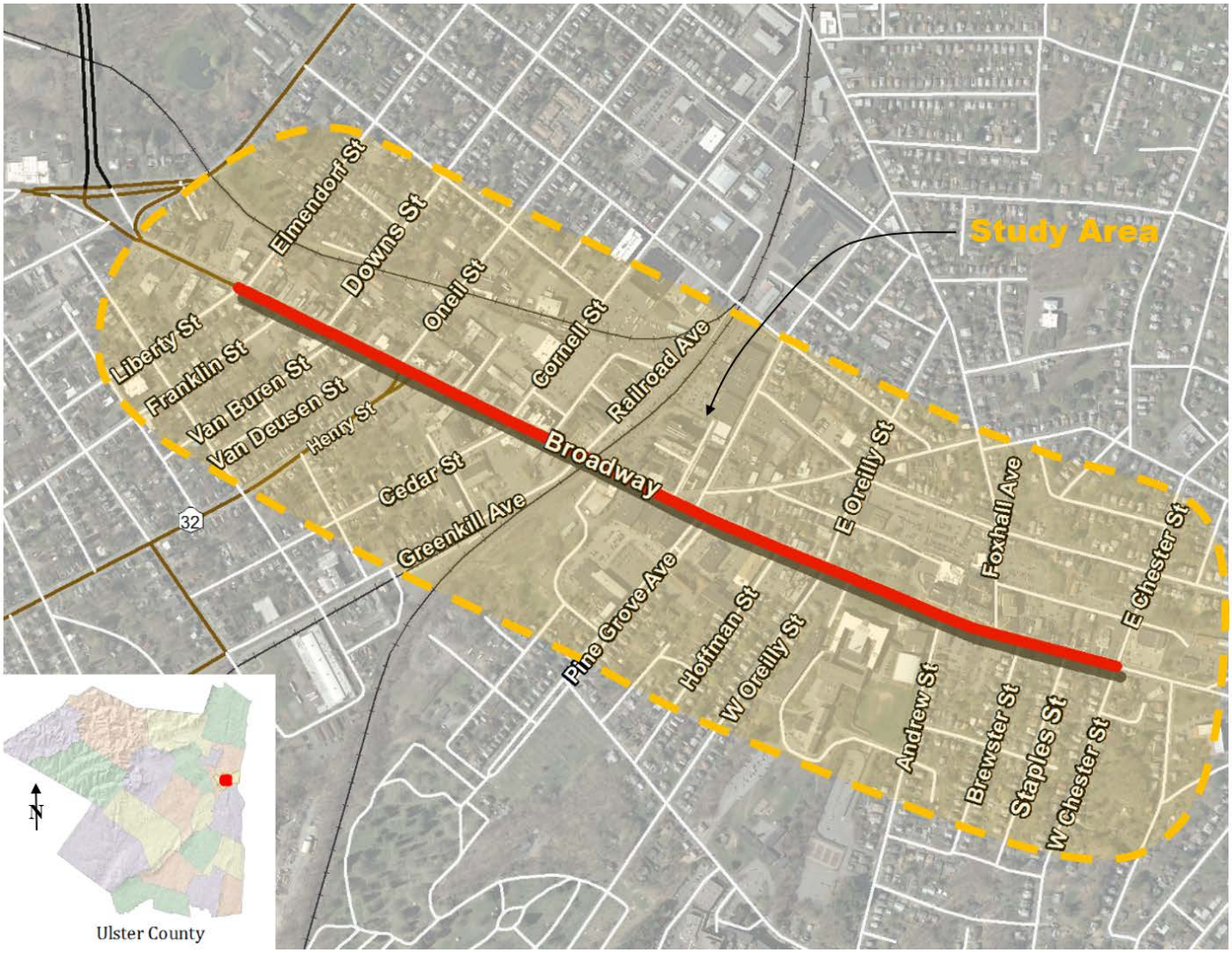
1 EXISTING CONDITIONS

1.1 Introduction

This existing conditions technical memorandum summarizes the VHB's review of previous studies, analysis of existing conditions and assessments for traffic, safety, parking, transit, complete streets, streetscaping, and land use for the Kingston Broadway Corridor Plan. The study limits are from Liberty Street/Elmendorf Street to Chester Street, as shown in Figure 1.

Figure 1 Project Study Area



Where there are issues or opportunities for improvement, general recommendations have been identified for consideration to improve conditions. To ensure that the potential actions or recommended elements meet the objectives of the project, all elements will be evaluated using a decision-making framework. The framework will provide a rational and consistent mechanism to prioritize recommendations.

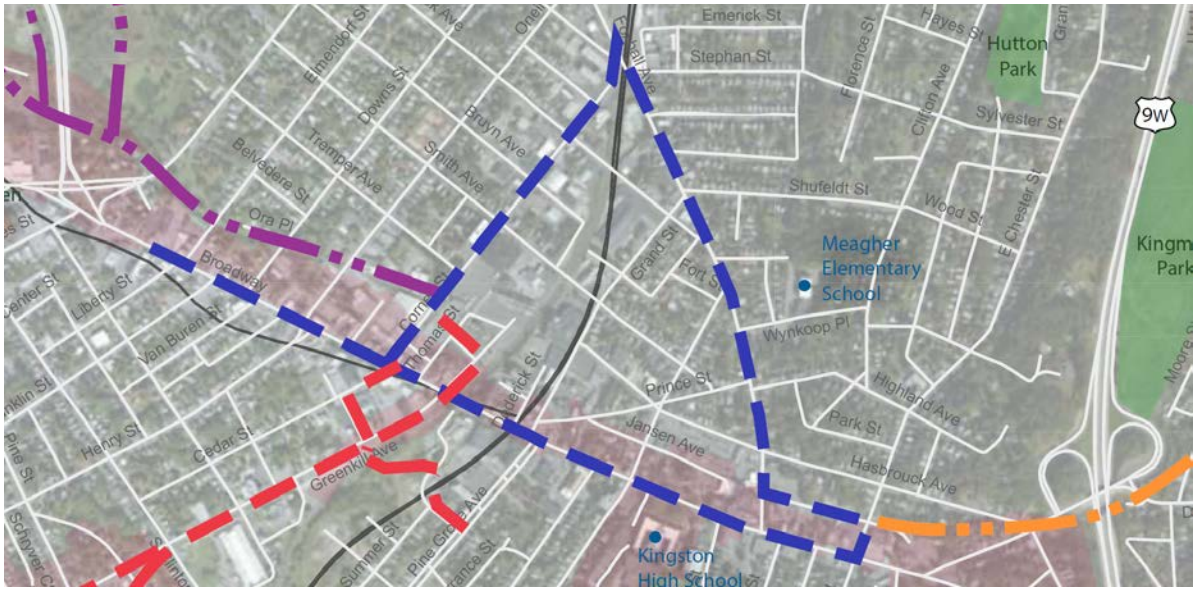
1.2 Previous Studies

VHB reviewed the previous studies described in the original RFP plus other, relevant studies. The studies with the most relevant information are included below, along with a description of the information and conclusions of each study.

Kingston Greenline Concept Plan, January 2014

This draft plan has valuable trail planning information which will need to be considered and incorporated into the study. As shown on Figure 2, the "Complete System Map" shows the Midtown Hub running along Broadway from Liberty Street to Chester Street, then one block north on Chester Street followed by one block west on Jansen Avenue, thence northwest on Foxhall Avenue to Cornell Street before turning back south along Cornell Street to Broadway. Connections from the Uptown area trail system, the Rondout trail system and the Walkill Valley rail trail system are proposed at Cornell Street, E. Chester Street and Cedar Street, respectively.

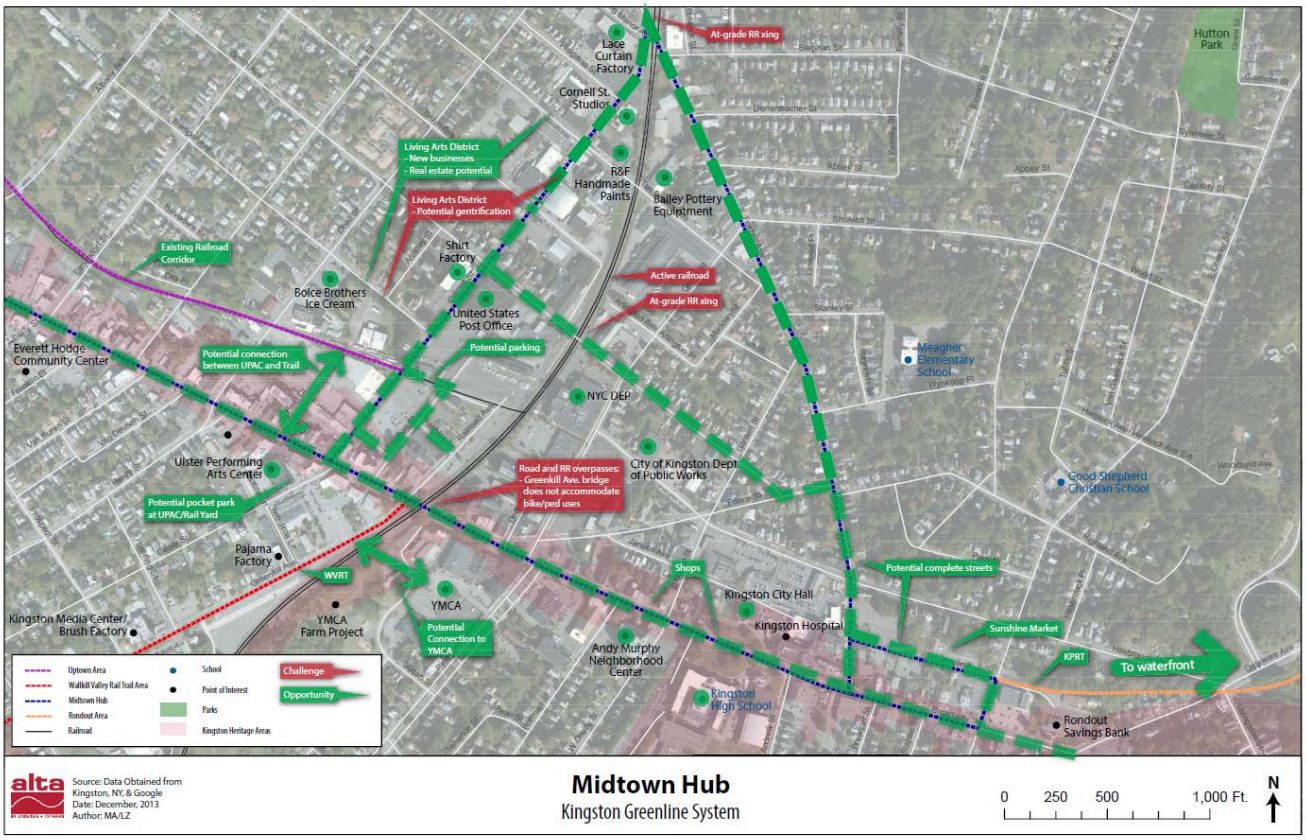
Figure 2: Kingston Greenline Complete System Map Excerpt



Greenline conceptual Midtown Hub (in blue) with connections (clockwise from top left) to the Uptown Area, the Rondout Area and the Walkill Valley Rail Trail system

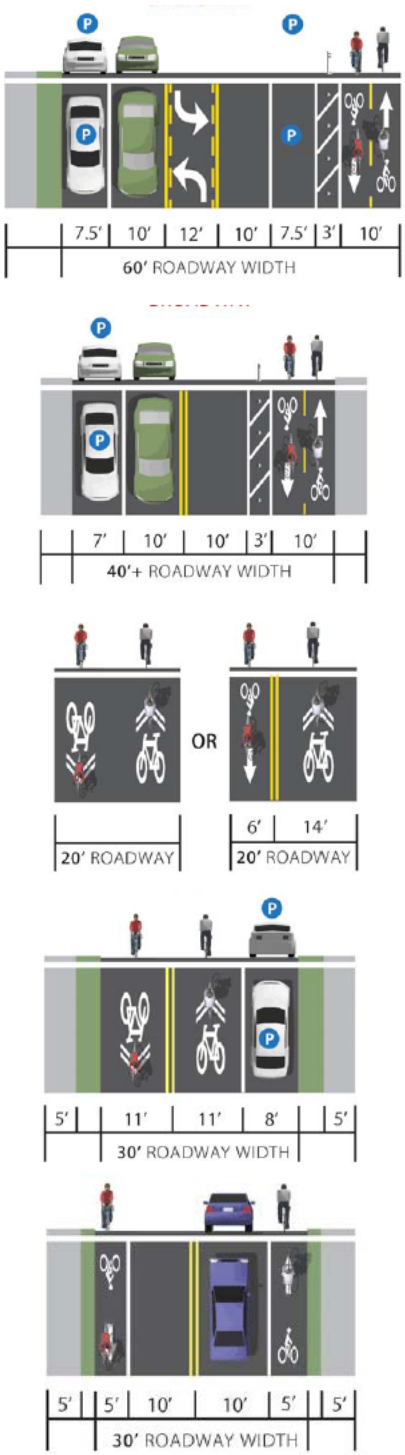
The Greenline Concept Plan also includes more detailed information for the Midtown Hub (included herein as Figure 3) showing existing railroad corridors, challenges and opportunities, potential bicycle circulation routes, points of interest, parking, etc.

Figure 3: Kingston Greenline Midtown Hub Information Map



Finally, the Greenline Concept Plan presents a number of cross sections illustrating concepts (shown below in Figure 4) for roadway configurations to accommodate cycle tracks, bike lanes or shared routes with shared lane markings, depending on the street. These concepts, which are presented below, will need to be evaluated as part of this study.

Figure 4: Kingston Greenline Plan Cross-Section Concepts



Midtown Hub Concept

A : Broadway West

West of the railroad, Broadway has a 60 foot curb to curb width. A road diet, from four travel lanes to three, is proposed. A 10 foot wide cycle track is proposed on the north side of Broadway. A 3 foot seperation is recommended between the cycle track and the westbound parking lane.

Cycle Track & Sidewaks

B: Broadway East

East of the railroad, Broadway has a curb to curb width of approximately 40 feet. A 10 foot wide cycle track is proposed on the north side of Broadway, in place of the existing parking lane. A 3 foot seperation is recommended between the cycle track and the westbound parking lane.

Cycle Track & Sidewaks

C: Jansen Avenue

Jansen Avenue assists in connecting the Midtown Hub, and also connects the Uptown Trail to the system. Two alternatives to accommodate cyclists include: a shared roadway with shared lane markings, or converting the roadway to one-way with a shared lane and a counter-flow bike lane.

Shared Lane or Counterflow Bike Lane

D: Foxhall Avenue

Foxhall Ave has a width of 30 feet between curbs and a sidewalk on the east side of the roadway. To maintain parking on the east, sharrows are recommended to accommodate cyclists.

Shared Lane & Sidewalk

E: Cornell Street

Cornell Street has a width of 30 feet between curbs and sidewalks on both sides. 5 foot wide bike lanes are proposed with 10 foot travel lanes.

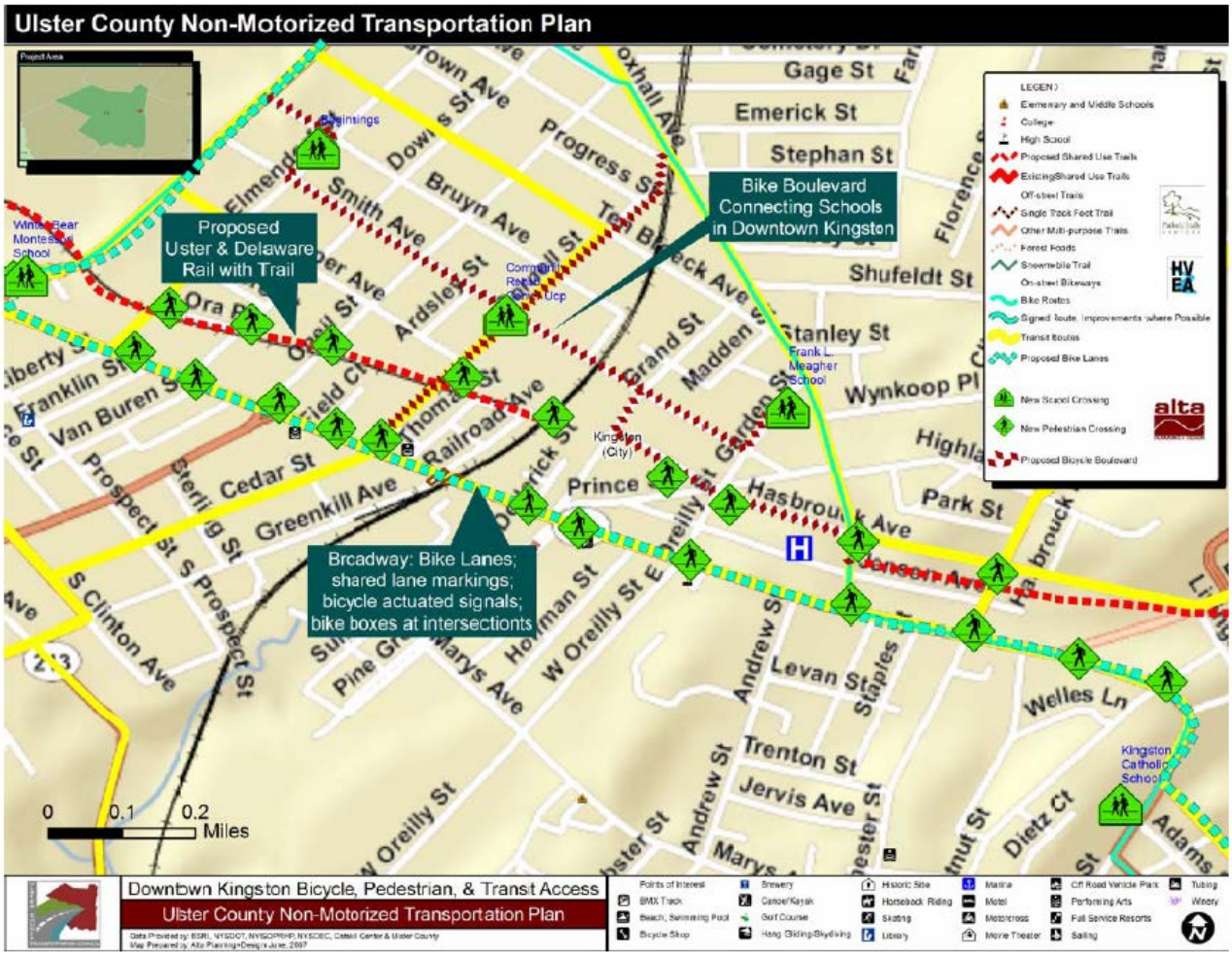
Bike Lanes & Sidewalks

This Greenline Concept Plan is in draft form and has not been adopted, but it is important that the concepts, particularly as they relate to the Broadway corridor and intersecting side streets, be considered for incorporation into the Kingston Broadway Corridor Plan.

Ulster County Non-Motorized Transportation Plan, December 2008

This plan includes the Kingston Broadway Non-Motorized Access project. The plan recommendations relevant to the Kingston Broadway Corridor study area are options to provide four to five-foot bike lanes by restriping Broadway, pedestrian safety improvements, traffic calming treatments, consideration of a road diet, and shared lane markings, depending on the cross section. A map from that study is included in Figure 5.

Figure 5: Ulster County Non-Motorized Transportation Plan: Downtown Kingston Access



Kingston Connectivity Project Application to the New York State Transportation Enhancements Program, August 2013

Consistent with the Greenline Concept Plan, the application describes using historic rail corridors to link a multimodal network from Uptown and Midtown along the Broadway Corridor to the Rondout and Hudson River Waterfronts. Rail trails end at the City line and do not continue as routes or bike lanes along City streets, and there are unserviceable or missing sidewalks. The project will bring the Walkill Valley Rail Trail, O&W Rail Trail, proposed Catskill Mountain Rail Trail and Kingston Point Rail Trail to a Midtown Hub at the center of the City. The connectivity plan proposes to do the following:

1. Conduct a study and implement an actuated coordinated traffic signal system along the Broadway Corridor from Albany Avenue at the I587 Intersection to Foxhall Avenue in Midtown
2. Complete Streets Design/Construction of Broadway including enhancements in the area near the Ulster Performing Arts Center, City Hall and Kingston High School
3. Provide for Heritage Area Enhancements including benches, decorative pavement, and façade improvements consistent with guidelines in the Heritage Area including along the Broadway Corridor
4. Provide for Walkability/Bikeability Enhancements with pedestrian signals, lighting, ADA compliant crosswalks, pedestrian ramps, and sidewalks.
5. Construct the Kingston Point Rail Trail and implement the “Greenline” concept as per plans developed by the Kingston Land Trust from Midtown near the Kingston Hospital to the Rondout Waterfront
6. Replace embedded rail trolley trackage along the Rondout Promenade and set the stage for electrification of the trolley from the Trolley Museum of NY to the lower end of Broadway
7. Extend the Waterfront Walkway/Bike Path connections along the Rondout and Hudson Waterfronts to Hudson Landing with a spur to Kingston Point Park

The overall project will create a multi-modal corridor and “Greenline” from the head of Broadway five miles to the Rondout Waterfront, Kingston Point Park, and the Hudson Landing Promenade. Funding is being sought under the New York State Transportation Enhancements Program for these specific elements of the Kingston Connectivity Plan:

- NYSERDA’s Cleaner Greener Communities Program award for the Kingston Connectivity Project, to focus on Broadway Corridor traffic signalization and other mobility improvements
- Traffic signalization overhaul at six intersections (based on findings of study)
- Broadway Corridor improvements to create a complete street that smooths traffic flows, creates bike lanes and a pedestrian-friendly corridor including trees and sidewalks
- Install enhancements including bike racks, benches, and vegetation
- Integration of the rail trail network into the existing transportation infrastructure

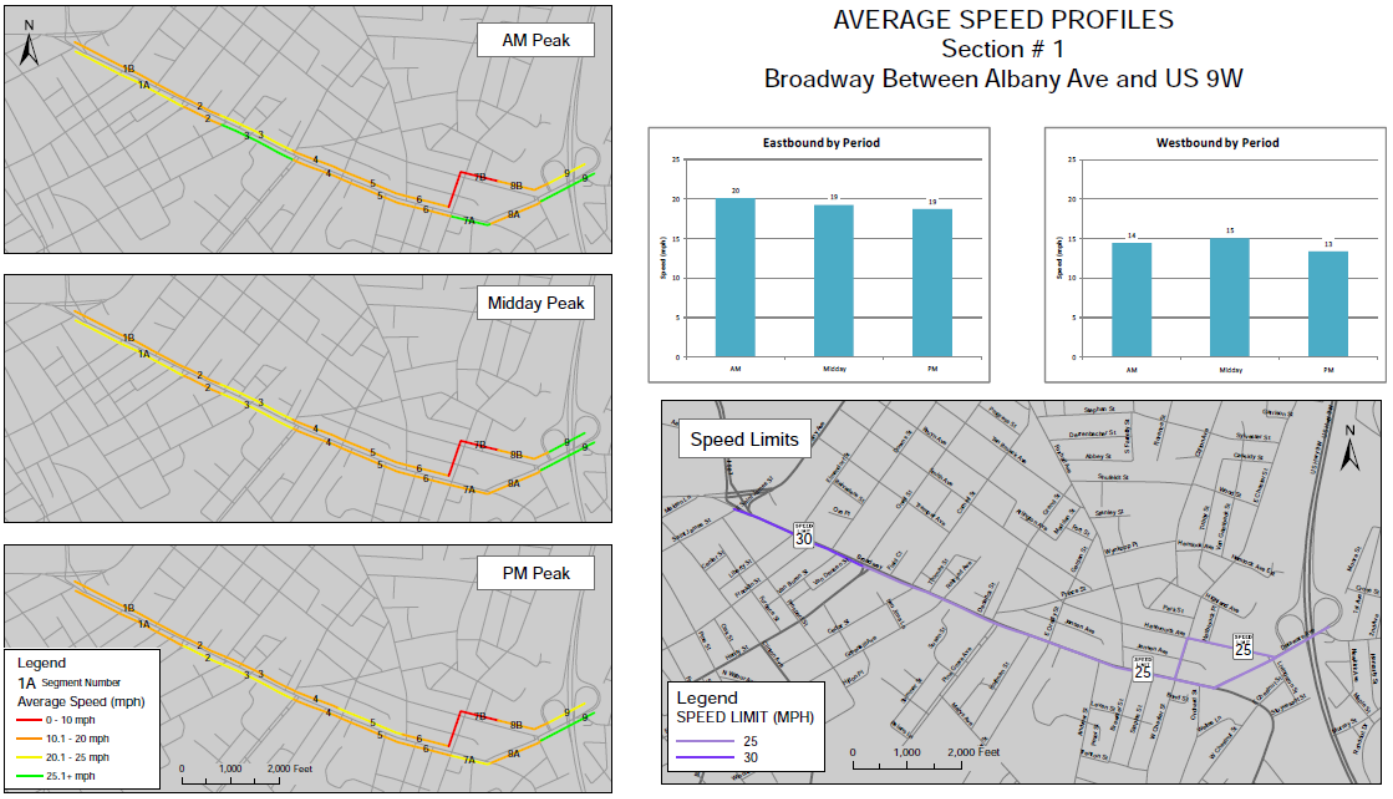
The performance measures of this plan related to transportation include a reduced crash rate, increased bicycle use, and reduced travel times.

Mid -Hudson Valley TMA Travel Time Study – dated October 7, 2011

This study included Broadway between Albany Ave and US 9W. The study found that average speed in the corridor was acceptable although travel times could use some improvement, as evidenced by the directional imbalance along the corridor. The average travel time for Broadway was approximately 4 minutes and 10 seconds for eastbound travelers and 6 minutes and 40 seconds for west bound travelers. Most of the delay in the westbound direction was in segment 1B at the intersection of Broadway and Albany Ave within the project limits of the NYSDOT intersection improvement project scheduled to begin in 2015.

As indicated in Figure 6, eastbound peak-hour speeds along the corridor averaged between 18 and 20 miles per hour while westbound peak-hour speeds averaged between 13 and 14 miles per hour.

Figure 6 – Average Peak-hour Speeds Along Broadway



Mid-Hudson Valley Transportation Management Area
Ulster County Travel Time Survey
Average Speed Profiles

Eng Werg, Taub & Associates

Other Studies

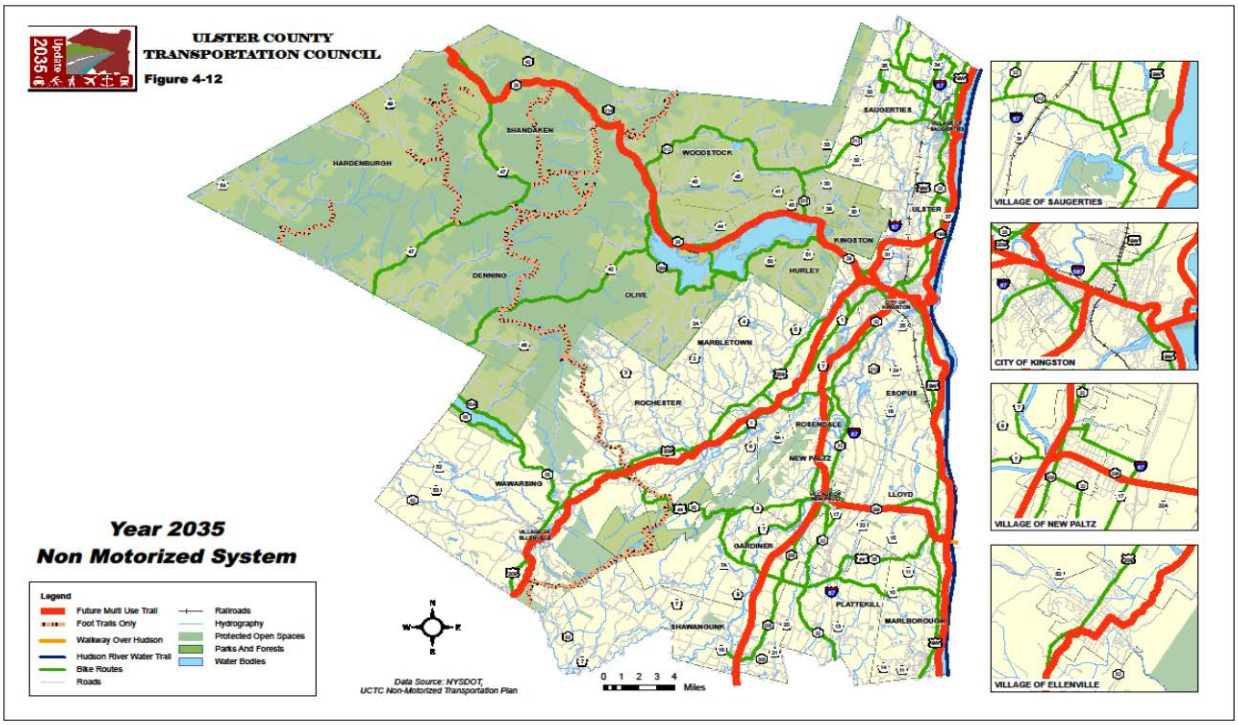
The I-587 at Albany Avenue/Broadway report provided information regarding the benefits of traffic improvements at and in the vicinity of that intersection (see Figure 7). Benefits on the Kingston Broadway Corridor study area were not quantified, however, it is assumed that the improvements would have a positive effect on the Broadway Corridor by reducing delays in the westbound direction. It is not clear whether there would be a noticeable effect on traffic delays in the eastbound direction although, with capacity improvements at the Albany Avenue/Broadway intersection the volume of traffic entering the corridor in the eastbound direction could increase during peak periods.

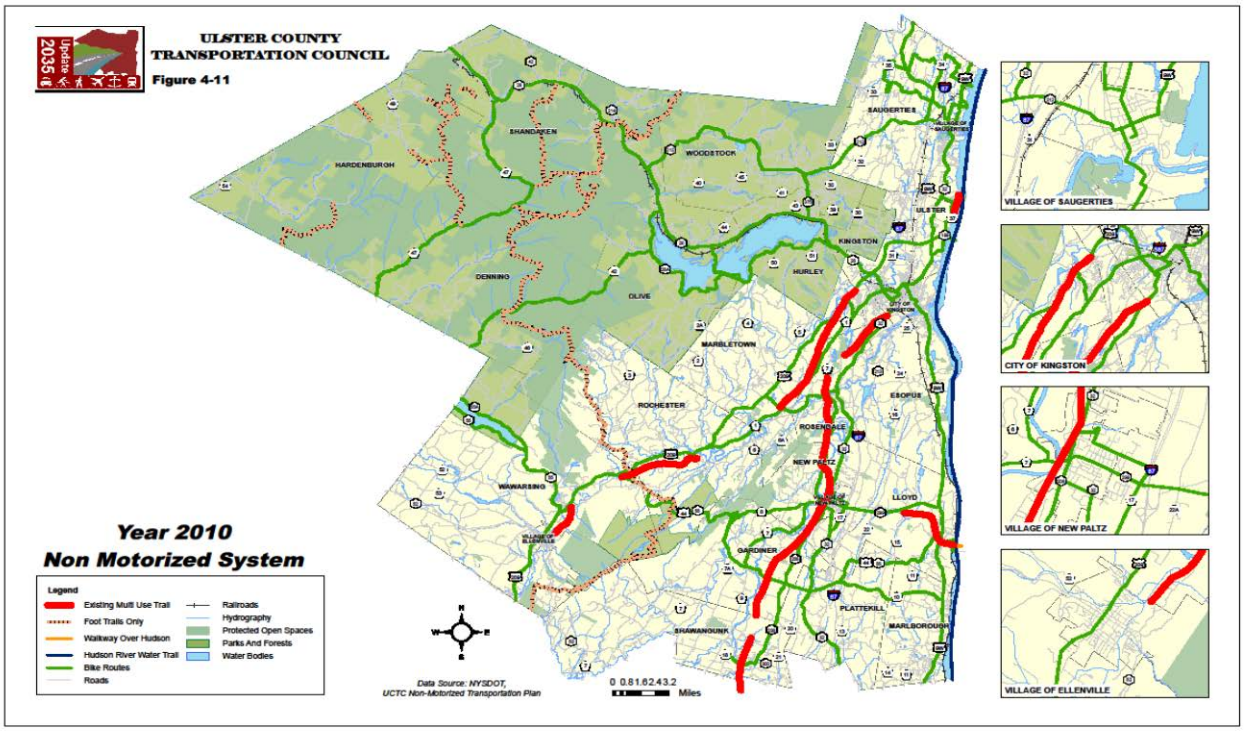
Figure 7: Rendering of the Proposed I-587 Roundabout Looking South

Source: April 2011 I-587 at Albany Avenue/Broadway Intersection Study - Executive Summary

The Ulster County Transportation Council Year 2035 Long Range Transportation Plan programs and prioritizes several projects within or adjacent to the study area, such as the Greenkill Avenue Bridge Replacement over Broadway, and the improvements at I-587/ Albany Avenue/Broadway. The Long Range Plan also includes relevant 2010 Existing Non-Motorized and 2035 Projected Non-Motorized Maps. These two maps, which are presented in Figure 8, show existing and proposed (2035) bike routes and multi-use trails in the study area. As can be discerned from the Kingston inserts in the figure, there is currently no multi-use trail in the study area, while bike routes run along Broadway from St James Street to Henry Street, from Andrew Street east, and along Foxhall Avenue. In the future, Broadway is envisioned as a multi-use trail with Foxhall Avenue remaining as a connector bike route.

Figure 8: Maps from Ulster County Transportation Council Year 2035 Long Range Transportation Plan





The Ulster County Transit Development Plan (2012) outlines service improvements for the two publicly –operated transit providers in Ulster County- Ulster County Area Transit and Kingston Citibus. Service recommendations for Kingston Citibus' operation along the Broadway corridor include exploring ways to maximize service frequency along the corridor, which would likely increase ridership. At present, service along the Broadway corridor is scheduled as hourly at best. Kingston Citibus has not implemented the recommendations, citing the need to focus its limited resources on maintaining service to client hubs distributed across the city.

The City of Kingston/Town of Ulster Quiet Zone and **City of Kingston Pedestrian Safety and Mobility Analysis Final Report** from April 2006 assess rail operations in and near the Greenkill Avenue crossing of Broadway as well as the costs and benefits of pedestrian safety improvements at grade crossings, but do not include Broadway since it is a grade-separated crossing.

Federal Aid Projects

According to the UCTC 2014- 2018 Transportation Improvement Program, there are two Federal –aid transportation projects scheduled within the study area. The City of Kingston is currently managing a $3.7 million project to replace the aging Greenkill Avenue bridge which passes over Broadway midway in the study area (PIN8756.18). The City is presently waiting approval of designs submitted to NYSDOT. NYSDOT Region 8 is scheduled to commence a $5.251 million project in 2015 to evaluate, design and reconstruct the intersection of I 587 with Albany Avenue in Kingston (PIN 8811.26). This will be a multi –year project and will utilize the UCTC I 587 at Albany Avenue/ Broadway report as a basis for design scenarios, findings of which were endorsed unanimously by the Kingston Common Council in 2013.

1.3 Street Geometry

Measurements of the Broadway corridor from St. James Street to Chester Street were conducted to provide an understanding of the various components of the corridor. The cross-sections were measured from building to building and included the pedestrian zone (sidewalks, street furniture, landscaped areas, etc.), parking lanes, medians and travel lanes. The measurements revealed that within the study area, there are generally five separate cross-sections, as summarized in Table 1 below.

Table 1 – Existing Corridor Geometry (minimum values)

Location	North Side				South Side		
	Pedestrian Zone	Parking	Through Lanes (No/Width)	Median	Through Lanes (No/Width)	Parking	Pedestrian Zone
West of Liberty Street	11’	9’	1/13’	1’-12’	1/13’	9’	13’
Roadbed Width		Increasing from 45’ to 56’					
Building to Building Width	Increasing from 69’ to 80’ from St. James Street to Liberty Street						
From Liberty Street to Cedar Street	12’	9’	2/21’	-	2/21’	9’	10’
Roadbed Width		60’					
Building to Building Width[1]	82’						
From Cedar Street to Dederick Street	10’	9’	1/15’	-	2/21’	9’	10’
Roadbed Width		54’					
Building to Building Width[1]	74’						
From Dederick St. to Hoffman Street	10’	9’	1/15’-12’	-	2-1/21’-12’	9’	10’-8’
Roadbed Width		Decreasing from 54’ to 42’					
Building to Building Width[1]	Decreasing from 74’ to 60’ from Dederick Street to Hoffman Street						
From Hoffman St. to east of Chester St.[2]	10’	9’	1/12’	-	1/12’	9’	8’
Roadbed Width		42’					
Building to Building Width	74’						

1. Except at Ulster Performing Arts Center, where the portal extends overhead to the curb
2. Street and Roadbed width narrows by 14’ and 12’ respectively between Pine Grove Avenue and Hoffman Street. Measurements from desktop surveys.

The following is a description of the five typical cross sections:

1. **St. James Street to Liberty Street/Elmendorf Street Cross-Section** – Starting at St. James Street, the building to building cross-section transitions from 69 feet to 80 feet approaching Liberty Street/Elmendorf Street. The roadway width varies from 27 feet to 38 feet and one travel lane is provided in each direction. A 9-foot wide parking lane is provided on either side of the roadway and a total of 22 feet is provided for sidewalks on each side of Broadway (generally a 9-foot sidewalk on the north side; 13-foot sidewalk on the south side).

2. **Liberty Street/Elmendorf Street to Cedar Street/Cornell Street Cross-Section** – In this section, a minimum of 82 feet is provided, measured from building to building. Broadway consists of two travel lanes in each direction (21 feet total per direction) and 9-foot parking lanes on each side. The remaining 22 feet is for the sidewalk area, except for the Ulster Performing Arts Center, where the columns supporting the portal extend to the edge of the roadway.

3. **Cedar Street/Cornell Street to Dederick Street Cross-Section** – In this area, due to the Railroad and Greenkill Avenue bridges, Broadway narrows to 74 feet, measured from abutment to abutment. The width of the travel lanes measures 36 feet and two to three travel lanes are provided, although the lanes are not clearly defined. Parking is provided at various locations on either side, with each lane measuring 9-feet wide. A sidewalk area is provided on each side with a total allocation of 20 feet.

4. **Dederick Street to Hoffman Street Cross-Section** – In this area, Broadway narrows from 74 feet to 60 feet, measured from building to building. The width of the travel lanes narrows from 36 feet to 24 feet. Parking is provided at various locations on either side, with each lane measuring 9-feet wide. A sidewalk area is provided on each side with a total allocation of 20 feet decreases to 18 feet.
5. **Hoffman Street to East of Chester Street** – From the previous cross-section ending at Dederick to Hoffman Street, Broadway transitions to a narrower roadway. Starting at Hoffman Street and continuing to the east of Chester Street, the cross-section measures 60 feet. One travel lane is provided in each direction (total of 24 feet) and 9-foot parking lanes are located on either side. Sidewalks are provided on each side, measuring a total of 18 feet wide.

1.4 Traffic

Traffic Volumes

Traffic data were collected in the spring of 2014 and consist of Automatic Traffic Recorders, manual turning movement counts at key intersections, manual turning movement spot counts at other locations, vehicle classification counts, and a speed study.

As indicated in Table 2 below, Broadway to the west of Grand Street experiences a higher level of traffic activity, with an average daily weekday volume of 12,343 eastbound vehicles and 9,821 westbound vehicles (22,164 total vehicles per day). To the east of O'Reilly Street, the average daily weekday volume along Broadway is 5,973 eastbound vehicles and 5,227 westbound vehicles (11,200 vehicles total per day).

Table 2 – 2014 Average daily Traffic volumes

Roadway Segment	Average Daily Weekday Volumes		
	Eastbound	Westbound	Total Both Directions
West of Grand Street *(between Dederick St. & Thomas St.)*	12,243	9,821	22,164
East of O'Reilly Street *(between O'Reilly St. & Andrew St.)*	5,973	5,227	11,200

Based on a review of the ATR data, the weekday PM peak hour was determined to be the most critical time period for conceptual design purposes. The ATR data also indicated that Broadway east of the railroad (where the hospital and high school are located) had a slightly earlier peak hour than Broadway west of the railroad.

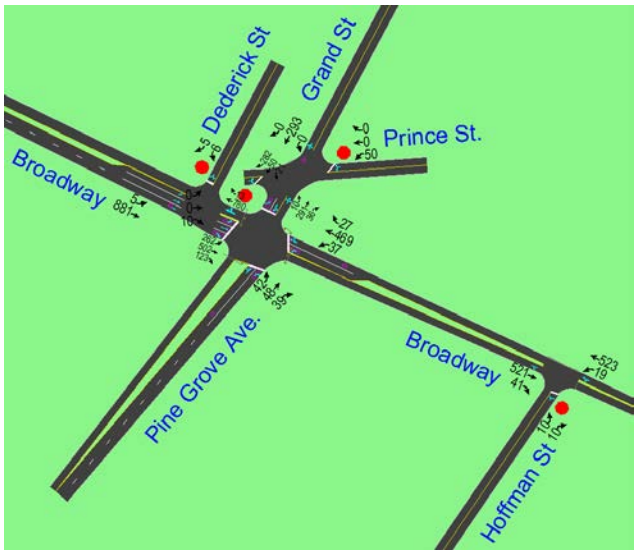
The manual turning movement counts revealed that the PM peak hour Traffic volumes on Broadway range from 485 to 885 vehicles per hour in the eastbound direction and from 430 to 785 vehicles per hour in the westbound direction. The higher volumes are generally located to the west of Grand Street and the lower volumes are located to the east of O'Reilly Street. The weekday PM peak-hour volumes from Liberty Street to Cedar Street are shown on Figure 9.

As can be seen from Figure 9, the volume of peak-hour traffic on Broadway in the 4-lane section from Liberty Street to Cedar Street peaks between Downs Street and Franklin Street with 680 vehicles traveling in the westbound direction and 835 vehicles traveling in the eastbound direction. Traffic volumes on the side street approaches range from 77 vehicles on the Downs Street approach to 275 vehicles on the Cedar Street approach.

Figure 9: Estimated Peak PM Hour Traffic Volume from Liberty Street to Cedar Street

The weekday PM peak-hour volumes from Dederick Street to Hoffman Street are shown on Figure 10.

Figure 10: Estimated Peak PM Hour Traffic Volume from Dederick Street to Hoffman Street

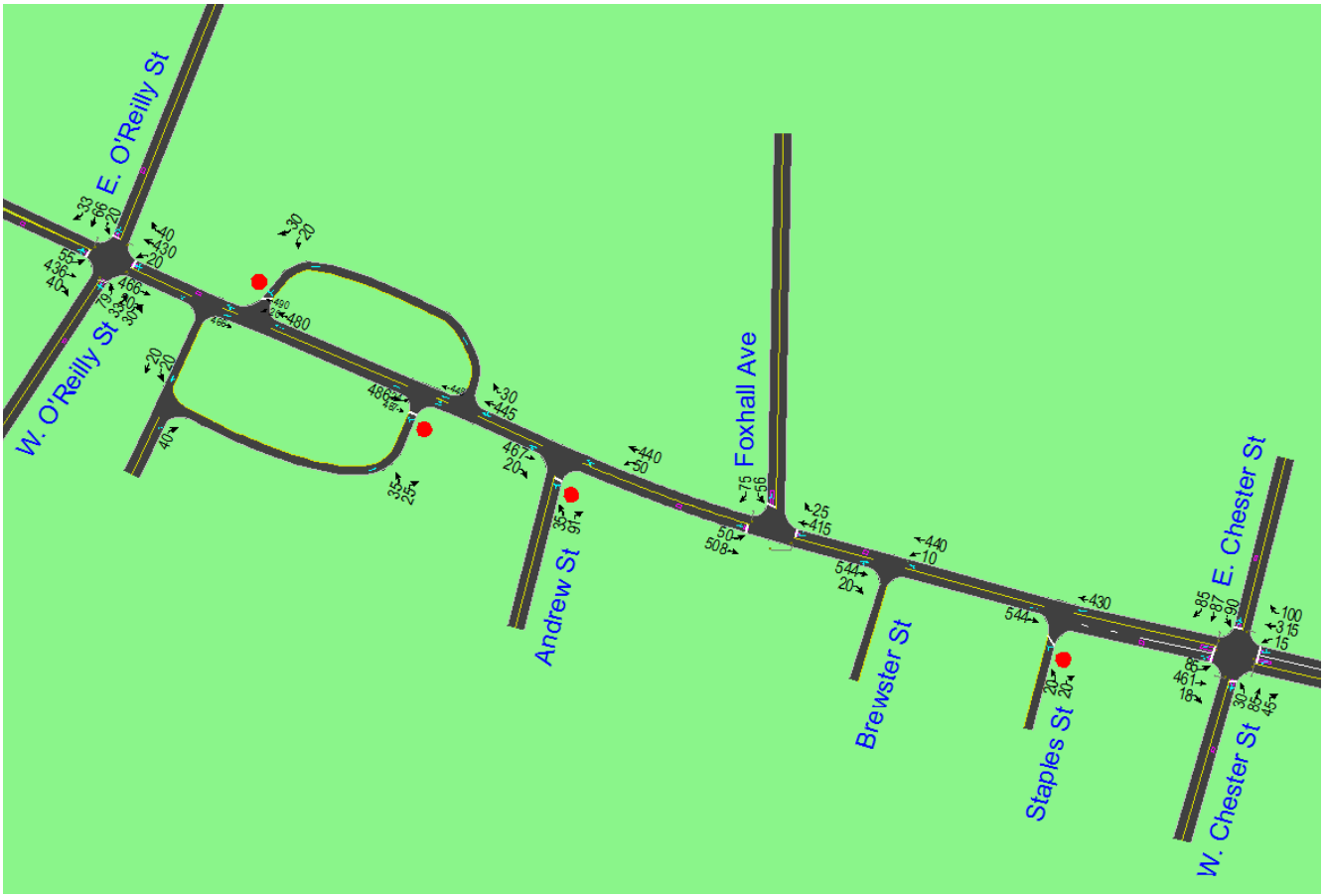


As can be seen from Figure 10, the volume of peak-hour traffic on Broadway in the 3-lane transitional section of the corridor from Dederick Street Hoffman Street peaks under the

railroad bridge, west of Grand Street with 785 vehicles traveling in the westbound direction and 885 vehicles traveling in the eastbound direction. This is logical, since the paucity of crossings of the railroad in the vicinity funnels traffic into the corridor at this point. Traffic volumes on the side street approaches range from 11 vehicles on the Dederick Street approach to 350 vehicles on the Grand Street approach.

The weekday PM peak-hour volumes from E/W O'Reilly Street to E/W Chester Avenue are shown on Figure 11.

Figure 11: Estimated Peak PM Hour Traffic Volume from O'Reilly Street to Chester Street



As can be seen from Figure 11, the volume of peak-hour traffic on Broadway in the 2-lane section of the corridor from O'Reilly Street east peaks just west of O'Reilly Street with 531 vehicles traveling in the eastbound direction and 542 vehicles traveling in the westbound direction. Traffic volumes on the side street approaches range from 40 vehicles on the Staples Street approach to 262 vehicles on the East Chester Street approach.

As can be seen from a review of these volumes, at 1,515 vehicles per hour, peak-hour traffic activity on the 4-lane section of Broadway is slightly less than the 1,670 vehicles per hour in

the transitional 3-lane section of Broadway, indicating that, if the 4-lane section were reduced to 3 lanes, similar operating conditions would prevail on this section of the corridor that currently prevail by Grand Street and Pine Grove Avenue. A review of the side street volumes at Cedar/Cornell Street and Grand Street/Pine Grove Avenue reveals that they too are comparable, further supporting the conclusion that a road diet along the western section of Broadway would result in similar conditions to those that presently exist from east of Cedar Street to Hoffman Street.

The peak-hour volumes also indicate that, at 1,073, the level of traffic activity on the eastern, 2-lane section of the corridor is approximately 2/3 of the level of activity along the rest of the corridor, although the level of traffic activity on the cross street at Chester street is only slightly less than that at Grand Street/ Pine Grove Avenue.

Vehicle Classification

According to classification counts, approximately three percent of vehicles are classified as heavy vehicles (trucks with six or more tires or buses) in the area of Foxhall Avenue, and about four percent are heavy vehicles in the area of Henry Street. Heavy vehicle percentages of less than five percent are typical for urban streets, and therefore do not indicate an issue with excessive heavy vehicle traffic.

Pedestrian Activity

Concurrent with the collection of traffic volumes in the spring of 2014, pedestrian traffic crossing Broadway at each cross street in the study area, and crossing each street along Broadway in the study area was collected. According to the counts, PM peak hour pedestrian volumes crossing Broadway range from a maximum of 30 to 40 pedestrians to a minimum of 5 to 10 pedestrians per hour per location. The highest pedestrian volumes crossing Broadway are at Dederick Street, Grand Street and Pine Grove Avenue because of the active commercial area, and at Andrew Street because of the high school and hospital.

PM peak hour pedestrian volumes crossing streets along Broadway reach a maximum of 40 to 50 pedestrians per hour in the vicinity of Dederick Street, Grand Street and Pine Grove Avenue and from O'Reilly Street to Staples Street. Pedestrian traffic crossing streets along Broadway are at approximately 20 pedestrians per hour or fewer west of Greenkill Avenue Overpass/Railroad Bridge.

Cyclist Activity

Bike activity along and crossing Broadway in the study area was also collected in the spring of 2014. Bike traffic along Broadway in the PM peak hour peaks at 20 to 30 bikes an hour in the eastbound direction near the high school, most likely as a result of the school dismissal. Elsewhere on Broadway, biking along the street is lower at approximately 5 to 10 bikes per hour per direction. On streets crossing Broadway, there are very few bike movements crossing Broadway – typically 5 or fewer bikes an hour per approach on the cross streets.

Traffic Operations

A Synchro traffic simulation was prepared for the typical PM peak hour traffic volumes and conditions. Traffic signal timings from the field were obtained and used along with traffic observations and traffic volumes to calibrate the traffic simulation. These analyses are summarized in Table 3.

The Synchro analysis indicated that all of the intersections along the 4-lane section of the corridor (from Liberty Street to Cedar Street) currently experience very good peak-hour operating conditions, except for the intersection of Cedar Street with Broadway (discussed hereafter). Delays along Broadway at the signalized intersections average 15 seconds per vehicle or less, while delays on the side street approaches (both signalized and unsignalized) average 21 seconds or less. These conditions are indicative of a system where the available capacity of the corridor considerably exceeds peak vehicular demand.

At the intersection of Cedar Street and Cornell Street with Broadway, the assignment of a disproportionate amount of signal green time to the Cedar Street approaches (combined with a 4-second all-red interval) results in an overall average delay of 22 seconds, with an average delay of 24 seconds on the Broadway approaches and 18 seconds on the side street approaches. The Synchro analysis revealed that a simple reapportionment of the green time would yield average delays on the Broadway approaches as well as for the intersection as a whole at 20 seconds or less, while delays on the side street approaches would average 23 seconds, indicating that available capacity at this intersection also considerably exceeds peak vehicular demand.

Broadway looking east toward Henry Street

Table 3 – Summary of intersection and Corridor Analysis (Weekday PM Peak Hour)

	Type of Control	Average Delay (Sec/veh)	Side Street /Overall Intersection	Level of Service
Liberty Street/ Elmendorf Street	Signal	12.1	Overall	B
Franklin Street	Stop Sign	16.7	Site Street	C
Downs Street	Stop Sign	14.4	Side Street	B
O'Neil Street/ Henry Street	Signal	13.5	Overall	B
Cedar Street/ Cornell Street	Signal	22.3	Overall	C
Dederick Street	Stop Sign	22.1	Side Street	C
Pine Grove Ave/ Grand Street	Signal	18.8	Overall	B
Hoffman Street	Stop Sign	15.2	Side Street	C
O'Reilly Street	Signal	13.1	Overall	B
City Hall Exit	Stop Sign	13.3	Side Street	B
High School Exit	Stop Sign	13.9	Side Street	B
Andrew Street	Stop Sign	18.7	Side Street	C
Foxhall Avenue	Signal	33.9	Overall	C
Staples Street	Stop Sign	14.9	Site Street	B
Chester Street	Signal	17.6	Overall	B
Orchard Street	Stop Sign	16.7	Side Street	C
Delaware Avenue	Pedestrian Signal	24.2	Overall	C
Entire Corridor	8 Signals	Average of 7 Seconds/ intersection	169 Gallons of Gas Used / Hr	Average Speed 13 MPH

Level-of-Service – "A" through "F", "A" best, "F" worst

The Synchro analysis indicates that all of the intersections along the 3-lane section of the corridor (effectively from Cedar Street under the railroad to Pine Grove Avenue) currently experience reasonably good peak-hour operating conditions. Delays along Broadway at the signalized intersection of Grand Street/Pine Grove Avenue average approximately 25 seconds per vehicle, while delays on the side street approaches average 22 seconds or less on the unsignalized approaches and 30 seconds or less on the signalized side street approaches. These conditions are indicative of a system where the available capacity of the corridor is more than sufficient to accommodate peak vehicular demand.

Along the 2-lane section of Broadway, from Hoffman Street east, the Synchro analysis indicates that reasonably good peak-hour operating conditions currently prevail, except at the intersection of Foxhall Avenue. Delays along Broadway at the signalized intersections average 15 seconds per vehicle or less, while delays on the side street approaches average 18 seconds or less on the unsignalized approaches and 38 seconds or less on the signalized approaches. These conditions are indicative of a system where the available capacity of the corridor is more than sufficient to accommodate peak vehicular demand.

At the intersection of Foxhall Avenue with Broadway, the assignment of 35 seconds of green time to the Foxhall Avenue approach, regardless of whether or not there is any traffic on Foxhall Avenue (combined with a 4-second all-red interval) results in an overall average delay of 35 seconds, with an average delay of 38 seconds on the Broadway approaches and 9 seconds on the Foxhall Avenue approach. The Synchro analysis revealed that a simple reprograming of the signal to end the green interval on Foxhall Avenue when all waiting vehicles have been accommodated would yield average delays on the Broadway approaches as well as for the intersection as a whole at 11 seconds or less, while delays on the side street approach would average 28 seconds, indicating that available capacity at this intersection also exceeds peak vehicular demand.

A review of the network summary for the corridor from Synchro indicated an average delay of 7 seconds per vehicle as they passed through the intersections along the corridor with an average speed of 13 miles per hour and 169 gallons of fuel consumed.

Field observations of traffic signal operations revealed that there is excessive yellow and red clearance times along the corridor. At Pine Grove Avenue and Grand Street, there is three seconds of yellow and four seconds of all red; at all other signalized intersections in the study area, there is four seconds of yellow and four seconds of all red. Traffic delays could be reduced by calculating the proper clearances intervals. Or, the resulting leftover signal time could be used to program Lead Pedestrian Interval signal timing phases where the pedestrian signal changes to WALK before the next traffic signal phase. This allows pedestrians to establish themselves in the crosswalk ahead of turning vehicles which has been shown to increase driver compliance with yielding to pedestrians.

Broadway Looking East toward Foxhall Avenue

1.5 Safety

VHB performed an analysis of the most recent 36-month period of available crash data from January 1, 2011 to December 31, 2013. Crash severity was tabulated (fatalities, injuries or property damage), crash type (rear-end, sideswipe, etc.), and whether another vehicle, pedestrian, bicyclist, tree or other fixed object was struck.

Broadway Corridor

According to the data, 369 crashes occurred within the study area at intersections or midblock on Broadway. Typically, urban corridors with a high density of intersections and a combination of the various conflicting activities found in a central business district (driving, biking, walking, transit, loading/unloading, etc.) tend to have higher accident rates than ex-urban corridors. Although useful comparables of urban corridors are difficult to find, with a calculated accident rate of 22.4 per million vehicle miles traveled, the Broadway corridor has a relatively high accident rate. Fifty-seven percent of the recorded accidents occurred at just six intersections, with almost 30% of these accidents (61) occurring at the intersection of Cedar/Cornell Streets with Broadway and almost 20% of these accidents occurring at the intersection of E/W Chester Street with Broadway.

For the entire corridor, there were no fatal crashes, 15 pedestrian crashes, and 12 bicycle crashes. Of the pedestrian and bicycle crashes, 25 percent occurred at an intersection and 75 percent occurred midblock. Of the intersection bike/ped crashes, only two of seven involved a pedestrian crossing against the signal, suggesting that most of these crashes were due to driver error. Of the non-intersection bike/ped crashes, 35 percent were crossing but

not at a marked crosswalk, 30 percent were along the road or at driveways, 20 percent were at marked crosswalks, and the remainder were "other."

Just over 21 percent of all crashes involved injuries, which is slightly lower than the average rate of 25 percent, according to the New York State Department of Transportation Accident Costs/Severity Distribution Tables for a free access, urban, undivided, 4-lane roadway based on data collected from August 1, 2011 to July 31, 2013. The predominant types of motor vehicle collisions on the corridor were rear-ends (33 percent), overtaking (19 percent), and right-angle (19 percent). Rear-end crashes on a street of this type can result from poor signal progression or a lack of left-turn or right-turn lanes where vehicles have to stop suddenly for turning vehicles. Overtaking crashes are also an indication that left-turn and right-turn lanes may be needed, because vehicles are suddenly changing lanes to turn or move away from a vehicle slowing to turn. Right-angle crashes are an indication that yellow and red clearance intervals at signalized intersections may need to be recalculated, or that there are not adequate gaps in traffic or sight distance issues associated with unsignalized intersections/driveways.

High Crash Locations

More than half of the crashes occurred at six of the seven signalized intersections:

- Liberty Street/Elmendorf Street;
- O'Neil Street/Henry Street;
- Cedar Street/Cornell Street;
- Pine Grove Avenue/Grand Street
- O'Reilly Street; and
- Chester Street.

Table 4 shows the crash type by location.

Table 4 – Crash Types for High Crash Locations

	Rear End	Right Angle	Side Swipe	Left turn	Right turn	Over-taking	Head on	Other (including unknown and ped-bike)
Liberty Street/ Elmendorf Street	29%	14%	0%	11%	14%	14%	0%	18%
Cedar Street/ Cornell Street	41%	13%	0%	15%	3%	18%	0%	10%
O'Reilly Street	44%	16%	0%	4%	4%	20%	0%	12%
Chester Street	37%	27%	2%	5%	0%	10%	2%	17%
Pine Grove Avenue/Grand Street	19%	10%	0%	10%	0%	29%	0%	33%
O'Neil Street/ Henry Street	24%	9%	0%	12%	3%	27%	0%	24%

As can be seen from Table 4, the majority of intersection crashes are rear-end, overtaking and right angle, which is similar to the findings for the entire corridor, except that there were few side-swipe accidents at these intersections.

Table 5 shows whether another motor vehicle, pedestrian, bicyclist, tree or other fixed object was struck.

Table 5 – "Collision With" Table for High Crash Locations

	Total Crashes	Collision With					
		Motor Veh	Ped	Bicyclist	Tree	Fixed Object	Other
Liberty Street/ Elmendorf St.	28	25	0	1	0	1	1
Cedar Street/ Cornell Street	**61**	**56**	**2**	**2**	**0**	**1**	**0**
O'Reilly Street	25	24	0	0	0	1	0
Chester Street	**41**	**36**	**2**	**0**	**1**	**2**	**0**
Pine Grove Ave /Grand Street	21	19	0	1	0	0	1
O'Neil Street/ Henry Street	33	26	2	3	0	1	1

As can be seen from Table 5, pedestrian crashes occurred at Cedar Street/Cornell Street, Chester Street and O'Neil Street/Henry Street, and bicycle crashes occurred at Liberty Street/Elmendorf Street, Cedar Street/Cornell Street, Pine Grove Avenue/Grand Street, and O'Neil Street/Henry Street.

Table 6 shows the crash severity at high crash locations.

Table 6 – Crash Severity at High Crash Locations

	Total Crashes	Fatal	Injury	Property Damage Only	Non-Reportable*
Liberty Street/ Elmendorf Street	28	0	5	9	14
Cedar Street/ Cornell Street	61	0	8	23	30
O'Reilly Street	25	0	6	4	15
Chester Street	41	0	11	10	20
Pine Grove Avenue/Grand Street	21	0	4	8	9
O'Neil Street/ Henry Street	33	0	6	6	21

* Non-reportable crashes are defined by NYS Department of Motor Vehicles as having no injuries or fatalities and less than $1,000 in property damage

As can be seen from Table 6, Chester Street had the highest percent of injuries (27 percent), while Cedar Street/Cornell Street had the most accidents but only approximately 15% were injury accidents. The expected Statewide Average injury rate for this type of intersection is 30 percent. Therefore, although there may be a high number of total crashes at these intersections, there were no fatalities and the rate of injuries was lower than average. According to the crash analysis, there is not an issue with severe crashes on the Broadway Corridor.

Speeds

Prevailing speeds (according to the 85th percentile calculations) are 29 to 30 miles per hour in the area of Andrew Street, which is at or below the speed limit. 85th percentile speeds are 37 to 38 miles per hour (seven to eight miles per hour in excess of the speed limit) in the area of the Greenkill Avenue overpass. The higher speeds at this location may be attributable to the the grade of the roadway and the long segment of Broadway with no traffic control devices to interrupt a free flow condition.

1.6 Parking

Parking use within a five-minute walk of Broadway in lots and on street was surveyed during a typical weekday in the spring of 2014. Figure 12 shows the parking use along and adjacent to the Broadway corridor.

Figure 12 – Parking Use on Broadway Corridor

According to the data, most streets and lots are not used to more than 70 percent of capacity, indicated by blue and green on Figure 12. It is noted that parking is restricted during certain hours on Broadway between O'Reilly Street and Andrew Street to allow for the drop-off and pick up of high school students, as this activity was recently prohibited from the circle in front of the school.

The areas on Broadway with greater than 70 percent but not more than 89 percent use indicating heavy utilization is the block west of Cornell Street/Cedar Street and just west and east of O'Reilly Street. The areas on Broadway with 90 percent or greater use are just east of Franklin Street and on either side of the Greenkill Avenue/Railroad Overpass (where it is mostly signed as "No Standing Anytime," even though there could be parking allowed). There are other sporadic pockets of heavy parking use and at-capacity use off Broadway, but they are not concentrated in one area. The parking data do not indicate a widespread parking deficiency, but there are areas where parking regulations could be modified to encourage more parking a block away where adequate capacity exists.

1.7 Signage

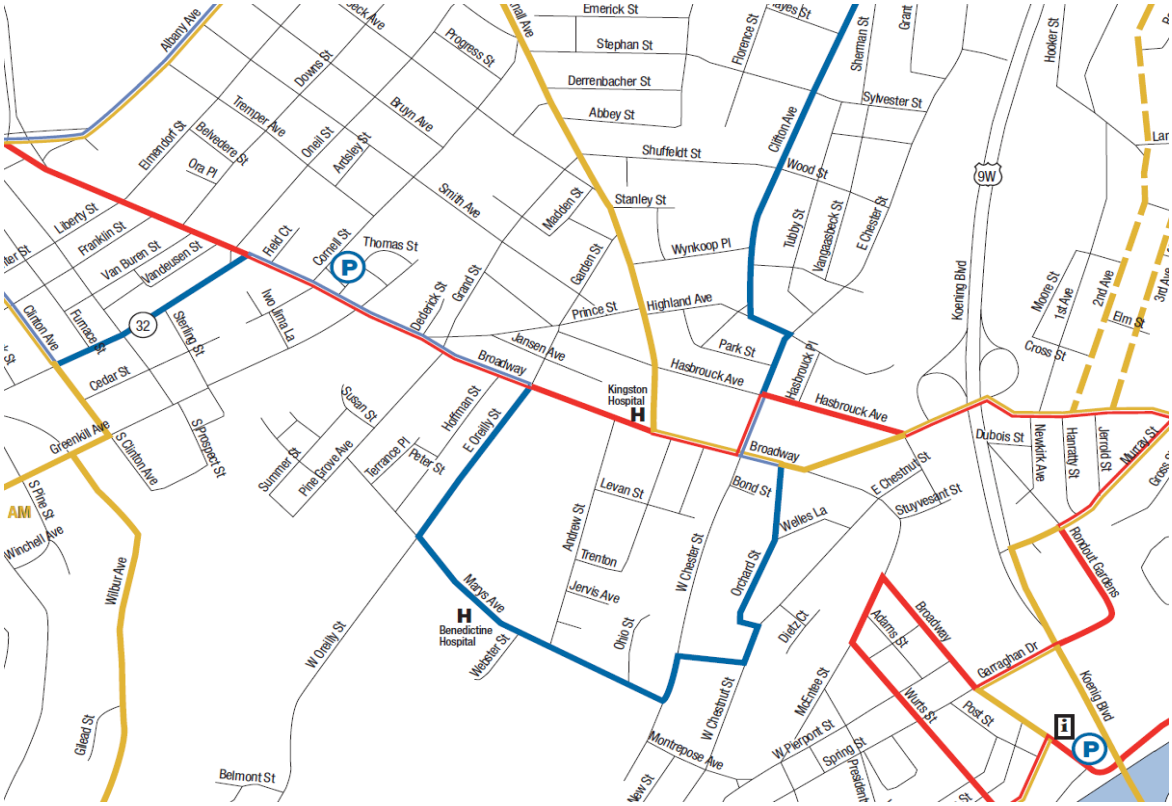
The signage on the Corridor is inconsistent and needs updating. The Bus stop signs vary in message and some do not provide information on the schedule. The route signs for State Touring Routes are in the corridor as are the street signs. Parking signs are adequate, although Municipal Parking Lots are not signed adequately for users unfamiliar with the corridor to find municipal parking lots. There are wayfairing signs that direct travelers to the Roundout water front in place in the east bound direction. There are banners throughout the corridor on street light poles.

1.8 Transit

Ulster County and the City of Kingston operate two separate transit networks serving the City of Kingston. The systems are complementary in their missions, but not seamlessly integrated. UCAT provides county-wide service, connecting Ulster County's towns, villages, and universities to the City of Kingston and to one another, while Citibus provides broad coverage within the City of Kingston and several areas on its borders. UCAT also links Ulster County residents to jobs and regional destinations in neighboring Dutchess and Newburgh Counties.

Figure 13 shows the Citibus routes. Figure 14 shows the UCAT routes.

Figure 13 – Citibus System Map



Citibus operates three routes which provide service to Broadway in what has been referred to as a deviated-fixed-route system: A (red), B (blue) and C (yellow). Service on the routes is infrequent with 1 hour headways and only operating from about 6:30 AM to 7:00 PM. Improvements to the transit service, as documented/referenced in the UCTC 2012 transit study, would benefit users and businesses along the Broadway Corridor.

Bus shelter on Broadway at Hoffman Street

UCAT currently operates as a “flag-stop” fixed-route system, meaning passengers may board at any location that is safe for the bus to stop along a bus route by flagging down an approaching bus. Similarly, passengers may request to exit the bus anywhere along the route. In the City of Kingston UCAT buses will drop passengers off upon request, but will only pick up passengers at Kingston Plaza and along Albany Avenue (for trips to Hudson Valley Mall).

Figure 14 – UCAT Bus Routes in the vicinity of Broadway

1.9 Complete Streets

VHB undertook an assessment of pedestrian safety infrastructure and led a walking tour along the corridor with the Technical Advisory Committee members. The Ulster County Performing Arts Center is a significant pedestrian generator during events. Also, the hospital, City Hall and Kingston High School are in close proximity to each other and are each major pedestrian generators. Other pedestrian trip generation is sporadic on the Broadway Corridor, with a few pockets of popular stores/restaurants generating foot traffic. However, during daytime observations, the only significant pedestrian traffic was on the blocks adjacent to the hospital, City Hall and Kingston High School.

Walking Tour

Conditions were assessed during school dismissal hours on May 30, 2014 during a walking tour on a typical weekday with school in session. Also, a more detailed inventory of pedestrian, bicycle and transit infrastructure was collected between 9:00 AM and 3:30 PM on July 14, 2014. The following general conditions are based on observations, and are not the result of traffic, parking, speed analyses or precise measurements:

Walking Tour Participants

- Sidewalk and crosswalk widths were appropriate for observed pedestrian volumes, i.e., low volumes, and were not restricted by sidewalk furniture or obstructions
- The speeds of most vehicles were not observed to have exceeded 30 MPH during field visits
- Parking violations, i.e., double parking, were not observed and, therefore, did not contribute to reductions in capacity due to blocked lanes
- There are no indications on Broadway that one is approaching – from either direction – a school on the block between O'Reilly and Andrew Streets; school signage and school pedestrian warning signage are needed
- Pedestrian warning signs – either crossing signs approaching uncontrolled, marked crosswalks or turning vehicles yield to pedestrian signs – are largely absent from the corridor; there are a few "state law yield to pedestrians in crosswalks" signs; more pedestrian warning signage is needed

Crosswalk without signs advising motorists

- Advanced stop bars, i.e., a stop bar stripe that is moved back by 8' to 10' from a striped crosswalk to provide a buffer between vehicles and pedestrians, are generally not present; advanced stop bars should be considered as a policy
- Street lighting was present at the majority of pedestrian crossings, and was only obstructed by trees in a limited number of locations (however, nighttime observations would determine if lighting was adequate)
- Urban traffic calming and complete street treatments such as curb extensions which provide pedestrians with greater visibility and shorter crossing distances, neckdowns (or short sections of narrowed roadway) which control traffic speeds by narrowing perceived lane widths, pavement markings that indicate additional users on the roadway like bicycles and buses, and pedestrian islands which would provide a refuge for pedestrians to use while crossing the street, etc., were not present; traffic calming should be considered
- Although street name signs were present and correctly oriented at most cross streets, they could be more visible to older users by upgrading them to the Clearview font type (proven to be more easily read), enlarging them, and/or illuminating them
- 8-inch lenses instead of the preferred 12-inch lenses are generally used on traffic signal heads
- There are generally two signal heads per approach on eastbound and westbound Broadway approaches, which is the minimum standard, and they are correctly oriented centered over each lane when there are two lanes
- Where intersections are signalized, pedestrian signals are present on both sides of all legs. It was noted that many of the pedestrian signal indications had been turned so that they no longer faced in the required direction and a number of the pedestrian push buttons were found to be inoperable, This issues should be rectified as soon as is possible
- At greater than half the intersections, it was determined that turn prohibitions could be considered to reduce pedestrian-vehicle conflicts; however, elimination of turning movements can result in delays at other intersections and additional vehicle-miles traveled due to diverting traffic no longer able to make a desired turn
- At greater than half of the intersections, parking did not block pedestrian desire lines
- Where uncontrolled crossings were located, it appeared that adequate gaps in traffic existed for pedestrians to cross; however, this was not quantified with a gap determination study or traffic or pedestrian volume count
- At about half of the intersections where bus stops were located, the stops were on the far side of the intersection
- At nearly all of the intersections, pedestrian ramps were present; however, this does not indicate the presence of ramps on both sides of each crossing, nor compliance to ADA standards. For instance, nearly all ramps were missing tactile warning strips/truncated domes

- On slightly more than half of the blocks, it was observed that driveways on Broadway were designed properly to best allow pedestrians to cross, i.e., the sidewalk continued across the driveway at the same grade and with minimal cross slope
- On the majority of blocks, though not all, benches and bike racks were not present
- Where there were bus stops, at most locations, bus shelters were not present
- On the majority of blocks, the surface on the walk and within the pedestrian crossings in the street were not smooth and level

Feature to which a bike can be locked

- On the majority of blocks, all four sidewalk zones were present
- On all blocks, bike/pedestrian-friendly storm drains were present
- A police officer was observed on May 30, 2014 directing traffic at Andrew Street during school dismissal, but it was not apparent if the officer is regularly deployed or if it was in relation to the street closure on W. Chester Avenue.

1.10 Street Scape

The Broadway Corridor has streetscape elements in various locations, but they vary widely in condition, quality, aesthetic appearance, and materials. These elements include:

- Sidewalks
- Street Trees (and tree grates)
- Street lights
- Street furniture (bollards, benches, waste receptacles)
- Bicycle racks
- Bus shelters
- Parking meters
- Signage (traffic signs, bus stop signs, plus way finding signs)
- Public service facilities – fire hydrants, utility boxes, mailboxes

Traditional Bluestone Sidewalk

The primary observation about these features in their existing condition is the variations that occur within the corridor. For example, many areas of the corridor have street trees, but the size, health and likelihood of success of the trees varies widely. Some trees have no tree grate (no space around roots), with pavement up to the trunks; others have no tree grate and some minimal space; other trees were planted with tree grates and/or adequate space around the trunks to allow for most likely success of the tree.

Another feature along the corridor is bus stops – where some bus stops have shelters with benches, some have just a sign post along the roadside.

Other examples include sidewalks varying in width, materials, and condition. Some places have a grass strip between sidewalk and road, some have pavement, and some have decorative pavers. Waste receptacles and street light posts are not consistent in type, size, location or materials.

Other features that influence streetscape appearance include: the setbacks of buildings and/or parking lots from the road (also dependent on zoning, historic context, and other factors); inconsistency of street furnishings, sidewalks, signage; and allowing for municipal maintenance functions including snow removal and snow storage, pedestrian circulation, safe bus stops, accessible fire hydrants and utilities, and accessible access for pedestrians, among others.

1.11 Land Use

Improvements to the Broadway Corridor are not being considered as a stand-alone project. Instead, they are part of the City's ongoing planning efforts aimed at upgrading not only the

corridor but also the Midtown area which surrounds it; it is a crucial element of Kingston as a whole and one of the main focuses of the City's current comprehensive planning effort.

In October of 2013, the City's Comprehensive Plan consultants - Shuster-Turner Planning Consultants – issued a report titled *Kingston 2025: Vision for the Future and Planning Needs*. That report contained the results of their initial planning reconnaissance, including the public visioning that helped to elucidate the attitudes and preferences of local residents and other stakeholders. A number of the report's observations and conclusions relate to Broadway and its surroundings, including the following:

- The Vision Statement identifies four cores for the city; one is "at a new core in Midtown centered at the existing Ulster Performing arts Center." (p.3)
- In terms of the vision for transportation, "The strongest sentiment regarding transportation infrastructure was for the construction and improvement of sidewalks and bikeways." (p.5)
- Among the top responses as to weaknesses of the city was, "Transportation infrastructure/ Bike lanes/ sidewalks/ traffic lights and buses" (p.8)
- For Opportunities, the leading item identified was "Beautify Broadway Corridor" (p.8)
- In the section on future actions, Goal 1 was, "Promote a new planned commercial node in Midtown centered around Education, the Arts, Entertainment and Ethnic Diversity." (p.11) [Note that, separate from the Comprehensive Plan process, this concept was the subject of a recent *Draft Revitalization Plan for Midtown* that focused on BEAT…Business, Education, Art & Technology.
- The report recounted past planning efforts, noting that the oldest and most focused study of Midtown was the 1976 Central Broadway planning study which included recommendations for "traffic signalization, installation of small parking lots and streetscape improvements." (p.21)

More specific recommendations are anticipated in late 2014 and are expected to incorporate proposals relative to the Broadway Corridor and the area around it.

1.12 Next Steps

Having documented existing conditions along the corridor, the next phase in the process is to compile a list of corridor needs and opportunity needs and to present it to the public along with the findings in this chapter. Subsequently, a public meeting will be held to determine whether the various users of the corridor believe findings are representative of current conditions along the corridor and that the needs and opportunities are reflective of the community's vision for the corridor. This may lead to a re-evaluation of certain conditions and will likely lead to further development and expansion of the corridor's needs and opportunities.