Average Annual Daily Traffic

The general unit of measure for traffic on a street or highway is the average daily traffic. This is the total traffic volume (both directions) during a 24-hour period. The average annual daily traffic (AADT) for a street can easily be determined utilizing factors correcting for the day of the week, and month of the year. Figures 6 and 7 summarize the AADT for several of the streets within the Summit neighborhood. These charts illustrate the distribution of traffic throughout the neighborhood, with the larger volumes of vehicles on the arterial roadways, the collector roadways, and finally with the lesser volumes on the local streets, as expected. As a point of reference, the AADT on North Main Street is 18,400 vehicles per day.

Vehicle volumes have also been graphed by the time of day, as shown in Figure 8. For the most part, the roadways show a distinct morning peak between 7am and 9am, a smaller peak around the noon hour, and an afternoon peak between 3pm and 5pm. The exception is Hillside Avenue, showing a fairly consistent volume over the 24-hour period.

All of the roadways within the study area, with the exception of Hope Street, operate at a Level of Service "A", indicating little congestion or delay. Hope Street experiences congestion during several hours of the day due to the interaction of heavy through volumes on Hope Street, with pedestrians, and vehicles destined for the many commercial and service establishments along the roadway. On-street parking and the public transit element also contribute to the congestion and delays experienced on Hope Street between Braman Street and Fifth Street.

Speeds

BETA obtained speed information on twelve streets throughout the Summit neighborhood. The average speeds observed range from a low of 15 mph on Tenth Street during the weekend, to 30 mph on Hope Street north of Fifth Street. The 85th percentile speed is generally taken as the yardstick by which the need for traffic calming is measured. This is the speed at which 85 percent of the drivers are traveling at or below. In the case of the 12 locations where data was collected as part of this study, the 85th percentile ranged from a low of 21 mph on Tenth Street to 34 mph on Hope Street.

Brewster Street, with buildings close to the back of sidewalk, and mature trees, experiences acceptable speeds. Parked cars narrow the pavement even more.

The Average and 85th Percentile speeds have been tabulated on the following pages, allowing a comparison between streets.

Specific traffic data relative to the individual streets or street areas are detailed in the next section.

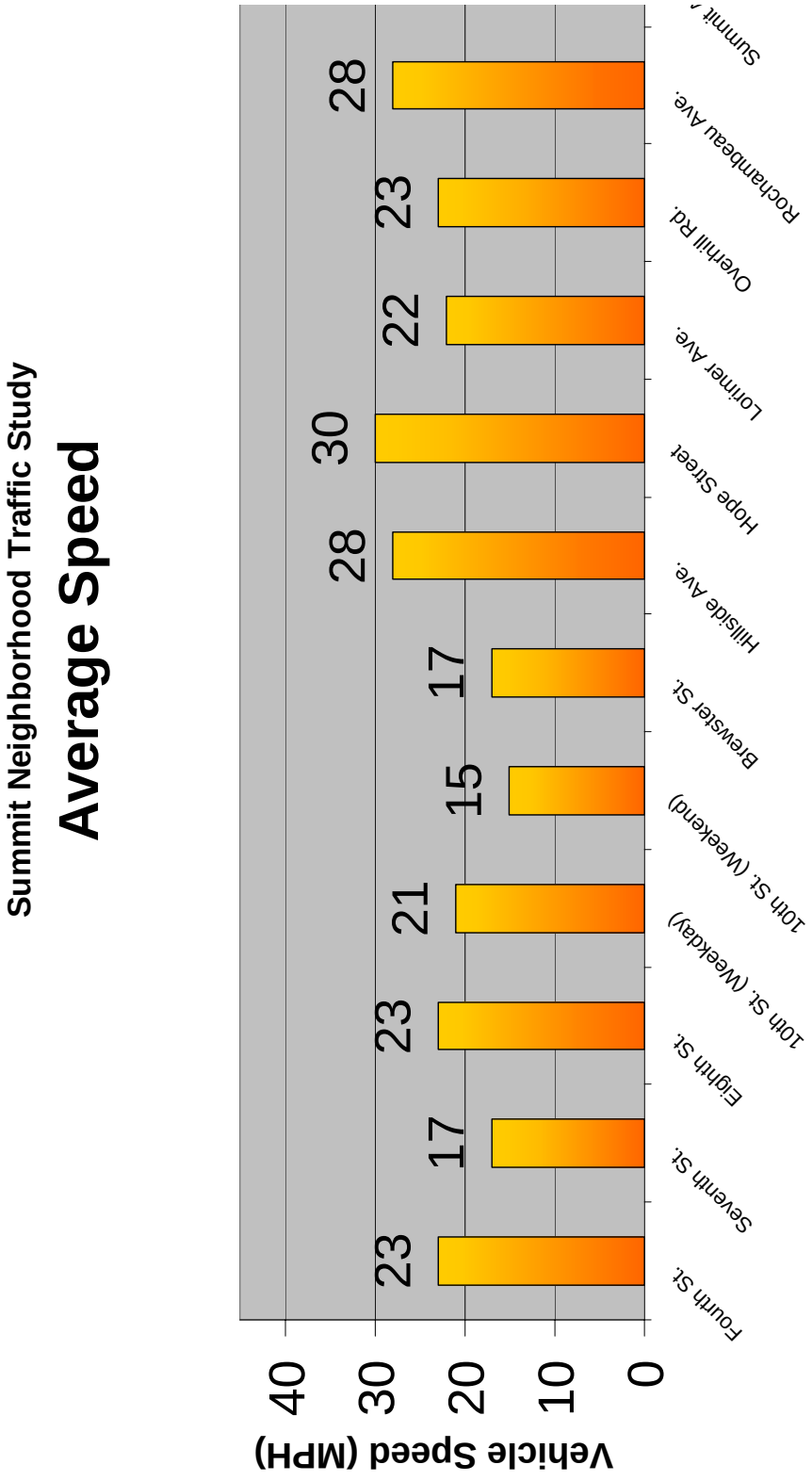

Summit Neighborhood Traffic Study
Average Speed
Vehicle Speed (MPH)
0
10
20
30
40
Fourth St.
Seventh St.
Eighth St.
10th St. (Weekday)
10th St. (Weekend)
Brewster St.
Hillside Ave.
Hope Street
Lorimer Ave.
Overhill Rd.
Rochambeau Ave.
Summit
23
17
23
21
15
17
28
30
22
23
28

Figure 9

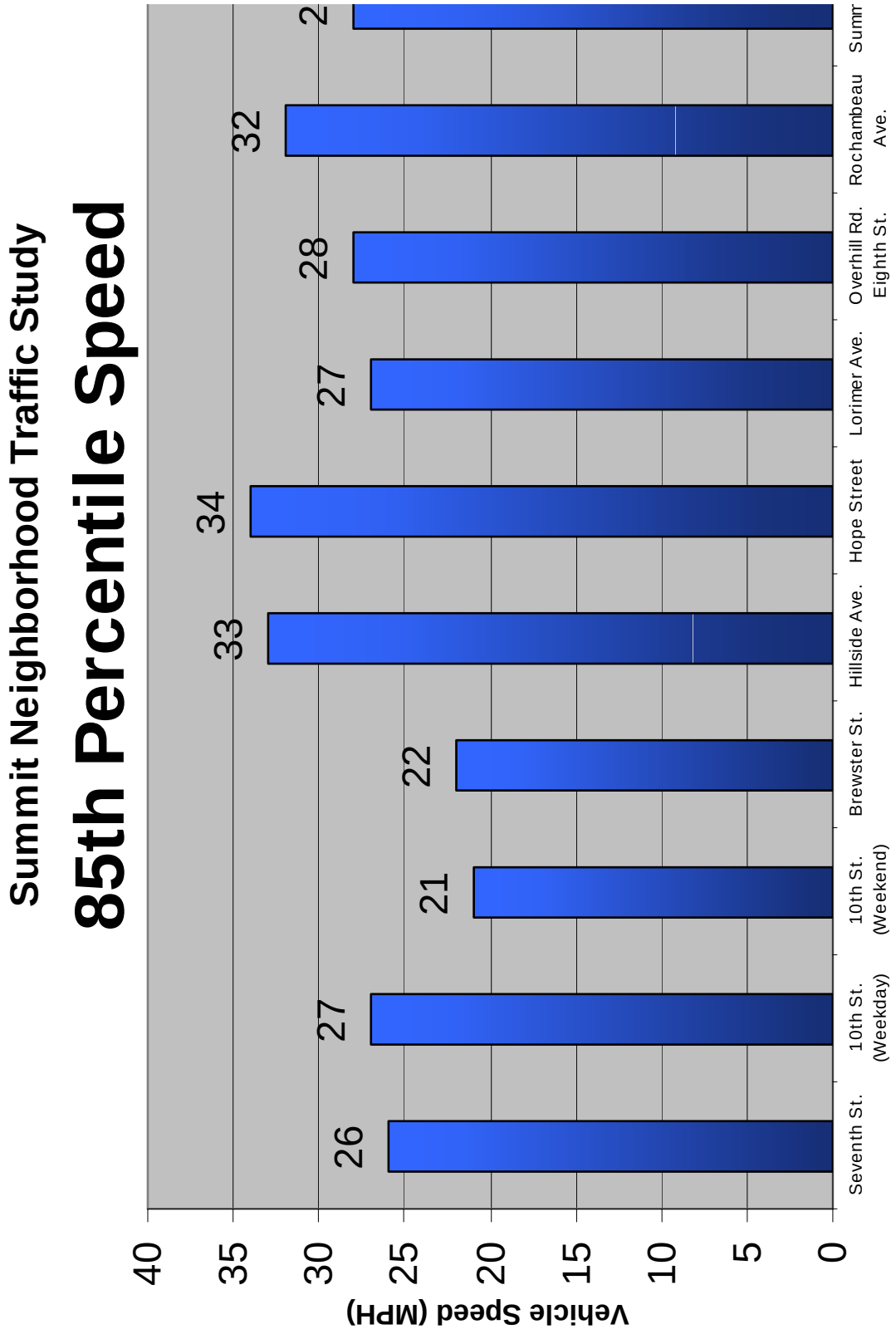

Summit Neighborhood Traffic Study
85th Percentile Speed
Vehicle Speed (MPH)
0
5
10
15
20
25
30
35
40
26
27
21
22
33
34
27
28
32
2
Seventh St.
10th St. (Weekday)
10th St. (Weekend)
Brewster St.
Hillside Ave.
Hope Street
Lorimer Ave.
Overhill Rd.
Eighth St.
Rochambeau Ave.
Summ

Figure 10

Traffic Calming

Traffic Calming includes the reduction of speed and through traffic volumes on roadways to enhance the street environment for non-motorists. Speed reductions include physical changes to the roadway cross section, while methods to reduce traffic volumes focus on diverting traffic by obstructing traffic movements in one or more directions, thus making a street less desirable for "cut-thru" traffic. Calming measures typically include the three "E's", traffic **education**, **enforcement**, and **engineering**.

In reviewing the collected data for the roadways in the Summit neighborhood of Providence, it is necessary to identify the problems as they relate to the volume of vehicles, the behavior of the traffic or the composition of the traffic. An individual street may be experiencing problems relating to some combination of the three, but every effort should be made to identify the exact source of the problem. Likewise, the neighborhood local streets should be examined as a whole, identifying common factors, existing truck and emergency vehicle routes, and regulatory signage. The goal is to calm the entire area instead of fixing a problem on one street only to transfer the same problem onto another street. It is also important to note that in traffic calming, the City can always go back and make additional improvements as conditions change.

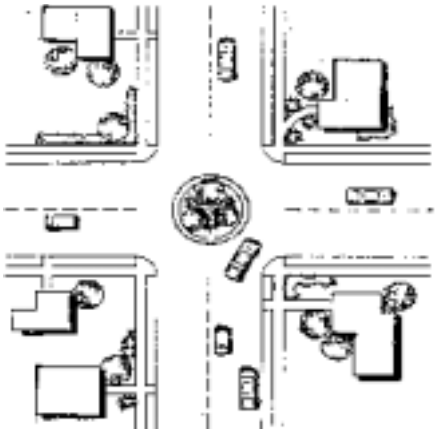
The data collected indicates that the roadways within the Summit neighborhood of Providence do not experience congestion, and the daily volumes obtained are consistent with the volumes generated by the neighborhood residences, businesses along Hope Street, and the traffic generated by the Miriam Hospital. The volumes of vehicles on Hope Street are consistent with the functional classification of the roadway as an arterial, connecting the City of Pawtucket to the downtown Providence area.

As such, implementing measures to divert or reduce the volumes on specific local streets would likely create additional or diverted traffic on adjacent streets. Therefore, the traffic calming measures appropriate for the Summit neighborhood will include those to reduce the higher travel speeds identified on several of the area roadways.

As mentioned previously, the Summit neighborhood is unique in that a major traffic generator is located in the middle of a stable, residential neighborhood. It can be concluded that the hospital will continue to service the neighborhood and the communities of Rhode Island. Future growth of Miriam in the neighborhood will be limited by the availability of land and the long term planning goals of the hospital as defined in their master plan. Overall, volumes on the streets surrounding the hospital have not changed noticeably from 1986 to present (refer to the Traffic Report by VHB, included in the Appendix), although there have been changes resulting from changes in hospital services and locations of employee parking. This level of traffic should continue as a base associated with the size and services of Miriam and the neighborhood surrounding it.

Speed control measures fall into three distinct types: Vertical measures, horizontal measures, and narrowings. Vertical measures use forces of vertical acceleration to discourage speeding, and include speed humps or bumps, undulations, raised intersections, and textured pavements. While often considered the most effective in slowing vehicles, vertical measures are often disliked for the appearance, the noise they can create, and the liability often associated with them.

Horizontal measures achieve speed reduction by forcing drivers around horizontal curves and by blocking long views of the road ahead. Traffic circles are an example of horizontal measures, and are appropriate at intersections where speed is an issue, by impeding the straight-through movement. Upon entering the intersection, the driver must first yield upon entering, turn to the right, and then to the left as they pass through the circle, and then right again after clearing the circle. While not as controversial as speed humps, there are limitations associated with traffic circles, including the inability of large trucks and buses to maneuver around the small radius curves. One solution is to make the curbing and outer ring wholly mountable to accommodate the occasional truck wheel loads.



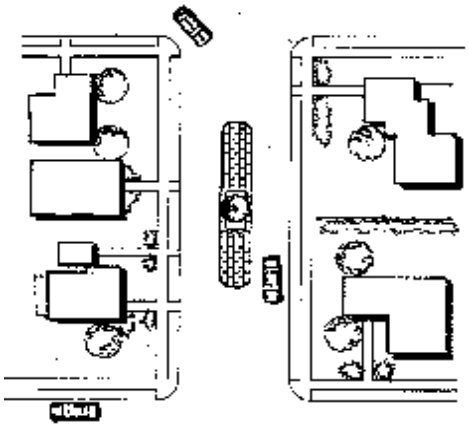
Neighborhood Traffic Circles

Traffic circles should not be confused with rotaries or roundabouts. Their primary functions are to deter cut-throughs, improve safety, and reduce speeds. They are visually attractive, with the opportunity for planting trees and other vegetation.

Detail of traffic circles in the Elmwood neighborhood. Hand painted tiles are attached to the center circle.

The final set of traffic calming measures uses roadway narrowing to achieve a reduction in vehicle speed. Narrowing the roadway creates a side friction, making it uncomfortable for the driver to travel at excessive speeds. Examples of narrowing include “neckdowns”, center islands, and “chokers”. Neckdowns are curb extensions at intersections that reduce the roadway curb-to-curb width. Their primary purpose is to “pedestrianize” intersections by shortening crossing distances, improve pedestrian visibility and drawing attention to the motorist of potential pedestrian activity. This increases the pedestrians safety and comfort. At signalized intersections, reducing pedestrian crossing distance reduces signal timing dedicated to pedestrian crossing, thus improving the overall operation of the intersection.

Center island narrowings are curbed islands located along the centerline of a street to narrow the travel lanes at a specific location. They are often landscaped to provide additional vertical friction necessary to give the perception that they traveled way has been narrowed. Center islands may be more effective when they are short interruptions to an otherwise open street, rather than long median islands that channelize traffic and separate opposing flows. The longer islands may actually increase the running speed since there is no opposing traffic.



Center Median island

Median islands provide safe refuge for pedestrians.

Center islands also provide a refuge for pedestrians crossing the road, allowing them a safe haven while waiting for a break in on-coming traffic, and should be used in conjunction with crosswalks where warranted.

Chokers are curb exensions at midblock that narrow the street by widening the sidewalk or planted strip. Similar to bulb-outs or curb extensions, chokers reduce speed, increase pedestrian safety by making them highly visible to motorists, and provide a visual vertical element. Chokers are appropriate at areas without frequent intersecting streets, particularly on those streets without Stop conditions for extended lengths.

Curb extensions at a Tee intersection in Elmwood.

Proposed Improvements

Hope Street

Hope Street North of Fifth Street

The average speed, as noted in the table below, is approximately the same for both directions, with northbound being slightly higher, perhaps due to the moderate grade of the roadway at this location. The 85th percentile speed of 33 mph is 8 mph higher than the posted speed limit, and 13 miles per hour higher than the acceptable speeds to minimize pedestrian injuries if hit by a vehicle. The 95th percentile speed is 36 mph, which translates into approximately 250 vehicles traveling at a rate of 36 miles per hour or greater per day.

Hope Street Traffic Characteristics

AADT:	9,500 vehicles per hour
Peak Hour: 8-9 am (weekday):	570 vehicles per hour
Peak Hour: 5-6 pm (weekday):	875 vehicles per hour
Peak Hour: 11am to 12 pm (weekend):	665 vehicles per hour

Northbound Speed Characteristics (Downhill)		Southbound Speed Characteristics (Uphill)	
Average Speed:	30 mph	Average Speed:	29 mph
85th percentile speed	*34 mph*	*85th percentile speed*	*33 mph*
95th percentile speed	*37 mph*	*95th percentile speed*	*36 mph*
Maximum speed range:	*46-50 mph*	*Maximum speed range:*	*46-50 mph*
Vehicle Classification:	*3% Trucks*		*1.8% Trucks*

Hope Street north of Fifth Street

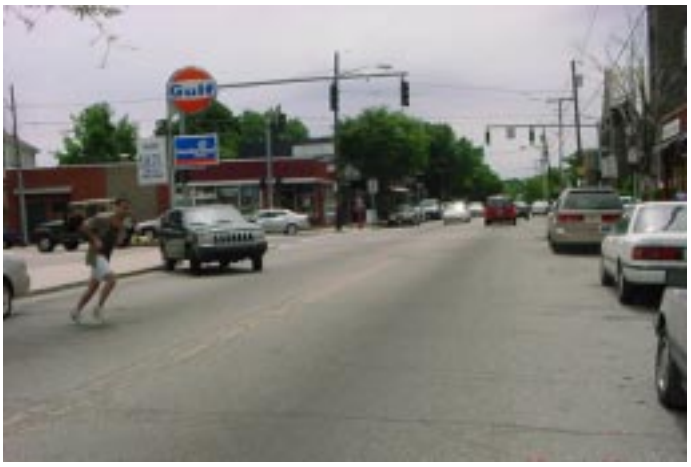
As noted earlier in the report, this section of Hope Street, north of the commercial blocks bordered by Braman Street and Fifth Street, is almost exclusively residential with off-street parking, the exceptions being a dentist office and a block of commercial properties between Eighth and Ninth Streets. It should also be noted that most of the residential driveways are narrow with no provisions for internal circulation. Therefore, almost all of the residents must back their cars out onto Hope Street.

Hope Street south of Fifth Street

The speed characteristics change significantly when entering the busy commercial area south of Fifth Street. While the pavement width remains the same, the roadway provides on-street parking on both sides, narrowing the traveled way to approximately 20 feet. Storefronts at the back of 10-foot sidewalks create the vertical friction to slow vehicles to an acceptable level. In fact, the 85th percentile speed drops to 23 mph in this area, while the average speed is 20 mph. This slowdown occurs at the intersection of Fifth Street for vehicles approaching from the north, and at Dana Street for vehicles approaching the intersection of Rochambeau from the south.

The commercial area of Hope Street relies almost exclusively on on-street parking for its clientele with the exception of the CVS, Citizens Bank, and a bakery. While a detailed parking study of the existing businesses and available parking spaces is beyond the scope of this study, it was noted on numerous occasions that, on several blocks, the parking is insufficient for the businesses, particularly during the peak lunch and dinner hours. This deficiency resulted in vehicles encroaching onto the residential streets. In addition, several businesses receive deliveries during peak traffic hours, adding to the congestion and causing delays. It is recommended that a further parking study be undertaken for the Hope Street corridor to determine the extent of the deficiencies.

Cars currently park illegally on the corners of side streets off Hope Street. Signposts as evidence of parking restrictions (i.e. No Parking Here to Corner) remain, although the signs have been removed or hit by vehicles. The result is potential unsafe turning movements from side streets due to sight distance restrictions and difficulty in negotiating the turns onto side streets, further hindering the free movement on the main road.



Pedestrians have a difficult time crossing the roadway due to vehicle speeds and volume.

The retail and service nature of the properties generate significant pedestrian traffic throughout the area. Crosswalks are striped at several intersections, however, pedestrians have been observed crossing mid-block. Those pedestrians have to cross the 40’ wide road, with little or no assistance from the physical environment.

The excessive speeds in certain areas created by the expansive pavement width on Hope Street has been identified as requiring traffic calming techniques. Hope Street carries 9,500 vehicles per day through a busy commercial area, and to the north, a quiet residential neighborhood. It's classification as an arterial matches the travel characteristics found in the survey, connecting the Providence neighborhoods with Pawtucket, while providing direct access to the retail development.

While the volume of vehicles using Hope Street is acceptable for the current infrastructure, the behavior of motorists was found to be cause for concern. Although parking is permitted during the day and evening hours on Hope Street, very few cars park on the street between Fifth Street and Eighth Street. The result is a constricted roadway in the commercial area but to the north in the neighborhood the roadway allows for wide travel lanes with numerous driveways and side streets.

It is recommended that small, vegetated islands be constructed in pairs from Hillside Avenue to Fifth Street. The islands would be five (5) feet in width by approximately 30 to 40 feet in length. The islands have been located on the roadway to allow access to all driveways and side streets, while narrowing the pavement width. The islands could be planted with spring flowering bulbs, and summer perennials, and perhaps upright trees. The islands will be located so as not interfere with the parking required for the businesses at Eighth Street. As illustrated in Figure 11, the islands will effectively reduce the pavement from 40 feet curb-to-curb, to travel lanes of approximately 17 feet, creating a visual friction making it uncomfortable for drivers to exceed the posted speed limit. The presence of parked cars between the island locations will reduce the traveled way further. High visibility crosswalks are proposed for all major pedestrian routes, particularly in the vicinity of the Lippitt Memorial Park, the businesses at Eighth Street, and near Fifth Street. The islands will create a safe haven for pedestrians crossing Hope Street. Refer to the illustrations below and on the following pages.

Fig. 11: Rendering by Gates, Leighton & Associates, Inc. of proposed improvements to Hope Street near Eighth Street

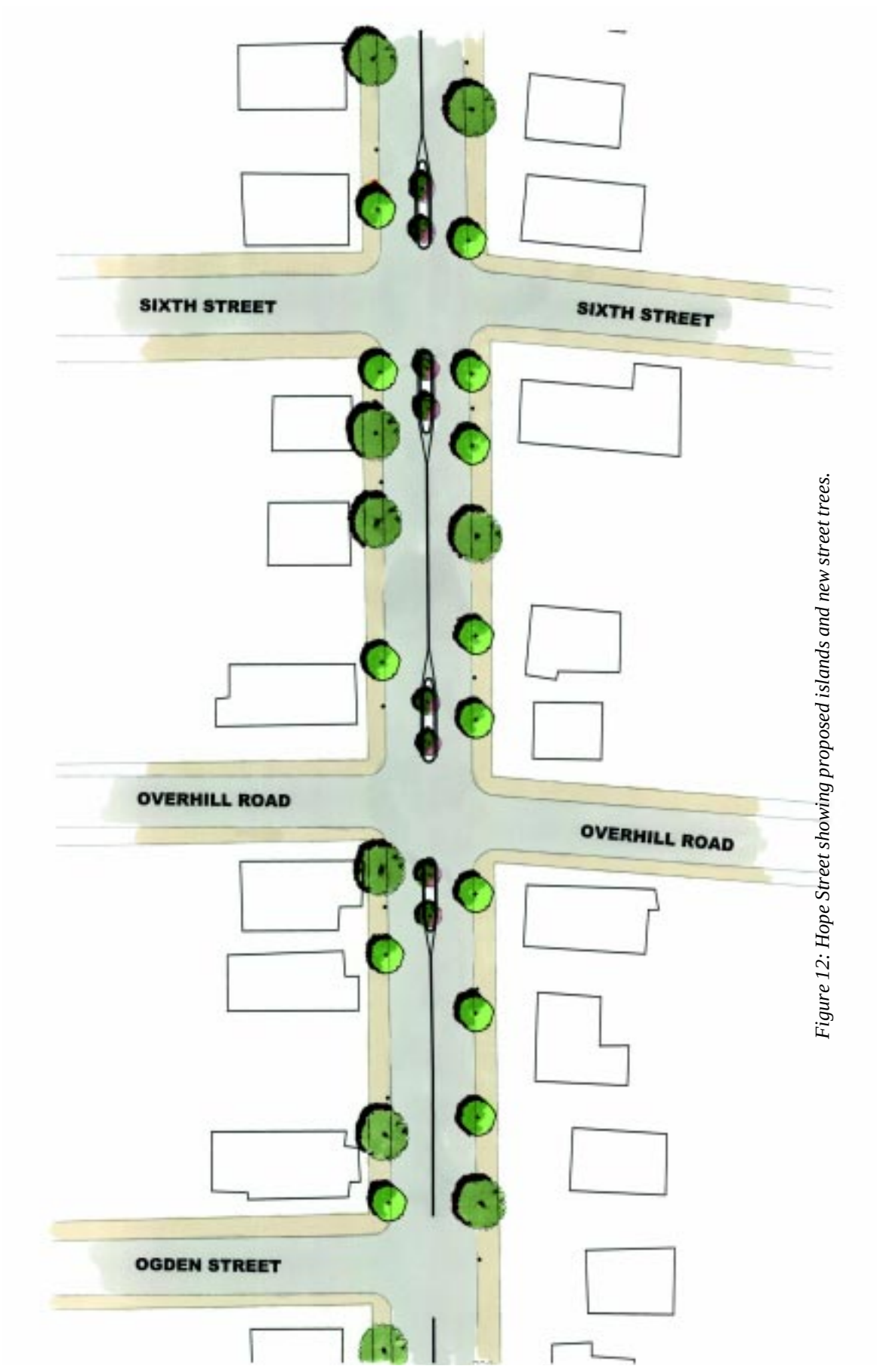


Figure 12: Hope Street showing proposed islands and new street trees.

BETA Group, Inc.
Engineers • Scientists • Planners

FIG. 13 - HOPE STREET
PROPOSED IMPROVEMENTS
Summit Neighborhood
PROVIDENCE, RHODE ISLAND