development
@ SE corner Wayland Ave / Waterman St

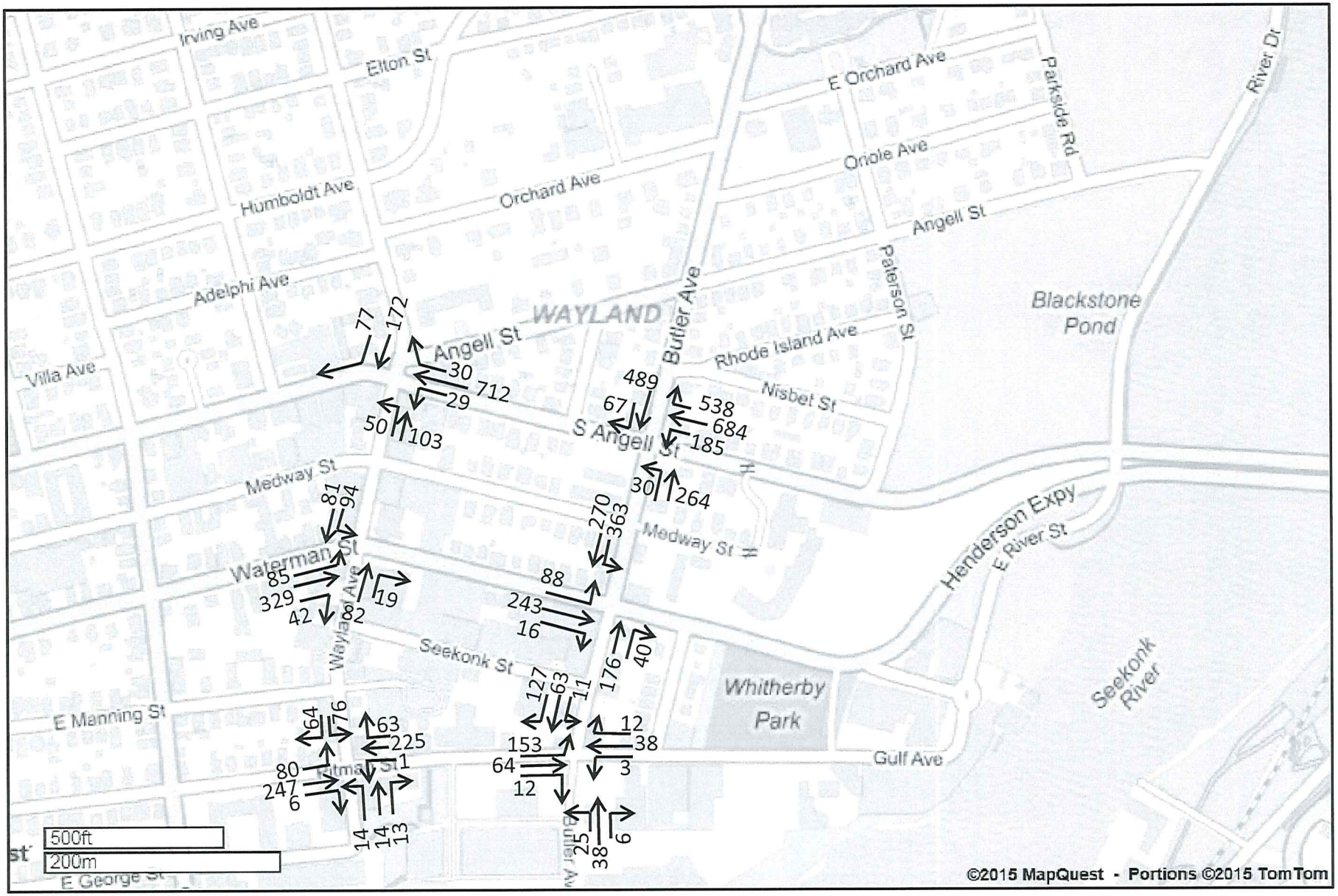


Figure 5 – AM Peak 2020 No Build Traffic Volumes

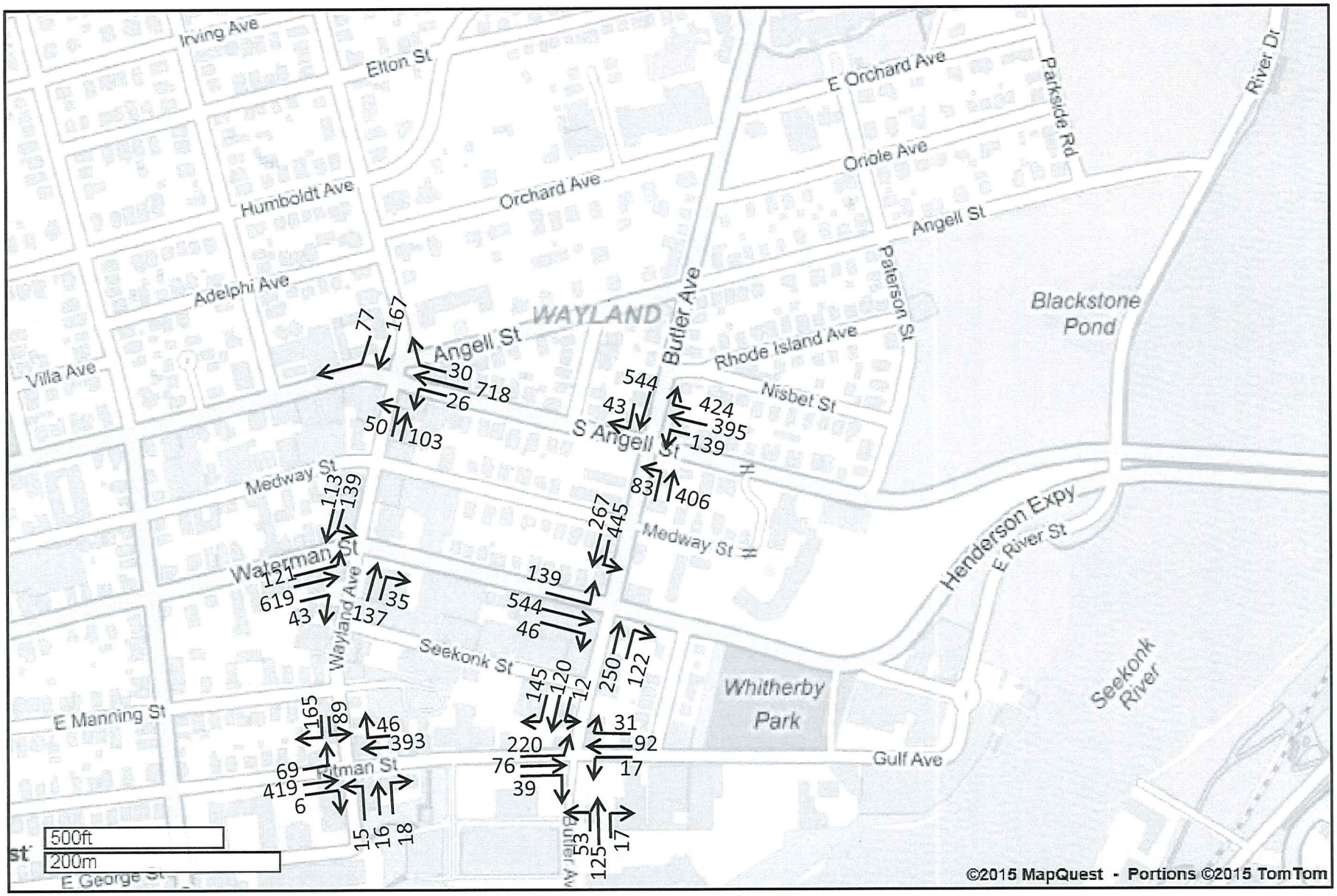


Figure 6 – PM Peak 2020 No Build Traffic Volumes

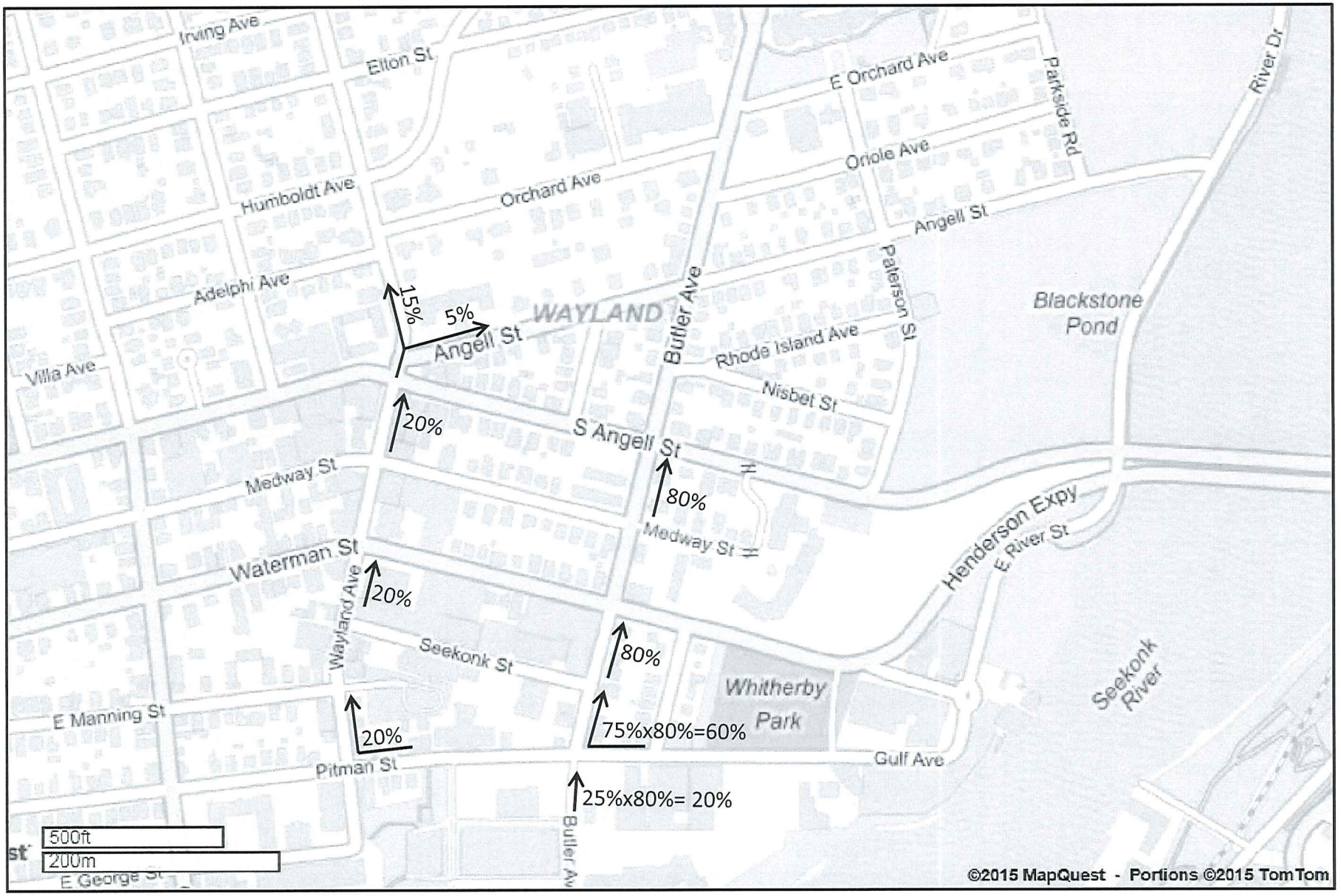


Figure 7 – Traffic Diversion from Change of River Road to One-Way SB

Assume 80% NB River Road traffic diverted to Butler Ave and 20% to Wayland Ave
Assume NB River Road traffic diverted consists or 25% To/From East Side Market Plaza

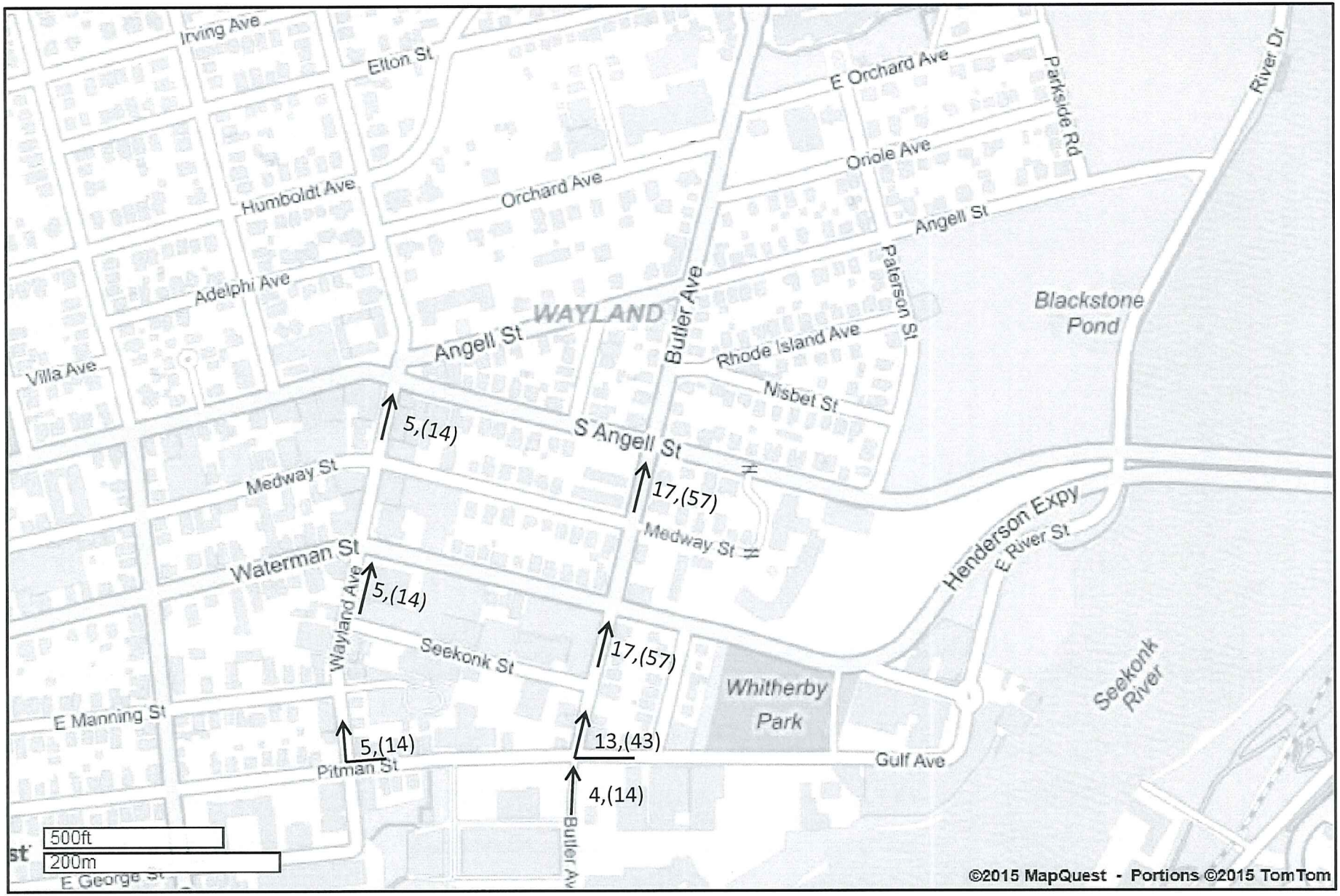


Figure 8 – Traffic Volume Diversion from Change of River Road to One-Way SB

AM Peak Traffic Volume = XX

PM Peak Traffic Volume = (XX)

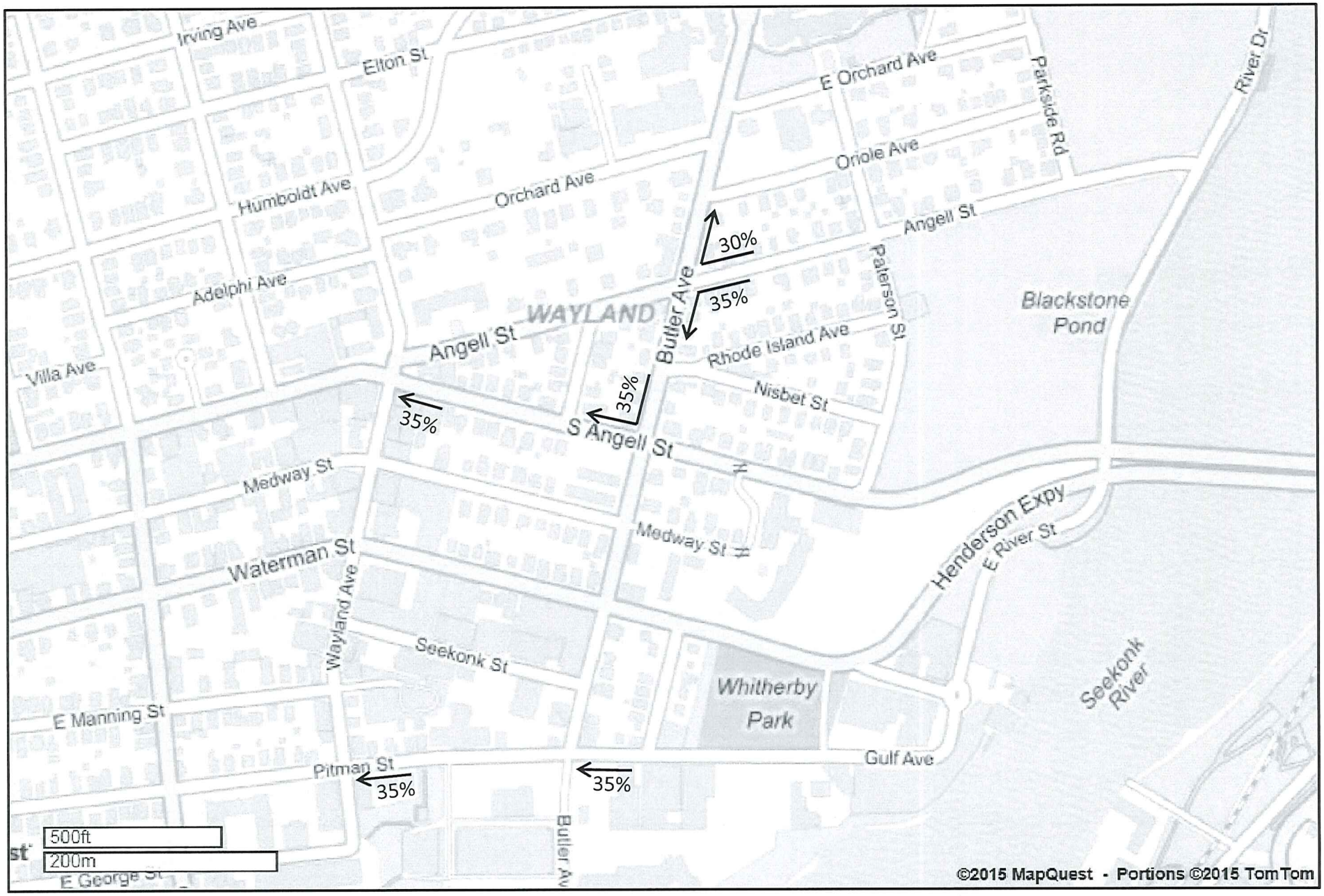


Figure 9 – Distribution of Trips Generated from River Road by Road Improvements (not including Change to One Way SB on River Road)

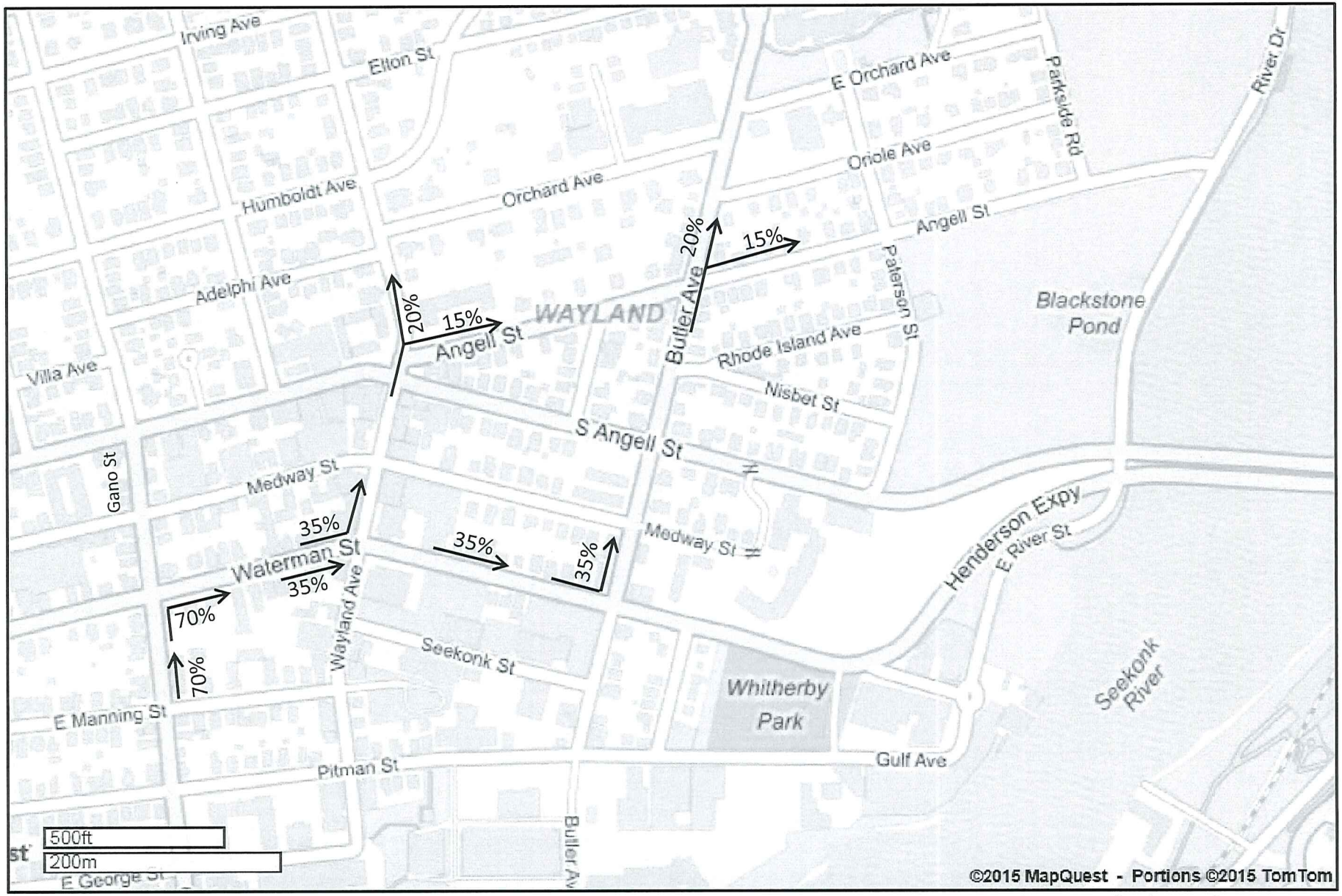


Figure 10 – Distribution of Trips Generated to River Road by Road Improvements (not including change to One Way SB on River Road)

Assumption: 70% from I-195 / Gano St.
30% local traffic

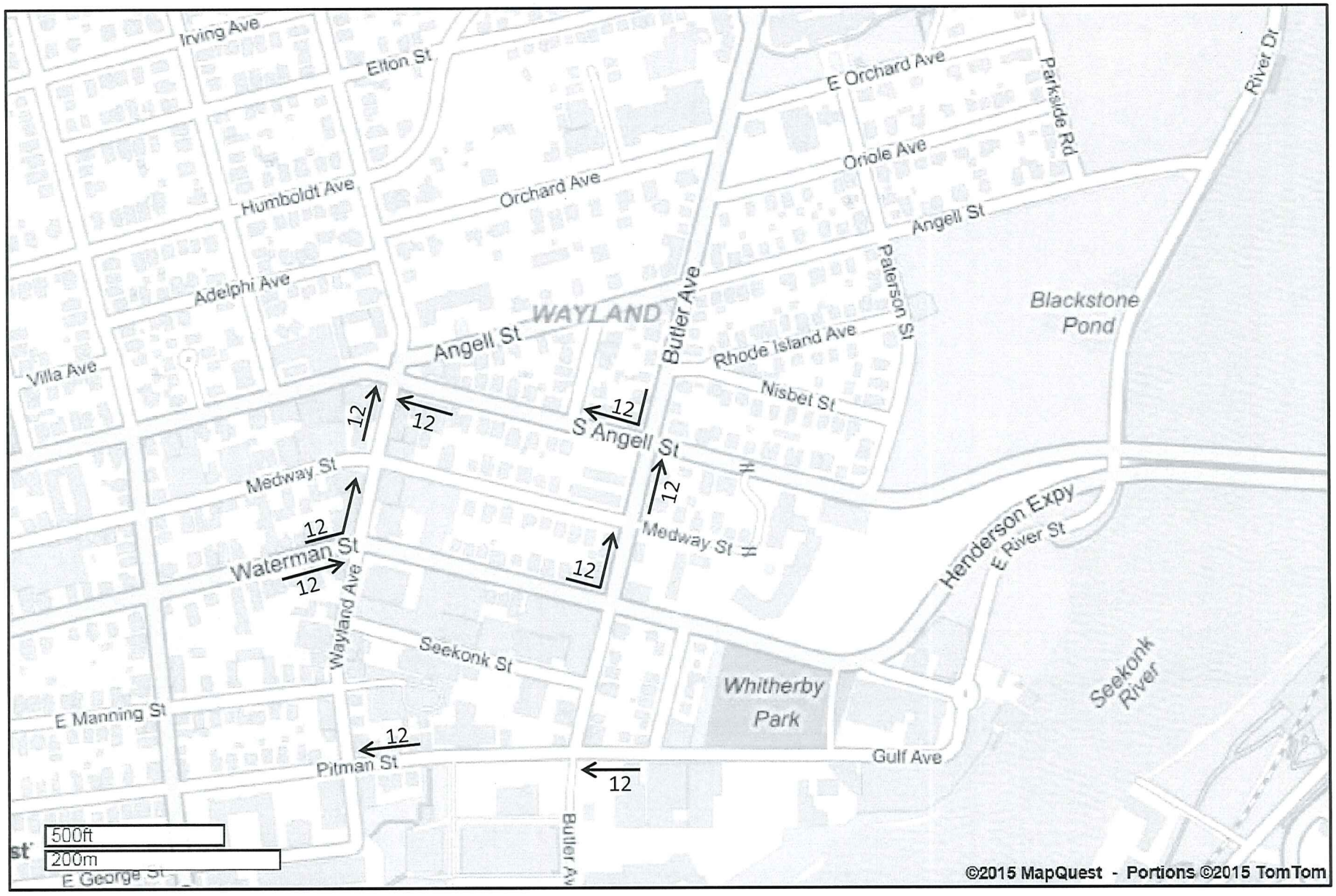


Figure 11 – River Road Improvement Trip Generation Volume (Not including One Way SB)

34 vehicles/hr. to River Road
34 vehicles/hr. from River Road
Assume same traffic generated in AM Peak and PM Peak

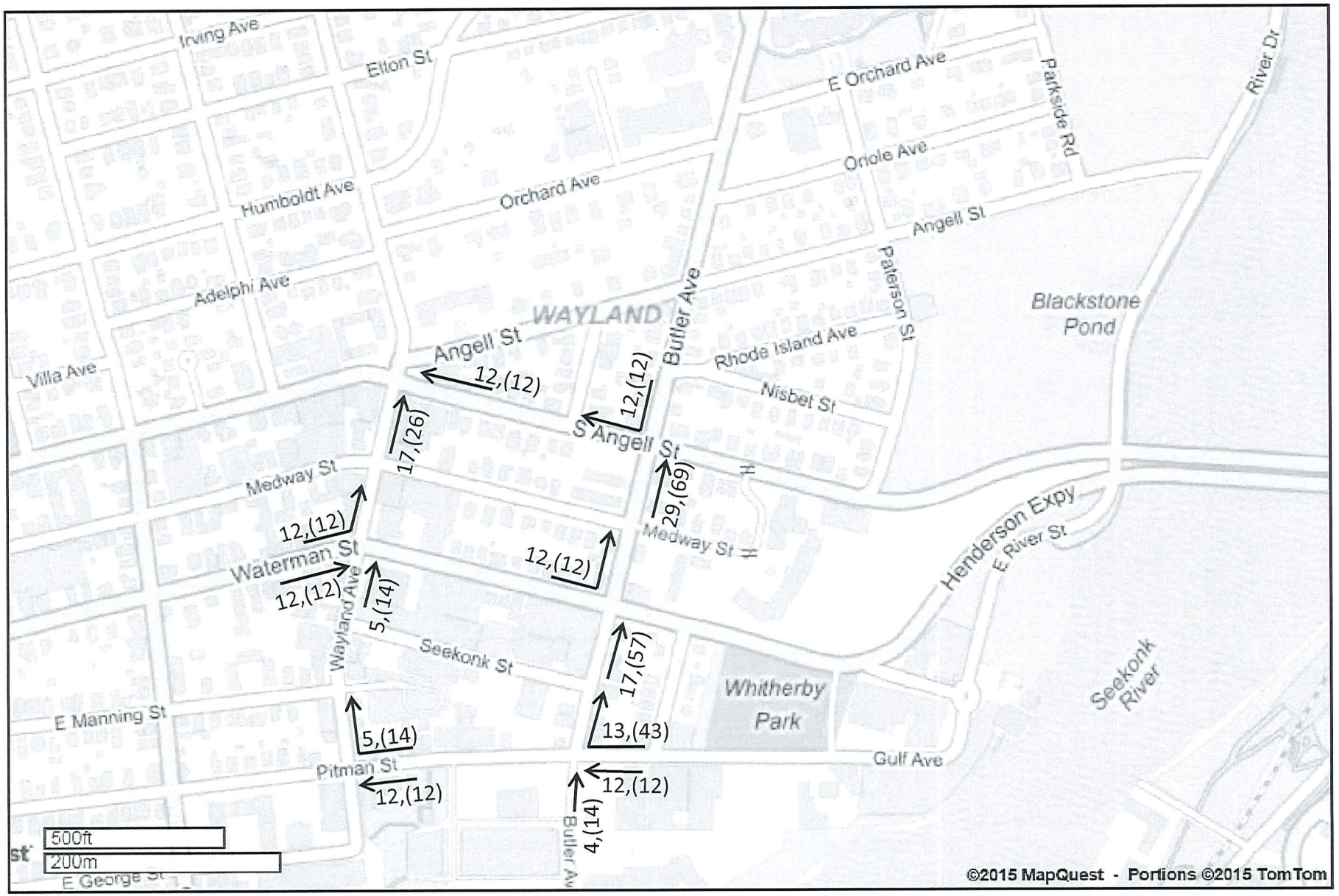


Figure 12 – River Road Improvements Trip Generation Volumes (Including Change of River Road to One Way Southbound

AM Peak Traffic Volume = XX
PM Peak Traffic Volume = (XX)

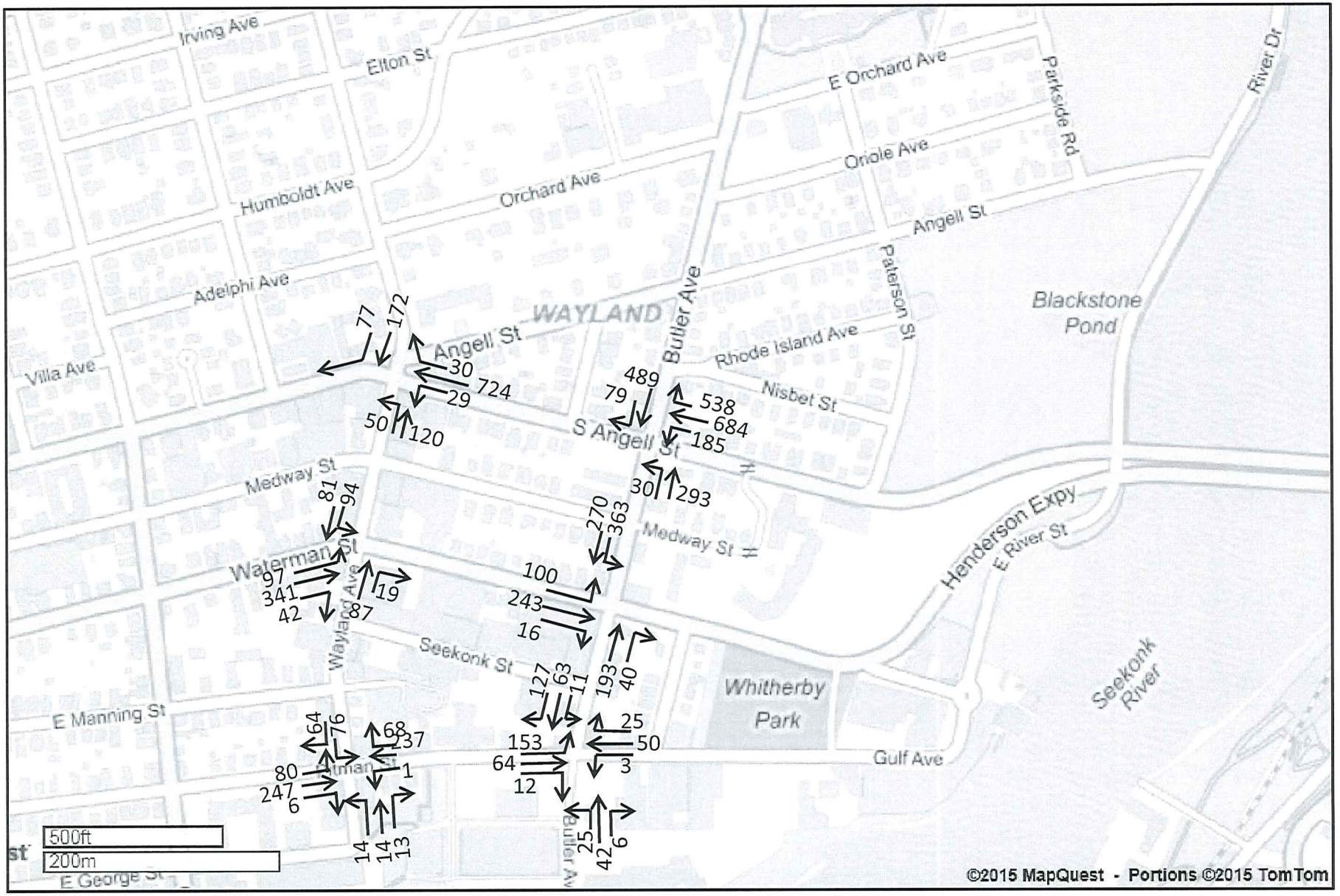


Figure 13 – AM Peak 2020 Build Traffic Volumes

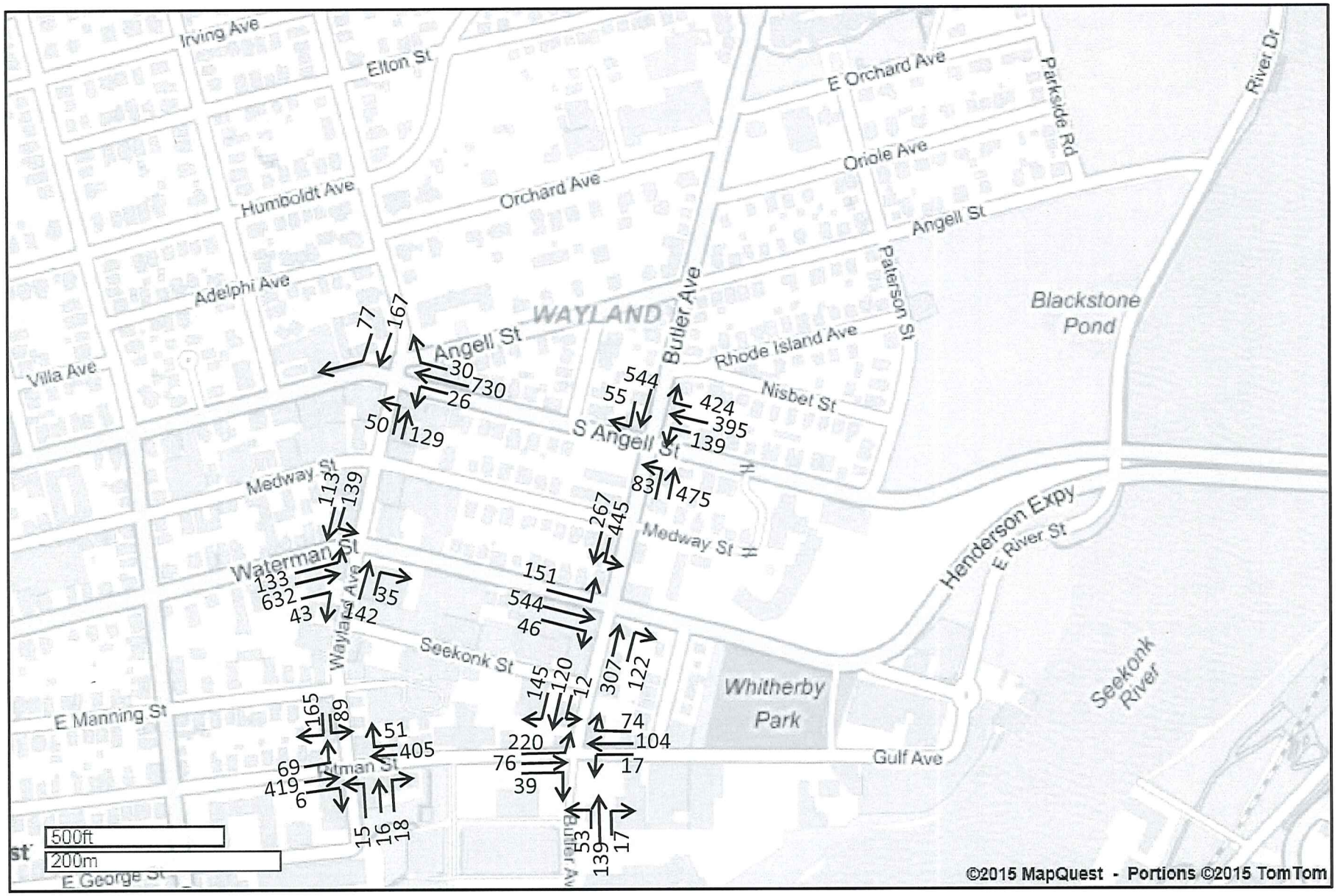


Figure 14 – PM Peak 2020 Build Traffic Volumes

4.0 TRAFFIC OPERATIONS ANALYSIS

Intersection capacity analyses are presented in this section for the Existing, No-Build, and Build traffic-volume conditions. Capacity analyses provide an index of how well the study intersections serve the traffic demands placed upon them by the proposed project.

4.1 CAPACITY ANALYSIS PROCEDURES

Capacity analysis of intersections was developed using the Synchro® Version 7 computer software, which implements the methods of the 2000 Highway Capacity Manual (HCM). The resulting analysis computes a number of measures of effectiveness which provide a measure of the operating condition at each of the study intersections. These measures of effectiveness include the volume to capacity ratios, control delay and Level of Service. The volume to capacity ratio is a ratio of the traffic volume at an intersection or an intersection movement relative to the intersection or intersection movement's traffic volume capacity. A value of 1.00 indicates the intersection or intersection movement is at capacity based strictly on its traffic volume. Control delay is a computed value of the delay vehicles experience at an intersection or intersection movement. The LOS is a letter designation that provides a qualitative measure of operating conditions based on the computed control delay. A range of six levels of service are defined on the basis of average control delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements and 80 seconds for signalized intersections).

4.2 INTERSECTION CAPACITY ANALYSIS RESULTS

LOS analyses were conducted for 2015 Existing, 2020 No-Build, and 2020 Build conditions for the study intersections. The results of the intersection capacity analyses are summarized below in **Table 3** and **Table 4**.

Table 3 and **Table 4** summarize weekday morning and weekday evening peak hour capacity analysis results for study intersections, with detailed capacity analysis results presented in **Appendix 7**.

To evaluate if the anticipated traffic generated by the River Road project will adversely impact area roads and intersections, a comparison of the 2020 NoBuild capacity analysis results was made with the 2020 Build results. The results indicate that none of the capacity analysis measures of effectiveness worsen between 2020 NoBuild and 2020 Build results for any of the study intersections. It should be noted that the 2020 Build Condition results at the Waterman/Butler Avenue intersection are with changes in the signal timings from what exists currently. The results indicate that none of the study intersections under the 2020 build condition have volume to capacity ratios of greater than one or Levels of Service appreciably worse than "D". From these results it can be concluded that traffic flow at area roadways and intersections will not be degraded due to the proposed improvements to River Road and the study intersections will operate satisfactorily if the project improvements are implemented.

Table 6
INTERSECTION CAPACITY ANALYSIS RESULTS – WEEKDAY MORNING PEAK HOUR

		2015 Existing			2020 No-Build			2020 Build		
Intersection	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Pitman Street at Butler Ave.										
	Eastbound	0.48	9	A	0.49	9	A	0.49	9	A
	Westbound	0.08	<5	A	0.09	<5	A	0.13	<5	A
	Northbound	0.100	7	A	0.10	8	A	0.11	8	A
	Southbound	0.34	6	A	0.35	6	A	0.35	6	A
Waterman Street at Butler Ave.										
	Eastbound	0.37	22	C	0.39	22	C	0.41	23	C
	Northbound	0.37	21	C	0.38	21	C	0.41	22	C
	Southbound L	0.56	13	B	0.58	13	A	0.59	13	B
	Southbound	0.25	9	A	0.27	9	A	0.27	9	A
South Angell St. at Butler Ave.										
	Westbound	0.79	19	B	0.87	24	C	0.87	24	C
	Northbound L	0.11	12	B	0.13	12	B	0.13	12	B
	Northbound TH	0.34	15	B	0.32	14	B	0.35	14	B
	Southbound	0.83	33	C	0.84	35	C	0.84	35	D
Pitman Street at Wayland Ave.										
	Eastbound	0.08	<5	A	0.08	<5	A	0.08	<5	A
	Westbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
	Northbound	0.15	17	C	0.16	19	C	0.17	19	C
	Southbound	0.32	20	C	0.38	20	C	0.39	20	C
Waterman Street at Wayland Ave.										
	Eastbound	0.36	7	A	0.40	8	A	0.42	8	A
	Northbound	0.17	6	A	0.17	7	A	0.18	7	A
	Southbound	0.37	9	A	0.42	11	B	0.42	11	B
Angell Street at Wayland Ave.										
	Westbound	0.69	23	C	0.71	23	C	0.71	23	C
	Northbound	0.19	11	B	0.20	12	B	0.22	12	B
	Southbound	0.31	11	B	0.33	11	B	0.33	11	B

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable

Table 7
INTERSECTION CAPACITY ANALYSIS RESULTS – WEEKDAY EVENING PEAK HOUR

		2015 Existing			2020 No-Build			2020 Build		
Intersection	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Pitman Street at Butler Ave.	Eastbound	0.45	8	A	0.49	9	A	0.54	10	A
	Westbound	0.41	20	C	0.44	21	C	0.52	21	C
	Northbound	0.38	20	C	0.41	21	C	0.42	21	C
	Southbound	0.69	22	C	0.69	22	C	0.69	22	C
Waterman Street at Butler Ave. (See Note 5)	Eastbound	0.77	58	E	0.80	93	F	0.75	47	D
	Northbound	0.65	26	C	0.68	27	C	0.92	52	D
	Southbound L	0.87	30	C	0.92	38	D	0.97	54	D
	Southbound TH	0.25	8	A	0.26	9	A	0.27	10	A
South Angell St. at Butler Ave.	Westbound	0.68	21	C	0.69	22	C	0.69	24	C
	Northbound L	0.21	11	B	0.26	12	B	0.27	12	B
	Northbound TH	0.37	13	B	0.39	14	B	0.46	15	B
	Southbound	0.65	25	C	0.68	26	C	0.70	27	C
Pitman Street at Wayland Ave.	Eastbound	0.07	2	A	0.07	<5	A	0.07	<5	A
	Westbound	0.25	<5	A	0.27	<5	A	0.28	<5	A
	Northbound	0.27	26	D	0.33	34	D	0.34	35	E
	Southbound	0.46	25	D	0.62	30	D	0.64	32	D
Waterman Street at Wayland Ave.	Eastbound	0.43	9	A	0.46	10	A	0.48	10	A
	Northbound	0.33	14	B	0.33	14	B	0.34	14	B
	Southbound	0.72	28	C	0.74	29	C	0.75	29	C
Angell Street at Wayland Ave.	Westbound	0.69	23	C	0.71	23	C	0.71	23	C
	Northbound	0.19	11	B	0.20	12	B	0.20	12	B
	Southbound	0.31	11	B	0.33	11	B	0.33	11	B

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable
5. Waterman St. @ Butler Ave. 2020 Build results are with signal timing changes

5 CONCLUSIONS AND RECOMMENDATIONS

The results of this Traffic Impact Study indicate that traffic generated from the proposed improvements to River Road will not have any adverse impact to area roadways or intersections. Further, no recommendations for mitigation or improvements are required due to the proposed project other than to monitor the Waterman St./Butler Ave. intersection once the project is complete to see if traffic signal timing changes are required.