BLACK ROCK TURNPIKE
SAFETY STUDY

FINAL
EXISTING AND FUTURE CONDITIONS TECHNICAL MEMORANDUM

FEBRUARY 2018

Innovative Planning
BETTER COMMUNITIES

Tighe&Bond
Engineers | Environmental Specialists

TOWN OF FAIRFIELD SEAL 1639 CONNECTICUT

METROCOG
Connecticut Metropolitan Council of Governments

Black Rock Turnpike Safety Study
Existing & Future Conditions Technical Memorandum

TABLE OF CONTENTS

1. Executive Summary

The Black Rock Turnpike is a major arterial that serves one of Fairfield's largest business and commercial districts. As a state highway (Route 58), the Turnpike is a main north/south corridor in Fairfield. It provides a key connection for residential neighborhoods to retailers and services as well as a vital link between U.S. Route 1 and Interstate 95 in the south and the Merritt Parkway (Route 15) in the north.

Purpose

The purpose of the *Black Rock Turnpike Safety Study (Black Rock Study)* is to explore alternatives and strategies that will enhance safety for all users along the corridor, including pedestrians, bicyclists, transit users, and motorists.

The overall approach for the *Black Rock Study* will be to take a broad perspective on the role and function of this stretch of Black Rock Turnpike, and through a contemporary planning process, apply leading-edge engineering solutions to address safety, mobility, and accessibility improvements to the corridor.

The development of this *Existing Conditions Technical Memorandum* has benefited from extensive community outreach that was intended to provide interested parties with a means to communicate their transportation needs and concerns with the project team. This input has greatly contributed to the team's understanding of the Turnpike and will guide the development of recommendations as the study continues.

Study Area

The study area for this project focuses on the area between the Black Rock Turnpike intersection with Tahmore Drive and Old Black Rock Turnpike to the north and Tunxis Hill Road to the south. In response to public input, the project team also performed a cursory analysis of the segment of Black Rock Turnpike directly north of the study area from the intersection with Tahmore Drive to the Merritt Parkway. While this section was not part of the predetermined study area, the public expressed concern about safety issues along this part of the roadway, which primarily serves residential properties and provides access to the Merritt Parkway.

Road Conditions

The study area lane configuration varies between two-lanes to five-lanes. The north and south ends of the study area carries two lanes of traffic, one in each direction, and the central portion carries four lanes of traffic, with a fifth lane for left turns at the Route 135 (Stillson Road) intersection. Generally, Black Rock Turnpike has inconsistent shoulders ranging 1 foot to 10 feet wide, with wider shoulders at the north and south ends of the study corridor and narrower along the denser development in the center of the study area. Undersized shoulder widths of less than 4 feet cannot effectively accommodate larger vehicles and challenges bicycle and pedestrian travel along the corridor.

Black Rock Turnpike is a road marked with numerous driveways. The number of driveways, or curb cuts, increases the number of potential conflicts, both vehicular and non-vehicular alike, while also contributing to congestion, confusion, and frustration for motorists as they attempt to find a break in traffic.

Bicycle and Pedestrian Activity

Bicycling and pedestrian use along the corridor is relatively light when compared against the volume of vehicular traffic, but non-motorized activity is present and would likely be higher if conditions to improve the comfort and safety of those travel modes were made. While daily ridership activity is modest along the corridor, transit riders are also pedestrians, and thus issues pertaining to safety, comfort and accessibility at the street and sidewalk level apply to GBT bus riders. Bus stop location plays an important role in access to and from destinations along the corridor, as bus riders making a round trip will use stops on both side of the street. The busiest bus stops are located on Black Rock Turnpike between Stillson Road and Katona Drive.

Traffic

A review of the historic average daily traffic (ADT) volume data collected indicates daily traffic volumes along Black Rock Turnpike peaked around 2005 and declined until 2013. Following 2013, volumes have shown a modest increasing growth trend, averaging between 18,000 and 23,000 vehicles per day. Traffic levels during the weekday afternoon and Saturday peak hours tend to be higher than other periods of throughout the week, which reflects higher percentages of retail traffic mixing with the commuter traffic. The busiest areas on Black Rock Turnpike occur proximate to the larger retail developments. Traffic is lighter north and south of the Study Area. This pattern is consistent with the intensity of land uses along Black Rock Turnpike.

Results of the traffic analysis indicate that most of the study intersections operate at a Level of Service (LOS) D or better during typical weekday morning and afternoon and at LOS B or better during typical weekday midday and Saturday peak hours. Although LOS A through D are generally deemed acceptable for developed areas, there are situations where a specific intersection approach or movement experiences LOS of E and F (the lowest), even if the total intersection does not. These occurrences typically occur during peak travel times in the morning or evening and motorists traveling along such approaches can often experience delays. In addition, the complex interaction of driveways upstream and downstream of intersections often creates congested conditions that the modeling of individual intersections does not consider. Still, the LOS analysis is a valuable tool for checking the effectiveness of signal timing and lane configurations at the major corridor intersections.

Queuing exists at specific approaches to the intersections in the central portion of the study area between the intersections with Samp Mortar Drive and the Turnpike Shopping Center and Fairway Plaza driveways. Along this segment the closely spaced intersections and high traffic volumes from the dense commercial development result in queues that extend beyond the available road storage, resulting in additional congestion that may not be fully represented in the level of service results. It is important to recognize that when conducting traffic operations modeling that several factors need to be taken into account when measuring the effectiveness of a roadway to efficiently move traffic. The complex operation of Black Rock Turnpike is difficult to model, and though the signal systems seems to be capable of handling the volume of traffic, many other factors are responsible for the delay often experienced by motorists.

The vehicle speeds during the off-peak (low volume) hours of the day were consistently higher than during the peak (high volume) hours. Off-peak vehicle speeds had the highest variation from peak-hour speeds in the southbound direction, south of Stillson Road and in the northbound direction, north of Arrowhead Lane. Since commercial development and pedestrian activity also increases to the south of Stillson Road, higher vehicle speeds during the off-peak hour in this location are potentially hazardous. It should also be noted that vehicle speeds during both the peak and off-peak hours were highest at the far north and far south ends of the study area (west of Arrowhead Lane and east of Black Rock Turnpike). In the peak hours, average vehicle speeds were approximately 35mph in both of these locations, in both directions (southbound and northbound). In the off-peak hour, average vehicle speeds were approximately 40mph in both locations and in both directions. These higher speed conditions make pedestrian and bicycle crossings difficult and potentially hazardous. Speeds higher than 25 miles per hour are statistically proven to be responsible for serious injuries and/or fatalities when pedestrians are involved in a crash. High speed coupled with the high frequency of driveways is a recipe for diminished safety for all road users.

Safety

Across the three-year analysis period (2014-2016), there were 428 total crashes that occurred within the study area—a road segment approximately 1.73 miles in length. A crash rate of 11.9 crashes per million vehicle-miles of travel was calculated, which is approximately two times higher than the average crash rate (5.8 crashes per million vehicle-miles) on an urban four-lane undivided roadway in Connecticut. Four-lane roads are almost always higher in crash occurrences due to the complex weaving characteristics, speed and diminished sight lines. When adjusting the crash rate for the highest crash segment of Black Rock Turnpike from the intersection with Whitewood Drive to the intersection with Samp Mortar Drive, a crash rate of 19.1 crashes per million vehicle-miles travelled was calculated. This crash rate is over three times higher than the average crash rate on a typical urban undivided roadway in Connecticut. Over the course of the three-year study period, the majority (77%) of the crashes were property-damage-only crashes. Twenty-two percent (22%) of the crashes involved an injury. There were three fatal crashes, occurring in the three-year period analyzed.

For the segment of Black Rock Turnpike north of Tahmore Road, the overall crash rate is significantly lower than the crash rate for the same period along the primary study area. The lower crash frequency does not diminish the serious consequences of the crashes that did occur, and a majority of those crashes are related to the Merritt Parkway ramp system and should be more thoroughly evaluated independently from this study.

Conclusion

In conclusion, Black Rock Turnpike is a 4-lane state highway designed to facilitate regional travel with a modest level of access to private property. Over the years, the segment of the Turnpike between Samp Morter Drive and the Tunxis Hill Cutoff has evolved into a major commercial corridor with very high levels of access to property. The physical design of the road encourages high speed driver behavior, and the heavy traffic volume that results from a mix of shopping and commuter traffic creates an environment that is compromised for both travel mobility and accessibility to properties along the road. In fact, this segment of the Turnpike has a crash rate 2 to 3 times higher than that of a typical 4-lane urban road in Connecticut.

In addition to diminished safety and driver frustration stemming from congestion, Black Rock Turnpike also presents a hostile environment for pedestrians and bicyclists. Whether walking along the Turnpike or crossing it, pedestrians are often at a significant disadvantage. Crossings are infrequent and long, pedestrian visibility to motorists is low, and the frequent driveways pose a constant threat to those walking the sidewalks. Bicyclists, save the very skilled riders, appear to avoid Black Rock Turnpike in favor of other routes even though they aren't as direct.

Based on the data collected and analyses performed as part of this existing conditions evaluation, the study team concludes that Black Rock Turnpike requires a level of redesign that emphasizes safety for all users, while still maintaining adequate access to the residences and businesses along its length. In areas with high crash frequencies and/or severe crashes, near-term mitigations are necessary. In the longer-term, a more system-wide solution to dealing with a wide range of stated deficiencies may be necessary.

The next step in the planning process is to develop a future year forecast for traffic over 20 years. This will be the year in which the study team will be developing roadway solutions for. Once the growth rate and traffic forecasts are reviewed and agreed upon by the Connecticut Department of Transportation, a future year traffic operations analysis will be conducted to help understand how Black Rock Turnpike is expected to perform.

Based on the future traffic operations results, the study team will work with project stakeholders to identify a range of potential solutions to addressing safety, congestion, and multimodal opportunities in the corridor. The list of options will be screened, and the best ideas taken forward into a more detailed evaluation process. Conceptual plans will ultimately be developed for the best performing alternatives, and a simulation model will be developed for the most promising option.

2. INTRODUCTION

A. Purpose and Study Area

The Black Rock Turnpike is a major arterial that serves one of Fairfield's largest business and commercial districts. As a state highway (Route 58), the Turnpike is a main north/south corridor in Fairfield. It provides a key connection for residential neighborhoods to retailers and services as well as a vital link between U.S. Route 1 and Interstate 95 in the south and the Merritt Parkway (Route 15) in the north. Approximately 20,000 vehicles travel along the turnpike every day and this volume of traffic combined with the road width, traffic speed, and frequent driveways have caused the Turnpike to be identified as a trouble spot by The Town of Fairfield.

The purpose of the *Black Rock Turnpike Safety Study (Black Rock Study)* is to explore alternatives and strategies that will enhance safety for all users along the corridor, including pedestrians, bicyclists, transit users, and motorists. While this is primarily a transportation study, it has been undertaken with the understanding that the transportation network plays a key role in establishing the character of a community and the quality of life that is enjoyed by its residents and visitors. As a vibrant commercial corridor, it is also imperative that good accessibility to businesses is an important objective.

The study is primarily focused on the section of Black Rock Turnpike from the Tunxis Hill Cut-Off to Tahmore Drive, as illustrated in the study area map shown on the following page. In response to comments from the community, the project team will seek to understand how the area north of the primary study area (up to the on-ramp to the Merritt parkway) affects operations and safety along the entire corridor.

The overall approach for the *Black Rock Study* will be to take a broad perspective on the role and function of this stretch of Black Rock Turnpike, and through a contemporary planning process, apply leading-edge engineering solutions to address safety, mobility, and accessibility improvements to the corridor.

Figure 2-1: Black Rock Turnpike Study Context Map *(Source: MetroCOG Geodatabase June 2017)*

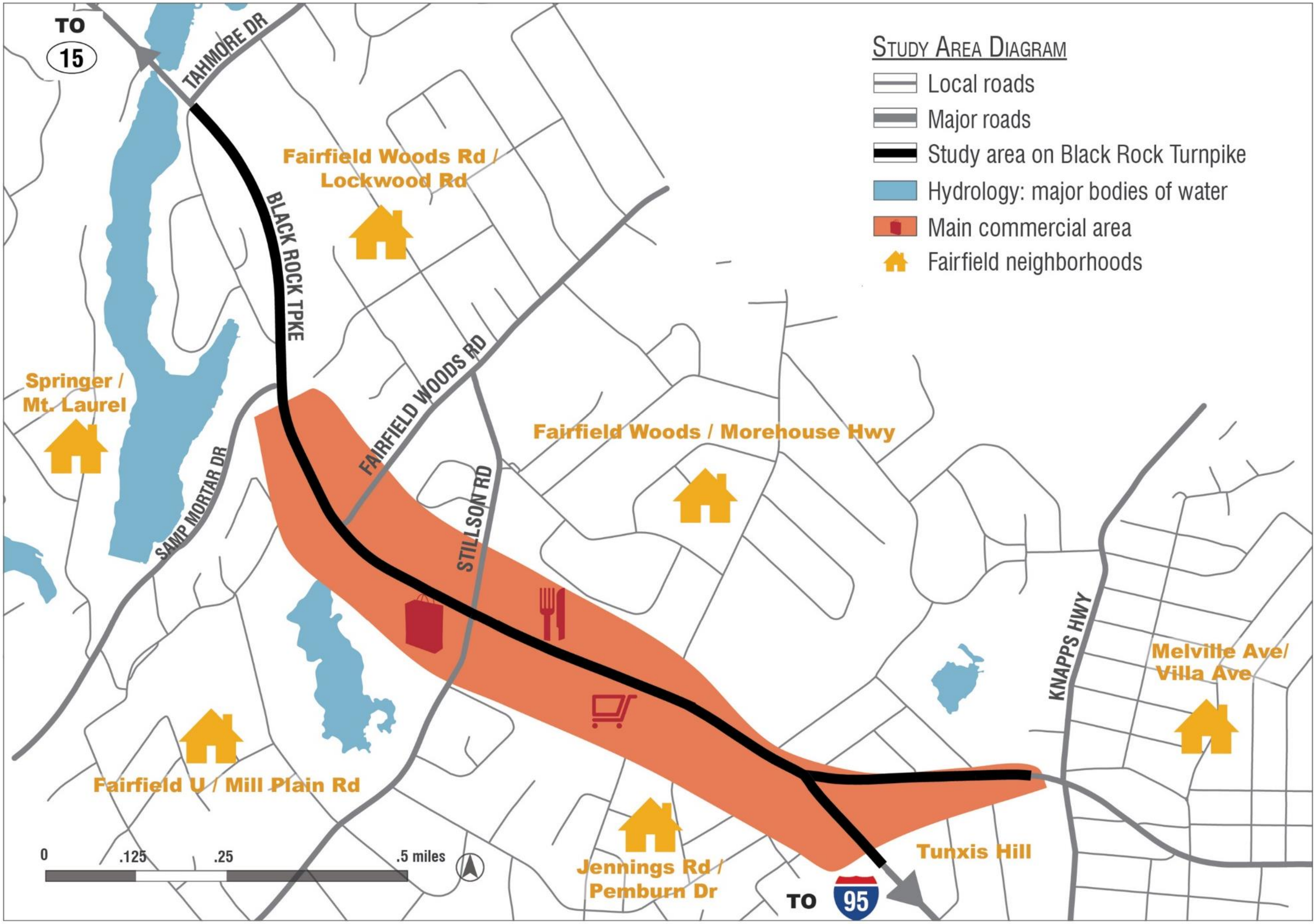

Figure 2-2: Black Rock Turnpike Study Area Diagram *(Source: MetroCOG Geodatabase June 2017)*

Figure 2-3: Black Rock Turnpike Study Base Map *(Source: MetroCOG Geodatabase June 2017)*

Figure 2-4: Black Rock Turnpike Study Aerial *(Source: Google Earth, 2017)*

B. Planning Context

Previous planning efforts have either directly focused on or referenced the need for improvements along the Black Rock Turnpike. The following section provides a summary of some of these prior studies and plans along with their resulting recommendations for the Black Rock Turnpike. The project team will take this prior work into consideration throughout the development of this study, and build off of what has already been suggested when possible.

Congestion Management System (CMS) Study: Route 58 & SR 732 Corridors (Greater Bridgeport Regional Planning Agency, 2003)

The Black Rock Turnpike has been of local and regional concern for decades. In 2003, the Greater Bridgeport Regional Planning Agency (GBRPA), the precursor to MetroCOG, conducted an assessment of the Route 58 and 732 corridors, which included the current study area, known as the *Congestion Management System Study for Route 58 & SR 732 Corridors (2003 CMS Study).* The purpose of the study was to "thoroughly investigate congestion in the corridor and identify and fully evaluate all appropriate congestion mitigation strategies." Like the *Black Rock Study*, the highest concentration of crashes was found to be between the Tunxis Hill/Black Rock Turnpike intersection and Samp Mortar Drive. Between 1998 and 2000, the Fairfield Police reported a total of 332 crashes between Burroughs Road and Samp Mortar Drive.

The Town of Fairfield implemented several recommendations from the *2003 CMS Study's* Short- Term Action Plan. These recommendations included additional lanes, minor widening and sidewalk installation. CTDOT revised signal timing along the corridor as well. The Town of Fairfield continues to work with property owners and developers in implementing access management strategies, shared parking and pedestrian facilities.

Fairfield requested that CTDOT continue the two-lane approaches from Tunxis Hill Cutoff and Black Rock Turnpike to extend beyond the Tunxis Hill Cutoff intersection to the Burroughs Road intersection. This change was necessary because the lane reduction along northbound Black Rock Turnpike from two lanes to one lane caused driver confusion and the potential for crashes. CTDOT added an additional lane for both northbound and southbound traffic between Tunxis Hill and Burroughs Road.

The Samp Mortar Drive/Black Rock Turnpike intersection was another problem intersection. Vehicles treated Samp Mortar's eastbound approach to Black Rock Turnpike as if it had a right turn and left turn lane, but it was not formally two lanes. The eastbound approach of Samp Mortar Drive was widened to accommodate two lanes. CTDOT revised signal timing at this intersection and included a pedestrian phase and crosswalk. The Town also worked with the state to formalize the southbound approach of Black Rock Turnpike into two lanes.

Improvements to pedestrian infrastructure have also been implemented. The *2003 CMS Study* found that the sidewalks between Burroughs Road and Samp Mortar Drive provided a safe pedestrian environment, with a width of five feet wide and a four- to six- foot buffer. However, other sidewalks along Black Rock Turnpike were found to be in poor condition and of inconsistent width or materials. Some areas did not have sidewalks. Sidewalks were installed on the western side of Black Rock Turnpike from Burroughs Road to Tunxis Hill Road, and continue on Tunxis Hill Road to Cedarhurst Lane. Along the west side of Black Rock Turnpike (Route 732), over 2,000 feet of sidewalk was installed from Mortiz Place south to Baros Street.

Town Plan of Conservation and Development (Town of Fairfield, 2016)

The *POCD* describes the town's planning goals and includes chapters on demographics, housing, the local economy, community facilities sand services, land use, transportation and traffic conditions. It also includes chapters that describe the existing and recommended development policies as well as a Shore Area Management Plan.

The recommended development policies are organized by planning areas. The section of the Black Rock Turnpike that is the focus of this *Black Rock Study* is located within the planning area known as Samp Mortar/Black Rock Turnpike. The town's *POCD* includes the following recommended development policies for this area:

- Encourage and support efforts of commercial property owners to upgrade the visual quality of Black Rock Turnpike with building, landscape, and sign improvements.
- Encourage opportunities for shared parking and vehicle access on Black Rock Turnpike to reduce the number of driveways.
- Eliminate barriers to pedestrian traffic between commercial properties and encourage better pedestrian linkages between such properties to reduce excessive vehicle movements.
- Encourage diversity of commercial uses including mixed residential/commercial uses to maintain and increase the vitality of the business corridor.
- Encourage the creation of a pedestrian/bicycle path along the Mill River corridor to link existing open spaces.
- Require parking lot shade trees for new commercial construction and redeveloped sites and encourage them for existing sites.
- Resist expansion of commercial districts.

Town of Fairfield Bicycle and Pedestrian Master Plan (Fairfield Bicycle and Pedestrian Plan Advisory Committee, 2013)

With encouragement from the Fairfield Bike Walk Coalition and support from the Greater Bridgeport Regional Council (GBRC), the Fairfield Bicycle and Pedestrian Plan Advisory Committee was formed in March 2010. In April 2012, First Selectman Michael Tetreau restructured the committee and it is now comprised of 9 residents with staff from the Town of Fairfield serving as advisors.

When it was initially formed, the Committee's goal was to develop a town-wide bicycle and pedestrian plan. They successfully did so, with technical assistance from GBRC, in 2013 when the *Town of Fairfield Bicycle and Pedestrian Master Plan* was endorsed by the Board of Selectmen. Today one of the Committee's primary goals is to work with the Public Works, Engineering, Health and Plan and Zoning departments to implement this town-wide plan.

Within the *Town of Fairfield Bicycle and Pedestrian Master Plan* there are numerous recommendations for the Black Rock Turnpike. These recommendations are as follows:

- Meet regularly with the CT Department of Transportation to advocate for much-needed bicycle and pedestrian improvements on state roads and intersections, including the Black Rock Turnpike/Tunxis Hill Road (Route 58).
- Designate shared roadway bicycle routes that provide intra- and inter-town connections and access to the Town Center, beaches and commuter rail stations.
    - Shared roadways have a four-to-five foot bicycle shoulder with a painted edge line (if the road is at least 30-32 feet wide). If the road is too narrow for a

bike shoulder, a Shared Lane Marking (sharrow) would be stenciled on the road. Standard bicycle route signage would mark all routes. Shared lane bicycle routes are recommended below.

  - Shared Lane North-South Bicycle Routes are recommended via Black Rock Turnpike, Tahmore Drive, Burroughs Road, High Street, Holland Hill Road and Barlow Road.

- Construct ADA compliant indents into the curb and shoulder area to provide a space for buses to pull off the road and pick-up/drop-off riders, particularly along the Post Road and Black Rock Turnpike.
- Complete the sidewalk network on Black Rock Turnpike between Candlewood Drive and Jennings Road, on Holland Hill Road by Gould Manor Park, and Fairfield Beach Road between the Penfield Pavilion and Beach Road.

Figure 2-5 illustrates the town-wide proposed bicycle route network in the *Town of Fairfield Bicycle and Pedestrian Master Plan*. While the Black Rock Turnpike has not been designated as a bicycle route at this time, its identification as a problematic corridor in need of improvement is partial justification for this *Black Rock Safety Study*.

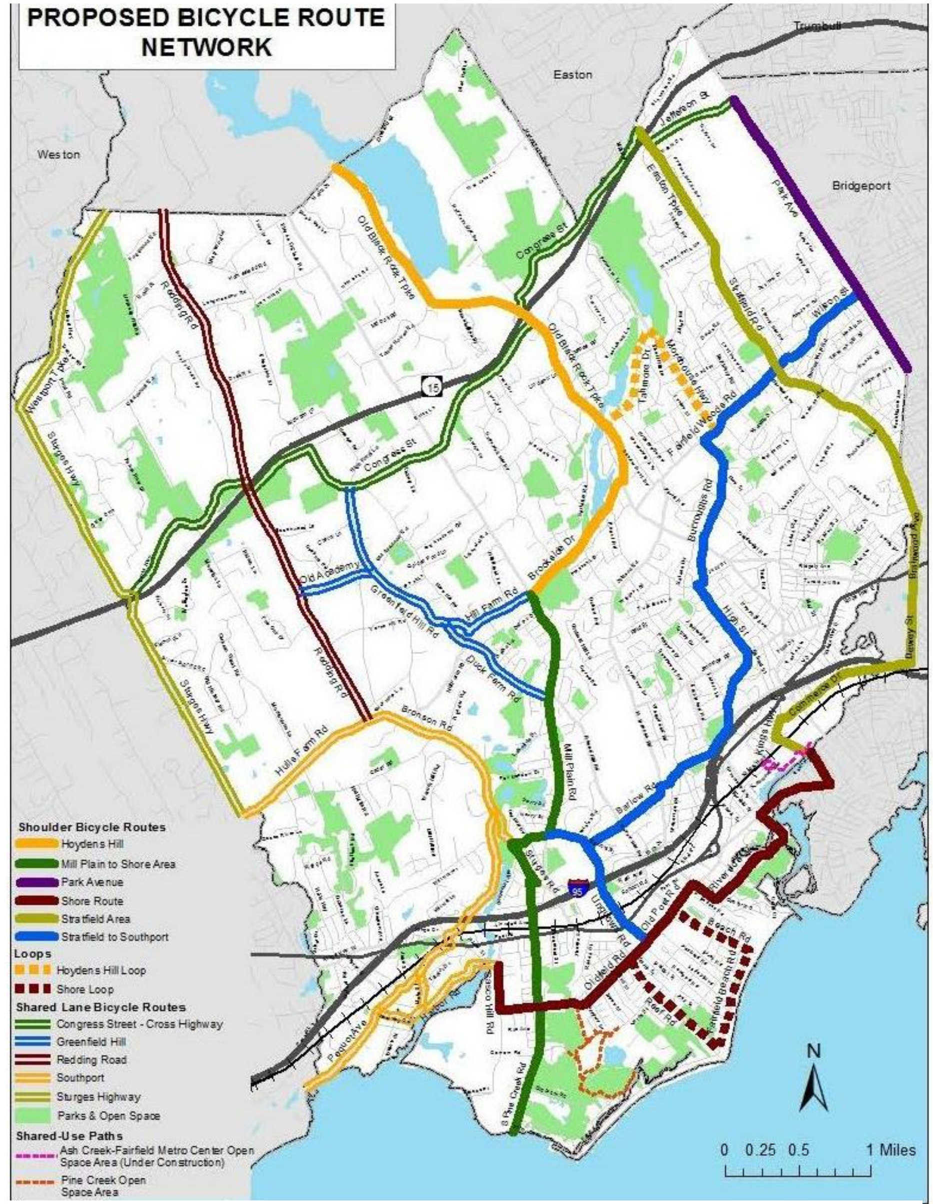

Figure 2-5: Town-wide Proposed Bicycle Route Network *(Source: Town of Fairfield Bicycle and Pedestrian Master Plan, 2013)*

C. Process and Engagement

The *Black Rock Turnpike Safety Study* is being prepared by a project team that consists of several organizations. The Regional Council of Governments, MetroCOG, is managing the project in coordination with the Town of Fairfield. The consultant team is led by Fitzgerald & Halliday, Inc. (FHI) with assistance from Tighe & Bond and CT Counts, LLC. In addition, key stakeholders and the public are considered to be an integral part of the project team and will continue to be involved through various outreach efforts.

The total budget for the study is $375,000 and it is being fully funded by the State of Connecticut's Local Transportation Capital Improvement Program (LOTCIP).

It will be completed by the middle of 2018 and include a total of three main phases as follows:

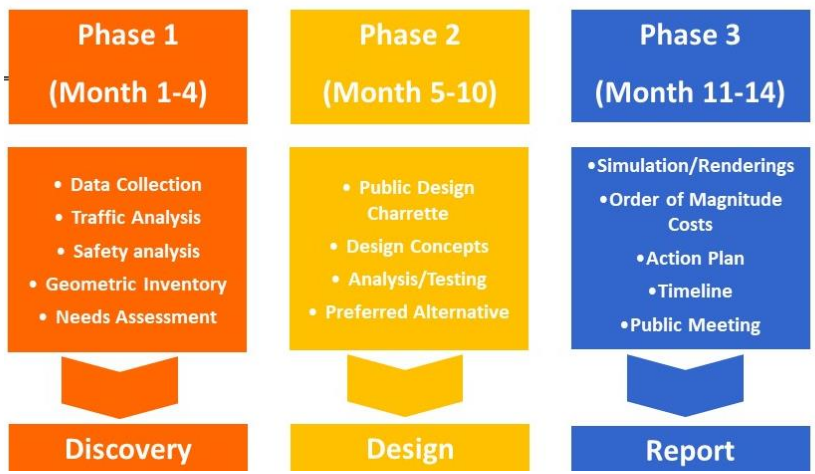

Figure 2-6: Black Rock Turnpike Safety Study Process Diagram

Community Engagement

The development of this *Existing Conditions Technical Memorandum* has benefited from extensive community outreach that was intended to provide interested parties with a means to communicate their transportation needs and concerns with the project team. This input has greatly contributed to the team's understanding of the Turnpike and will guide the development of recommendations as the study continues.

The following summarizes the community engagement activities that have occurred thus far. It should also be noted that there will be additional opportunities for input as the study progresses to the next phases. This will help to ensure that the *Black Rock Study* results in a plan that responds to the needs and desires of those who travel along and spend time on the Turnpike.

Committees

The *Black Rock Study* is intended to be a collaborative effort among the many stakeholders with a vested interest in the future of the Black Rock Turnpike. As such, the project team will receive guidance from two advisory committee, both of which will meet throughout the project. The responsibilities of these committee members are as follows:

- Provide insight and expertise on local conditions and issues;
- Collaborate with the project team to brainstorm potential ideas and recommendations;
- Review and provide feedback on project products before they are broadly distributed to the public; and
- Assist with the project team's public and stakeholder outreach effort by (1) identifying information resources and potential lines of communication; and (2) helping to raise awareness about community outreach efforts.

The two committees are described in further detail below.

Technical Advisory Committee

The Technical Advisory Committee (TAC) is comprised of representatives from the public organizations and agencies that are involved in the study. The project team will meet with the TAC three times over the course of the study so the committee members can provide their technical knowledge about engineering, design guidelines, policies, and more. The first meeting was held on Wednesday, May 31st and focused on the conclusion on the discovery phase as well as preparations for the Public Meeting that occurred the following week. Members of the TAC are as follows:

Table 2-1: Technical Advisory Committee

Name	Organization
Anna Bergeron	CTDOT, Transportation Planner
Doug Holcomb	Greater Bridgeport Transit (GBT), CEO
Steve DeMichele	GBT, Planner
Meghan Sloan	MetroCOG, Planning Director
Matt Fulda	MetroCOG, Executive Director
George Obeng	MetroCOG, GIS Technician
Mark Barnhart	Fairfield Office of Community & Economic Development, Director
Bill Hurley	Fairfield, Engineering Manager
Jim Wendt	Fairfield, Planning Director
Brian Carey	Fairfield, Conservation Director
Rob Kalamaras	Fairfield Police
Gary Wikman	Fairfield Police

Community Advisory Committee

The Community Advisory Committee (CAC) includes representatives from local businesses as well as community organizations, groups, and institutions with key expertise and local knowledge about the Black Rock Turnpike. The CAC will formally meet twice over the course of the study at approximately the same times as TAC meetings. In addition, the CAC briefly met prior to the Public Meeting on Wednesday, June 7th to formally introduce the project team and discuss the committee's role. Members of the CAC are listed below:

Table 2-2: Community Advisory Committee

Name	Organization
Steven Heffer, M.D.	AFC Urgent Care, Owner/Medical Director
Caleb Hodson	Black Rock Congregational Church
Eileen Kennelly	Disability Services Coordinator
Kevin Lesko	EDC Member/Property Owner
Laura OBrien	Fairfield Bike/Ped Committee, Vice Chair
Keith Gallinelli	Fairfield Bike/Ped Committee, Chairman
Tom Cullen	Fairfield BOE, Director of Operations
Beverly Balaz	Fairfield Chamber of Commerce, President
Ray Meglio	Fairfield Economic Development Commission
Gerry Alessi	Fairfield P&Z Commission, Vice Chairman
Urb Leimkuhler	Fairfield Senior Advocates
David Ebling	Fairfield Warde HS, Principal
Nancy Coriaty	Fairfield Woods Library
Gary Rosato	Fairfield Woods MS, Principal
Laura Cretella	Holland Hill Elementary, Principal
Bruce Carter	Human Services Commission
Laura Incerto	Human Services Commission

Robert Riemer	Jennings Elementary
Ken Kleban	Kleban Properties
Jason Hyde	Lake Hills Neighborhood Association, President
Larry Roberts	Larry Roberts Properties
Dave Marsillio	Marsillio's
Leslie Pearson	McKinley Elementary, Principal
Michelle Gurner	McKinley Elementary, PTA Representative
Frank Arnone	Osborn Hill Elementary, Principal
Lynne Brocklesdy	Osborn Hill Elementary, PTA Representative
Jack Wallace	Resident
Tom Tully	Shoprite, Store manager
Carol Martin	The Fairfield Housing Authority, Executive Director
John Ficke	Transportation Supervisor (School Buses)
Chris Petherick	Wild Birds Unlimited, Owner

Website

A publicly accessible project website, accessed via http://bit.ly/blackrocksafetystudy, was developed and hosted on MetroCOG's main website. The public has been encouraged to visit the website to learn more about the Black Rock Study, view meeting announcements and related materials, review published material and draft documents, and submit comments.

A project email (blackrockstudy@fhiplan.com) was created as another option through which people could submit comments. Meeting announcements and project updates were also sent out to Committee members as well as members of the public who had signed up for the mailing list via this email account.

A significant number of comments were received via the website and the project email that varied from questions, input, new ideas, and other considerations. The project team will continue to take this input into account throughout the next phases of the Black Rock Study.

In addition, business cards with the project name, logo, and website address have been distributed to the public and available at all engagement events.

Figure 2-7: Black Rock Turnpike Safety Study business card

Pop-Up Outreach Event

On Saturday, June 3rd, 2017, the project team hosted a "Pop-Up Outreach Event" near the entrance/exit to ShopRite along the Black Rock Turnpike, which was selected for the high level of pedestrian traffic it attracts on a typical Saturday. The purpose of the event was to:

- Solicit input on the community's impressions of the Turnpike's existing issues

- Introduce the community to the project and encourage the community to attend the June Public Meeting
- Distribute the URL link to the online survey

From 10:00 AM – 2:00 PM, the project team set up a project booth with informational material and two large poster boards through which to solicit input. A map of Fairfield was shown on the first board with the title "Where do you live?" Visitors to the booth were asked to use a sticker dot to indicate where they live. Two boxes were also included where people could place dots if they lived in Fairfield but outside the study area or if they lived outside of Fairfield.

A second poster displayed a more detailed map of the study area along with the question prompt, "Where are the biggest issues along the Black Rock Turnpike?" Attendees were provided a set of sticker dots that they used to place wherever they thought issues exist. Staff was on hand to talk with participants about the areas they were marking and why. The resulting map, shown in Figure 2-10 on the following page, clearly illustrates that the area between Brookside Drive and Burroughs Road is in need of improvements. All the intersections were noted as problematic in some way as well as the driveway entrance to ShopRite. Many participants also described various issues within the parking lots off the Turnpike as well.

Public Meeting

A public meeting was held on Wednesday, June 7th, 2017 at 7:00 PM in the All-Purpose Room at Osborn Hill School. The meeting included a presentation and small group breakout sessions for an interactive activity. The presentation provided an overview and background information about the project, including the project purpose, schedule, and vision, as well as a review of previous community engagement events and the existing conditions analysis. After a brief question and answer session, attendees were broken into small groups. Each group received a large aerial map of the study area and a handout with instructions that asked them to share their thoughts about the existing conditions on the Turnpike. For example, attendees were asked to use red markers to circle locations that they thought were very unsafe and to use a purple marker to indicate which driveways are the most challenging to get into and out of.

Figure 2-8: Small Group Working Session, June 7th Public Meeting

Figure 2-9: Small Group Working Session, June 7th Public Meeting

Figure 2-10: Map of Public Input during Pop-Up Outreach Event on June 3rd, 2017: Issue Areas along Black Rock Turnpike

Online Survey

An online survey was conducted during the summer of 2017 to help the project team better understand the issues and opportunities for all those who travel along the Turnpike, including motorists, bicyclists, pedestrians, and transit users. The survey was available for the public to participate from Monday, May 22nd to Friday, July 28th and it was advertised via a press release from the Town of Fairfield; social media sites for MetroCOG and the Town of Fairfield; various mailing listserves, including the one developed for this project; the Committee members' networks; local community blogs and websites; seat drops on GBT's Route 10 bus; and more.

A total of 1069 people completed the survey, approximately 70% of whom live in Fairfield. Respondents answered questions about how and why the currently travel along the Black Rock Turnpike as well as what improvements they would like to see along the Turnpike in the future. A visualization of the results of the two questions regarding the future of the Black Rock Turnpike is shown in Figure 2-11. A full compilation of results, including comments, can be found in Appendix A.

Upcoming Opportunities for Engagement

There will be additional opportunities to provide input as this study continues to develop. Examples include another Pop-Up Outreach Event, Public Workshop, and stakeholder interviews. The project website is regularly updated with news and opportunities to get involved.

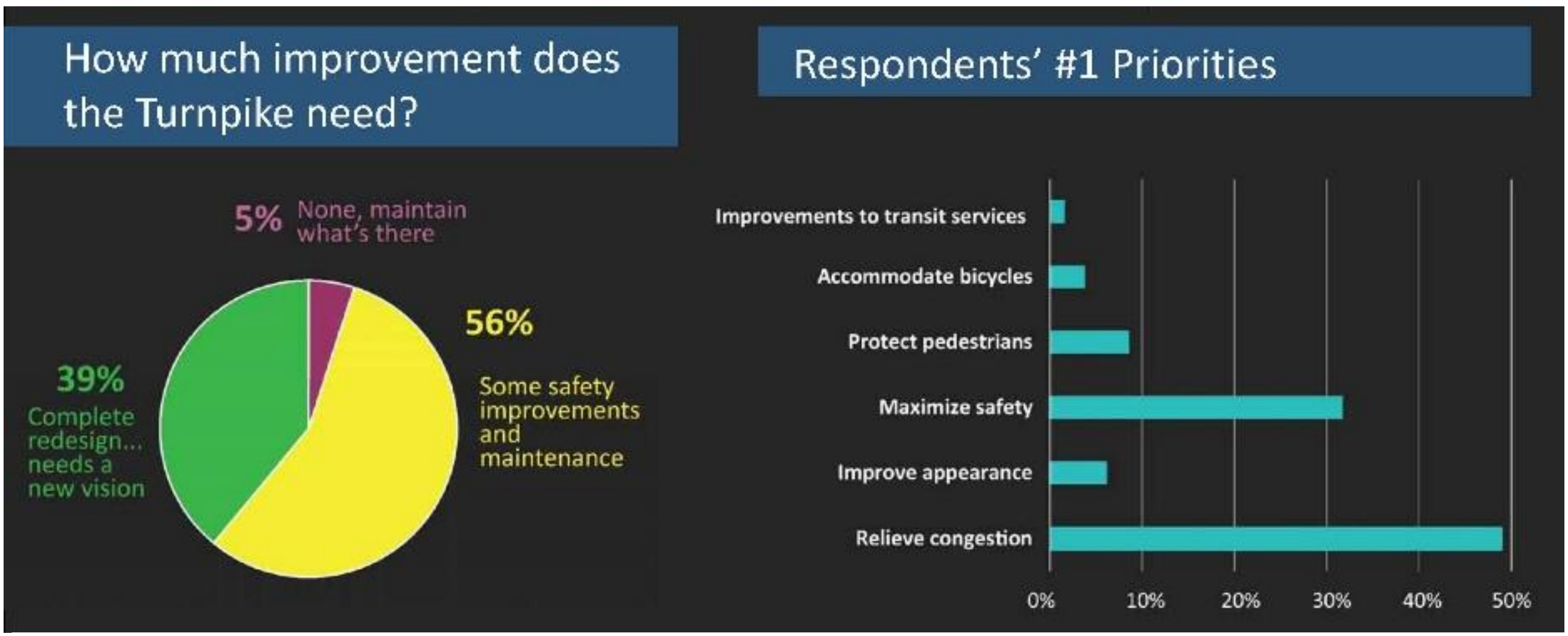

Figure 2-11: Sampling of results from Black Rock Turnpike Safety Study Online Survey *(Fitzgerald & Halliday, November 2017)*

3. EXISTING CONDITIONS

A. Transportation Network Overview and Context

The existing roadway network in the study area links residential neighborhoods to retail destinations. The roadway network in the immediate vicinity provides access to various other land uses (parks, schools, and waterfront) and links major cities such as New Haven, Stamford, New York and Boston.

i. Functional Classification

The functional classification defines the role that the roadway plays in moving vehicles through a transportation network. Functional classification carries with it expectations about roadway design, including its speed, capacity and relationship to existing and future land use.

Within the study area, Black Rock Turnpike (Route 58) is classified by the Connecticut Department of Transportation (CTDOT) as an urban minor arterial. At the southern end of the study area, Tunxis Hill Cutoff (Route 58) and Black Rock Turnpike (Route 732) are also classified as minor arterials. In the center of the overall study area, Black Rock Turnpike is intersected by Stillson Road (Route 135), which is also a minor arterial. Minor arterials generally provide service for trips of moderate length, and offer connectivity to principal arterials. They are generally regarded as essential corridors for both local and regional travel.

ii. Regional Travel Patterns

To the immediate north of the study area, Black Rock Turnpike provides access to the Merritt Parkway (State Route 15) at Interchange 44. The Merritt Parkway runs west towards Norwalk, CT and east towards Trumbull, CT. Black Rock Turnpike also extends southward of the study area, and provides access to Interstate 95 at Interchange 24. Interstate 95 is a major arterial that provides interstate mobility to both New York City to the west and to Providence/Boston to the east. Black Rock Turnpike also provides access to Route 1 in this area, which parallels Interstate 95, both provides local access to towns along CT's shoreline as well as longer-distance interstate mobility. Given that Black Rock Turnpike provides access to and from such major highways, it will undoubtedly continue to play an important role for regional travelers.

iii. Local Travel Patterns

At the local level, Black Rock Turnpike provides direct access to a major commercial district in the Town of Fairfield. The densest portion of this commercial district spans from the intersection with Burroughs Road to just south of the intersection with Samp Mortar Drive. Driveways to the businesses in this area are located on both sides of Black Rock Turnpike. Business owners rely on there being safe and efficient access to these driveways so that shopping activity can remain resilient. Balancing the needs of local travelers that want to access commercial locations along Black Rock Turnpike and regional travelers looking to access one of the nearby major highways is an important component of this project.

iv. Surrounding Land Uses and the Built Environment

The section of the Black Rock Turnpike that is included in this study travels through two distinct areas. The first is the northern area between the intersection with Tahmore Drive and the intersection with Samp Mortar Drive. This area is mainly single-family residential development on one-half to one-acre lots. Many of these residences are part of the Lake Hills Neighborhood. This area also has numerous privately-owned lakes and recreation spaces in addition to public open green areas.

The second distinct area is very different in its land use and character. This area includes the portion of the Black Rock Turnpike that runs between Samp Mortar Drive to the end of the study area at the Tunxis Hill Cut-off. It is characterized by substantial commercial development serving both Fairfield and the surrounding communities. This kind of commercial development is often referred to as 'high-end big box retail' although it also includes businesses that focus on financial services, dining, and more. Examples along the Black Rock Turnpike include the Gap, Old Navy, Party City, Trader Joe's, ShopRite, Dunkin Donuts, Panera, T.J. Maxx, Bank of America, Starbucks and much more. While some condominium developments also exist in this area, the commercial cluster of establishment dominates the area.

Almost all of these developments have been designed with large setbacks to allow for large parking lots to exist in the front of the building. This type of design is often considered auto-centric and can contribute to a built environment that is less comfortable for pedestrians. Other elements that contribute to the built environment are large-footprint building massing, deep building setback, mostly ground floor uses, and architectural qualities typical of commercial strip development.

Many of these commercial businesses share a parking lot but some do not. Black Rock Turnpike is a road marked with numerous driveways, as shown in Figure 3-1. High concentrations of driveways were determined according to a qualitative review of all curb cuts; no quantitative methodology was used. The number of driveways, or curb cuts, increases the number of potential conflicts, both vehicular and non-vehicular alike, while also contributing to congestion, confusion, and frustration for motorists as they attempt to find a break in traffic. Many businesses have attempted to clarify which driveway is the correct one for their associated parking lots with signage. Some members of the community have expressed that the amount of sign clutter along the Turnpike has had the opposite effect.

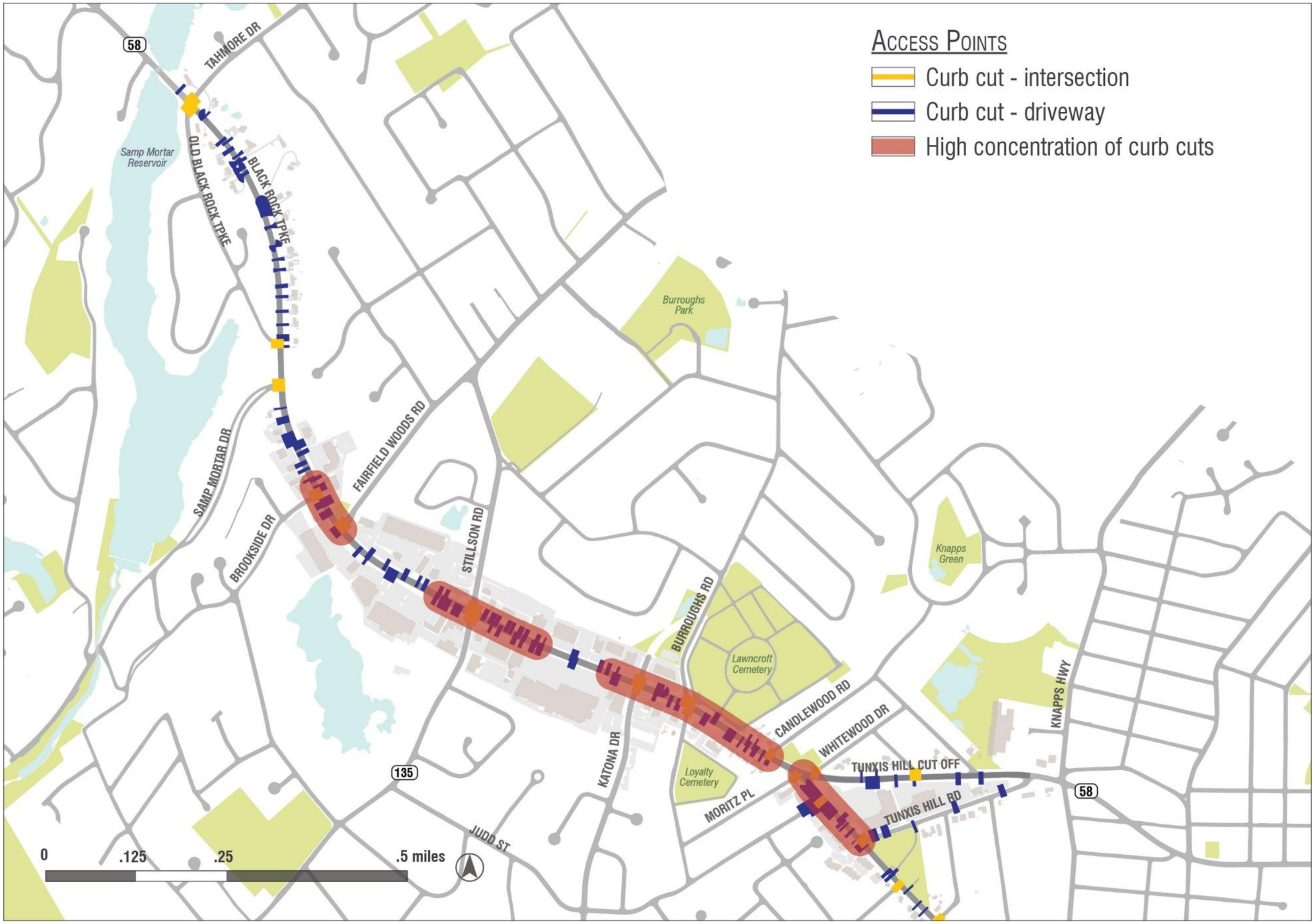

Figure 3-1: Access Points *(Source: MetroCOG Geodatabase June 2017; Fitzgerald & Halliday, Inc. Field Data June 2017)*

v. Environmental and Cultural Considerations

Environmental and cultural features have been identified within the study area. This information will inform the study recommendations by ensuring sensitivity to surrounding context. The following features were included in this inventory:

- Environmental and Cultural Resources
  - Parks, open spaces, cemeteries
  - Recreation areas
  - Tree cover
  - Hydrology: Rivers, lakes/ponds, streams, reservoirs, and marsh swamp
  - Marine features: docks and piers
  - Schools
  - Historic properties (as defined by the Town of Fairfield*)
- Constraints to Development
  - 100-year floodplain
  - 5-year floodplain
  - Marsh swamp
  - Steep slope (over 15%)

The locations of these features are illustrated in Figures 3-2 and 3-3 on the following pages. The high number of environmental and cultural resources that are in close proximity to the study area is also notable and further emphasizes the important role the Black Rock Turnpike plays as a local connection for residents and visitors alike. The map also highlights the lack of environmental features immediately adjacent to the Turnpike's main commercial area due to the built environment, such as buildings and parking lots. As such, the study might consider strategies to mitigate harmful effects from stormwater run-off. It is also important to note that a small portion of the study area in the north is within the 100-year floodplain or 500-year floodplain as this will have to be taken into consideration if any recommendations for this portion of the Turnpike require construction.

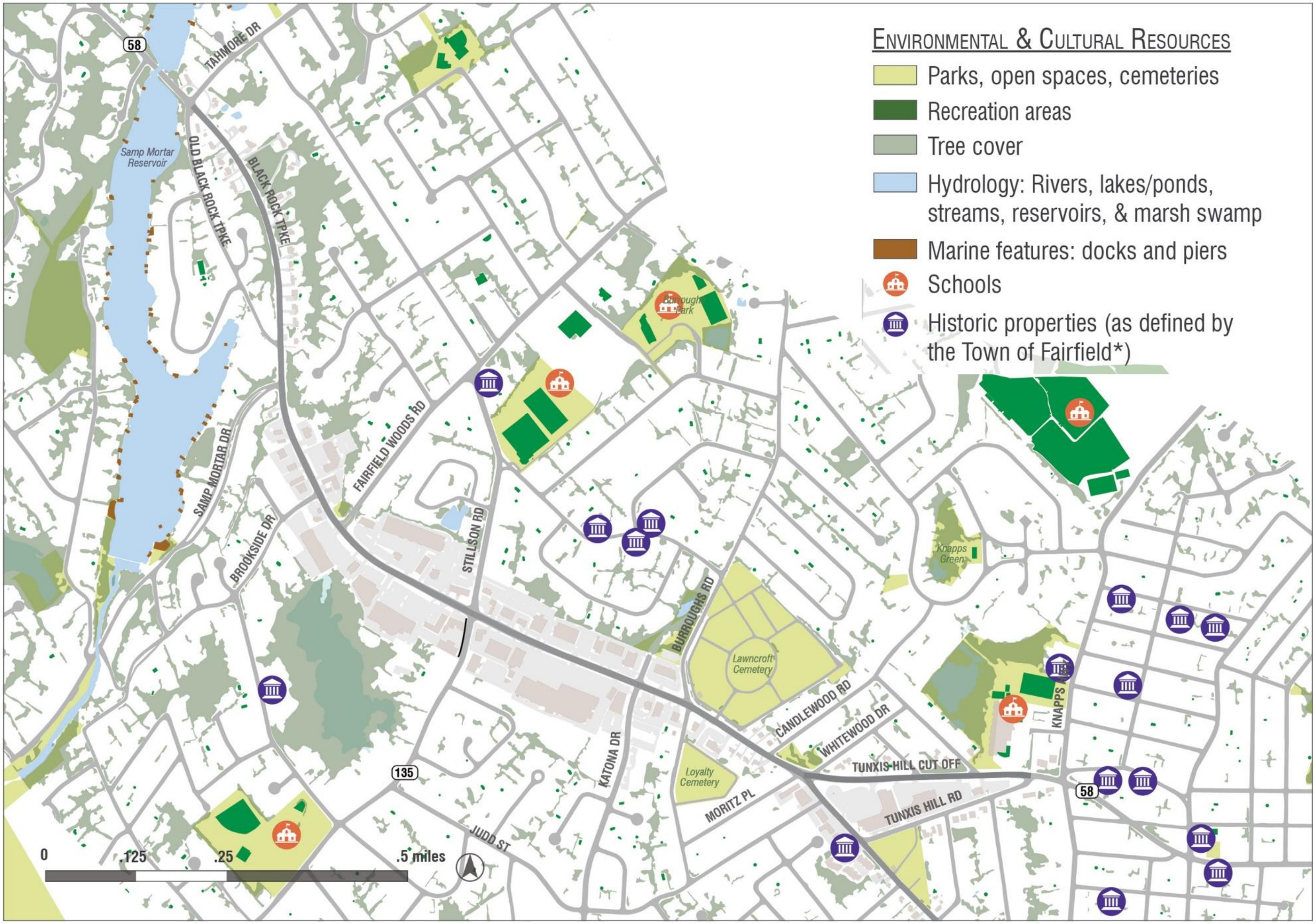

Figure 3-2: Environmental and Cultural Resources *(Source: Town of Fairfield, MetroCOG Geodatabase June 2017)*

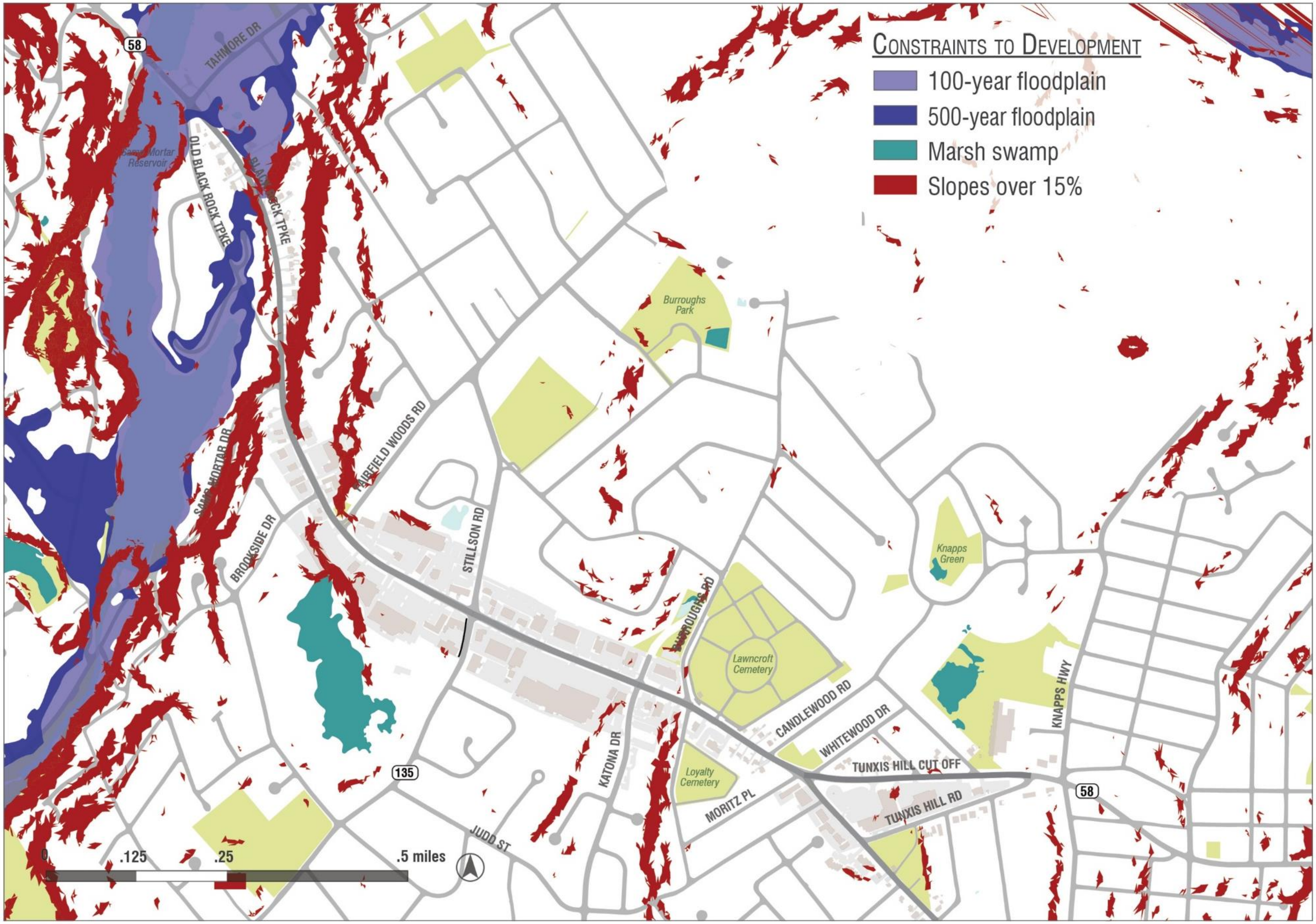

Figure 3-3: Constraints to Development *(Source: CTDEEP, MetroCOG Geodatabase June 2017)*

B. Roadway Geometry

The physical layout (geometry) of a road contributes to the degree of safety for motorists, bicyclists, and pedestrians. Factors such as number of lanes, lane width, grade, curvature, and intersection type affect traffic volume, capacity, travel speed, congestion, safety, access to property, and driver behavior. This section summarizes geometric conditions and will be important when considering the integration of all travel modes and addressing any gaps in the transportation system. Figure 3-4 provides a summary of the study area geometry and traffic control. In addition, roadway cross sections for various locations along the corridor are provided in Appendix B.

i. Travel Lanes

Black Rock Turnpike is a minor arterial that begins at U.S. Route 1 in Fairfield to the south and continues north through Easton and Redding and into Bethel where it terminates at Route 302. The study area for this project focuses on the area between the Black Rock Turnpike intersection with Tahmore Drive and Old Black Rock Turnpike to the north and Tunxis Hill Road to the south. The study area lane configuration varies between two-lanes to four-lanes as summarized in Figure 3-4. The north and south ends of the study area carries two lanes of traffic, one in each direction, and the central portion carries four lanes of traffic, with a left turn pocket that serves as a fifth lane at the Route 135 (Stillson Road) intersection. The lanes are standard widths including 11 feet for through travel lanes, and 10 to 12 feet for left and right turning lanes. In some cases, approaches from the side streets offer sufficient width (18 feet plus) to allow for simultaneous movements from a single travel lane.

ii. Shoulder Width

Road shoulders serve a number of purposes including emergency vehicle access, breakdown space, and lane separation for bicyclists and pedestrians on the sidewalk. According to the CTDOT Highway Design Manual, arterials are typically designed with 4 foot to 8 foot shoulders. Generally, Black Rock Turnpike has inconsistent shoulders ranging 1 foot to 10 feet wide, with wider shoulders at the north and south ends of the study corridor and narrower along the denser development in the center of the study area. Undersized shoulder widths of less than 4 feet cannot effectively accommodate larger vehicles and challenges bicycle and pedestrian travel along the corridor. Therefore, the only portions of the study area conducive to bicycle travel are at the northern and southern ends.

iii. Vertical Grade

Highway grade, or hills, can present safety and operational challenges by restricting sight lines and increasing the distance a vehicle needs to safely stop. During inclement weather, road grades can also contribute to the loss of traction between a vehicle's tires and the pavement surface. The CTDOT Highway Design Manual suggests that a 7% grade should be considered the maximum for arterial roadways. Generally, Black Rock Turnpike contains grades well below 7% with the exception of three locations. Uphill gradients of 5% to 7% approaching the Samp Mortar Drive, Fairfield Woods, and Burroughs Road intersections from the north. In addition, Samp Mortar Drive has an uphill gradient of approximately 7% and Fairfield Woods has a steep downhill gradient of approximately 11% approaching their intersections with the Black Rock Turnpike.

iv. Horizontal Curvature and Sight Distance

Horizontal curvature of a roadway affects a driver's ability to see far enough to be able to stop safely to avoid a collision. Curves also can contribute to a loss of control of a vehicle if speed limits are not followed. There are two common sight distances that control the design of a roadway, stopping sight distance (SSD) and intersection sight distance (ISD). The SSD is defined as the distance it takes for a driver to identify a hazard in the roadway and have the vehicle come to a safe stop, while the ISD is the distance a driver must see from an intersecting roadway to make a safe turn onto a roadway.

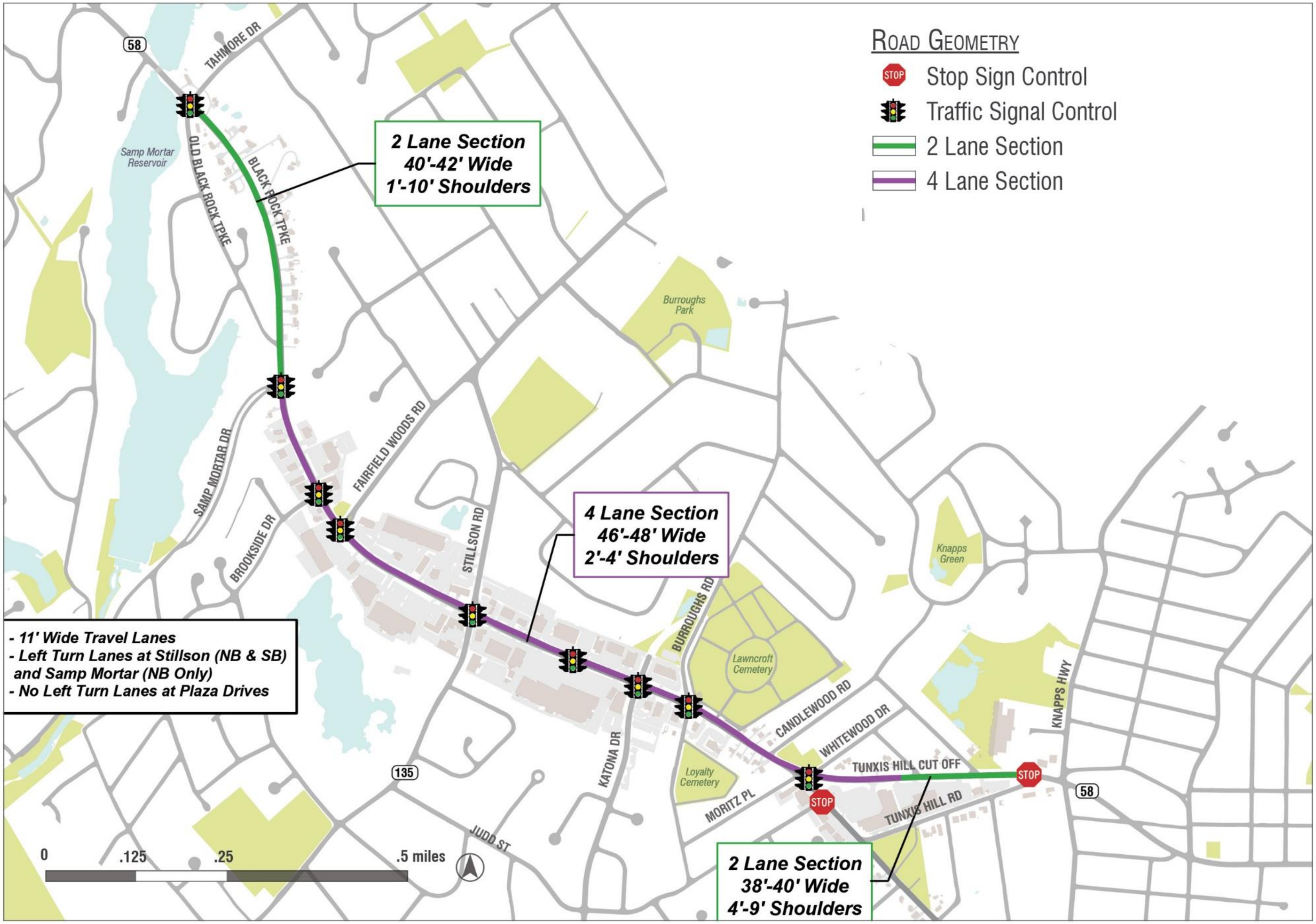

Figure 3-4: Roadway Geometry *(Source: Tighe & Bond, September 2017)*

Table 3-1 identifies both the SSD's and ISD's along the corridor per the CTDOT Highway Design Manual based on the roadway cross section and posted speed limits of 30 and 35 miles per hour. However, as detailed in the travel speed section, vehicles were observed traveling above the posted speed limit in several sections of the study area, which would increase the SSD's and ISD's. Several intersections and driveways along the corridor also have limited sight distance, which is discussed in further detail in the next section. Black Rock Turnpike at Fairfield Woods Road is one notable intersection where sight distances are restricted due to the horizontal curvature of the Turnpike as well as over grown vegetation and a retaining wall south of the intersection.

In general, the corridor provides sufficient SSD's for traffic along Black Rock Turnpike. In some cases, limited ISD's were observed due to the horizontal and vertical curvature along Black Rock Turnpike, grade and retaining walls adjacent for the roadway, and traffic signal equipment, utility poles, and landscaping proximate to intersections.

Table 3-1: Required Stopping Sight Distance (SSD) & Intersection Sight Distance (ISD) for Posted Speed

Driveway	Posted Speed	Required SSD (ft) Both Directions	Required ISD (ft) Both Directions
Route 58 Part One*	30	200'	
Route 58 Part Two**	35	250'	
Minor Approaches	25		280'
Minor Approaches	30		335'
Minor Approaches	35		390'

Source: 2013 CTDOT Highway Design Manual 11-2(6) (pg 299)
**Part 1 – Route 1 to Samp Mortar Drive #2; **Part 2 – Samp Mortar Drive #2 to .37 Mi N/o Route 1*

v. Traffic Control

Traffic signals and stop signs control the flow of traffic on Route 58 and streets that intersect it as shown in Figure 3-5. There are 9 signalized intersections along the corridor and CTDOT operates and maintains these signals. The unsignalized intersections within the study area are two-way stop controlled and are located at the Black Rock Turnpike and Tunxis Hill Road intersection and the Route 732 at Judd Street intersection. Two-way stop controlled intersections have stop control on the side street or minor approaches while the main street remains uncontrolled.

Traffic flow at signalized intersections is controlled by the signal timing and phasing as well as the overall cycle length (the amount of time given to complete all traffic movements). The cycle length is the total time for a traffic signal to complete one sequence of all movements within an intersection and generally range from 45 seconds to 180 seconds. The larger or more complex an intersection's configuration is, the greater the cycle length will be to accommodate all movements. Changes in traffic demand throughout the day will also result in varying cycle lengths, with longer cycle lengths and phases during peak times and shorter cycle lengths during off-peak times.

To further manage traffic flow, signals can be actuated; meaning they are triggered by an approaching vehicle, or set at a fixed time if no detection device has been installed. These detection devices are usually cameras located on the overhead wires or poles or loops located in the roadway travel lane. All signals in the study corridor are actuated for side streets and left turns from Black Rock Turnpike.

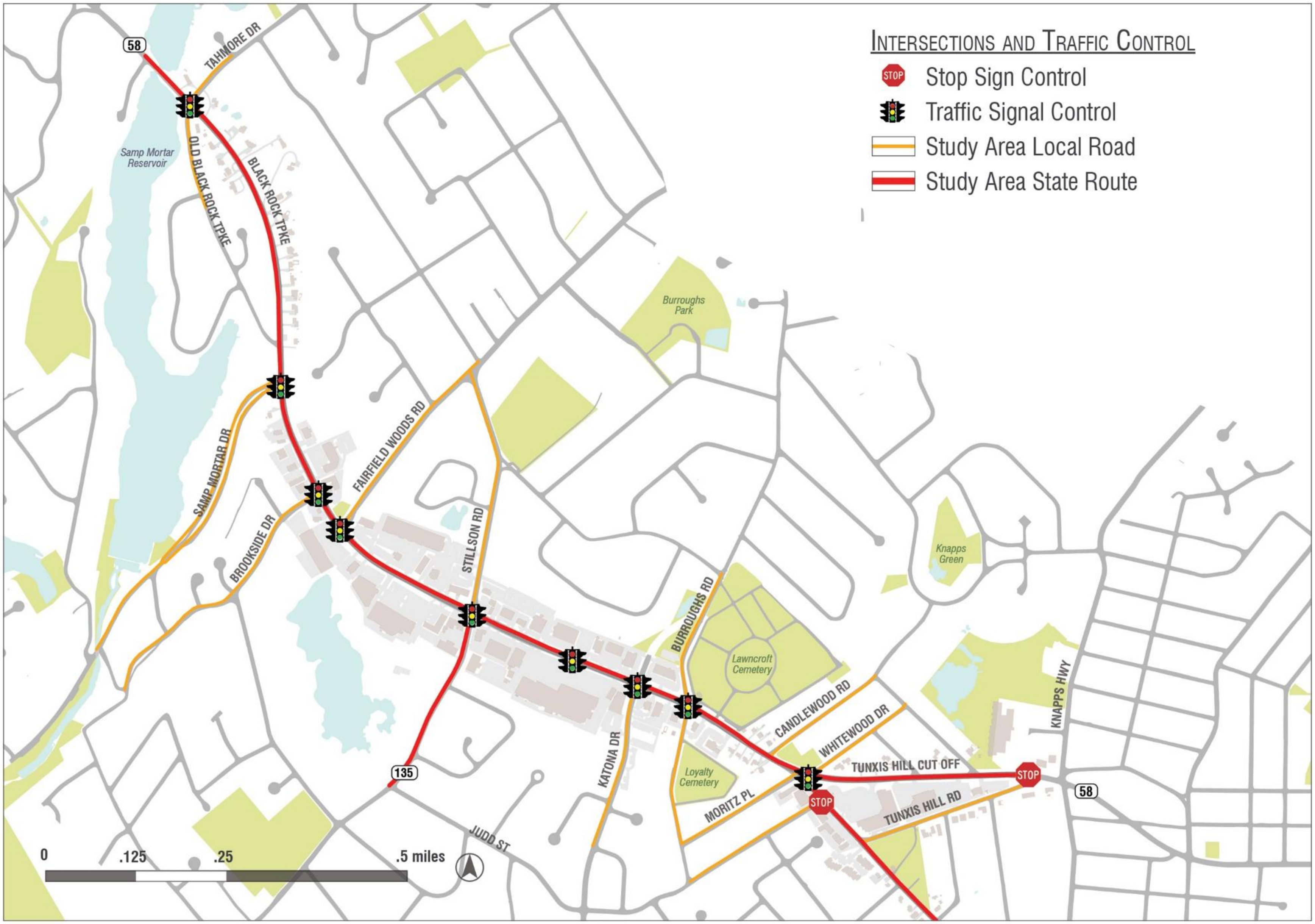

__Figure 3-5: Study Area Intersections and Traffic Control__ (Source: Tighe & Bond, September 2017)

Signal coordination is another form of traffic control. This occurs when closely-spaced signals coordinate individual movements so that drivers encounter a progression of green lights as they travel along the coordinated corridor. All the signals along the Black Rock Turnpike in the study area operate in a coordinated system with the exception of the intersection with Tahmore Drive and Old Black Rock Turnpike, which is located too far from the other signals to benefit from coordination. In addition, although the Route 135 (Stillson Road) and Moritz Place and Tunxis Hill Cut Off are part of the coordinated system, they run free from the coordination to allow for flexibility in each signal movement phase to accommodate vehicles on all approaches more efficiently.

The standard practice is to develop time-of-day signal timing plans to account for the fluctuations in traffic volumes that naturally occur throughout the day. The timing plans are usually made for a “typical” day: however, when traffic conditions change significantly as a result of seasonal fluctuations or incidents, the pre-programmed plans often cannot process traffic efficiently. The coordinated system runs a consistent cycle length of 75 seconds throughout all peak periods. The Route 135 and Moritz Place/Tunxis Hill Cut Off intersection operates at cycle lengths of approximately 150 seconds and 90 seconds, respectively. The uncoordinated Tahmore Drive and Old Black Rock Turnpike intersection operates with a cycle of approximately 65 seconds. Copies of the traffic signal plans for each of the 9 signalized intersections as well as the timing spreadsheet are provided in Appendix C.

vi. Traffic and Geometric Observations Summary

As part of the existing conditions assessment, an analysis of each study area intersection was conducted. This included reviewing the existing data provided by the Town of Fairfield, CTDOT, MetroCOG and conducting a field review of each intersection. The results of this assessment are can be found in Appendix D. These results have also been summarized and illustrated in Figure 3-6 on the following page.

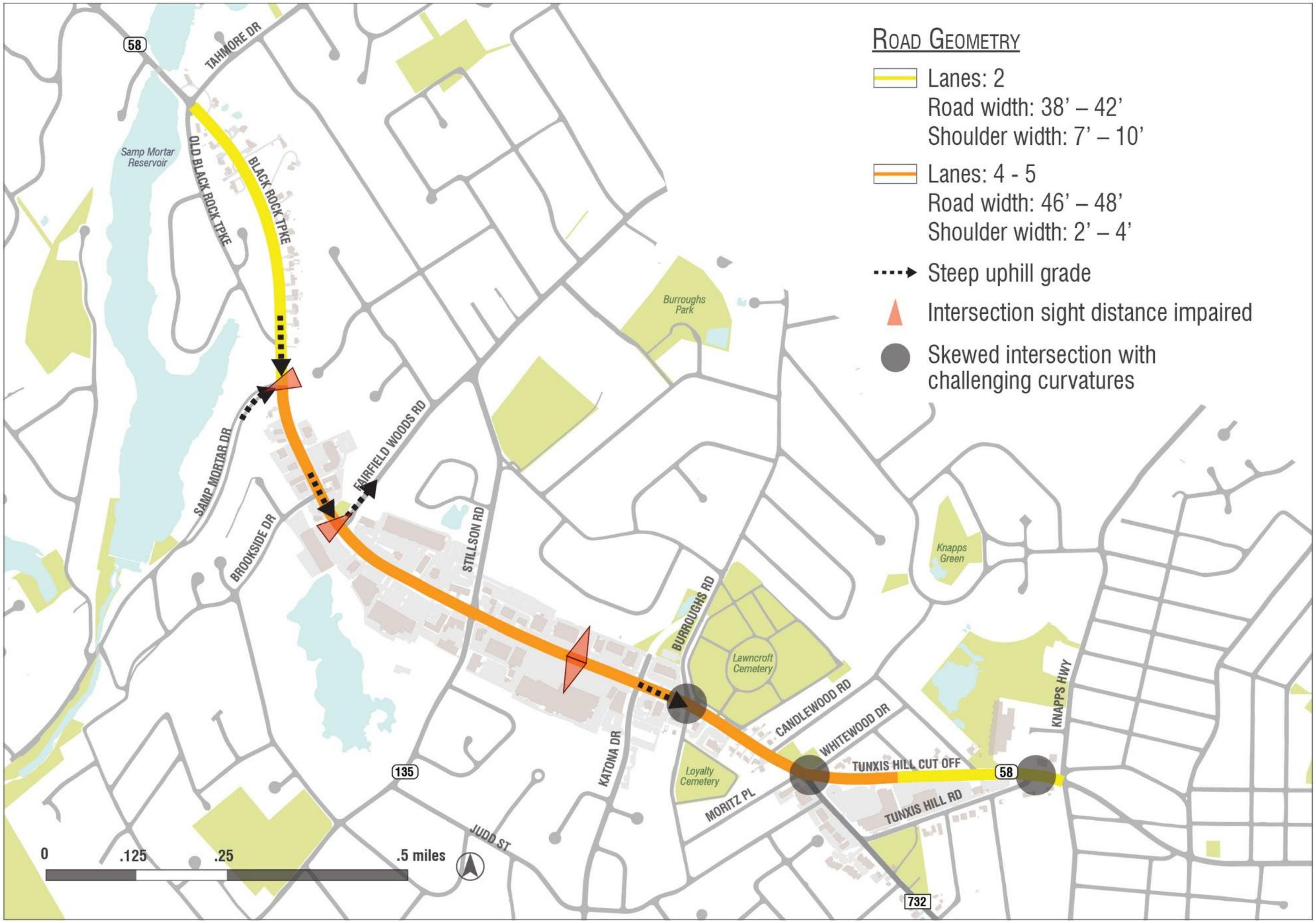

Figure 3-6: Study Area Traffic and Geometric Observations *(Source: Fitzgerald & Halliday, Inc. and Tighe & Bond, September 2017)*

C. Travel Demand

Travel demand refers to the desired need for travel during a particular period of time. Along Black Rock Turnpike, most of the demand for travel is served by the private automobile, although walking, biking and transit are available options that are used to varying degrees. This section will define the existing transportation system, and provide a foundation for understanding how trips can be better served along Black Rock Turnpike in the future.

The following sections provide an analysis of the existing vehicular, bicycle and pedestrian travel along the Black Rock Turnpike. Research was collected for this analysis through a variety of resources including data from the town of Fairfield, MetroCOG, and CTDOT as well as traffic count data collection and input from the public and key stakeholders during the spring and summer of 2017. Ongoing planning efforts at the state, regional, and local level have been and will continue to be taken into account in the assessment of the multi-modal conditions along this roadway.

i. Average Daily Vehicular Traffic Volumes

When analyzing a roadway corridor, it is important to understand the change in volume that has occurred over time. CTDOT conducts triennial traffic counts along State-owned roadways. Available traffic volume data was obtained from the CTDOT and supplemented with an extensive traffic counting program conducted as part of this Study to assess historic and existing traffic along Black Rock Turnpike. Data sources included:

- CTDOT triennial 24-hour continuous automatic traffic recorder (ATR) data between 2001 and 2013. There are 6 locations near the study area with historical data during this time frame. The most recent count year for the Town was 2013. CTDOT did not conduct these regularly scheduled counts in Fairfield in 2016.
- Manual turning movement counts at 11 study area intersections conducted in May and June 2017 as part of the Study data collection effort. Raw data in included in Appendix E.
- ATR counts at 4 different locations on Black Rock Turnpike and 1 location on Tunxis Hill Cutoff in May and June 2017 as part of the study's data collection effort. Raw data is included in Appendix E.

A review of the historic average daily traffic (ADT) volume data collected indicates daily traffic volumes along Black Rock Turnpike peaked around 2005 and declined until 2013. Following 2013, volumes have shown a modest increasing growth trend. Table 3-2 and Figure 3-7 illustrate the ADT trends based on the CTDOT ADT data and data collected for this study at multiple count locations in the study area. Figure 3-8 presents the 2017 ADT at the count locations within the study area.

Table 3-2: Historic Average Daily Traffic

Station	Location	Year					
		2001	2004	2007	2010	2013	2017
33	Route 58 North of Candlewood Road	21,200	20,700	21,100	20,300	19,400	22,785
34	Route 58 South of Whitewood Drive	11,100	10,900	11,100	10,500	10,300	11,069
62	Route 732 North of Tunxis Hill Road #3	12,400	12,300	12,700	11,700	12,200	
71	Route 58 South of Stillson Road	22,600	23,700	23,000	21,400	19,100	20,154
72	Route 58 North of Stillson Road	19,500	24,000	23,300	21,500	18,400	18,381

Source: 2013 CT DOT Triennial 24-hour ATR Data

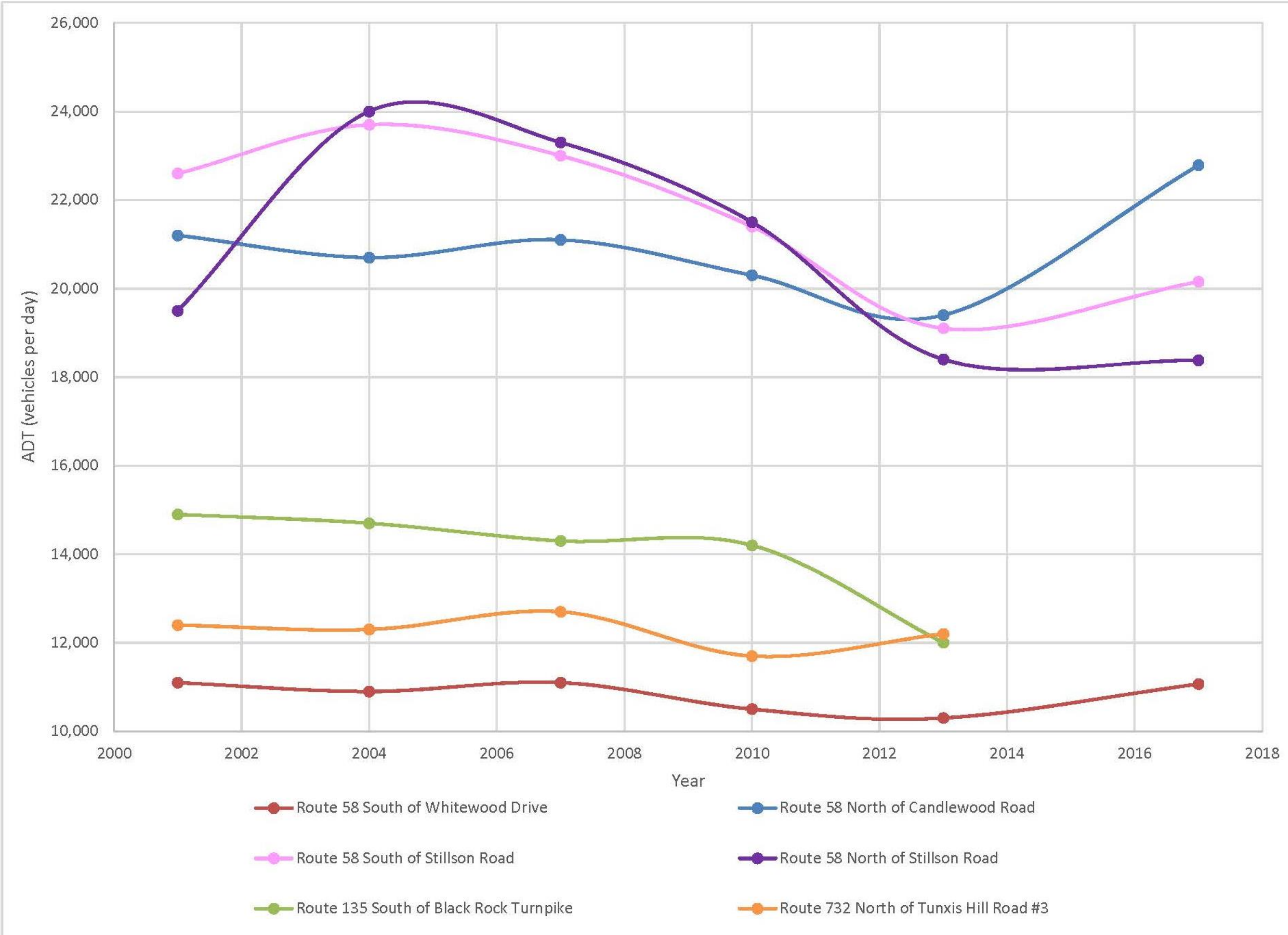

Figure 3-7: ADT Trends at Multiple Count Locations *(Source: CTDOT Treinnal Counts, FHI May & June 2017 Traffic Counts)*

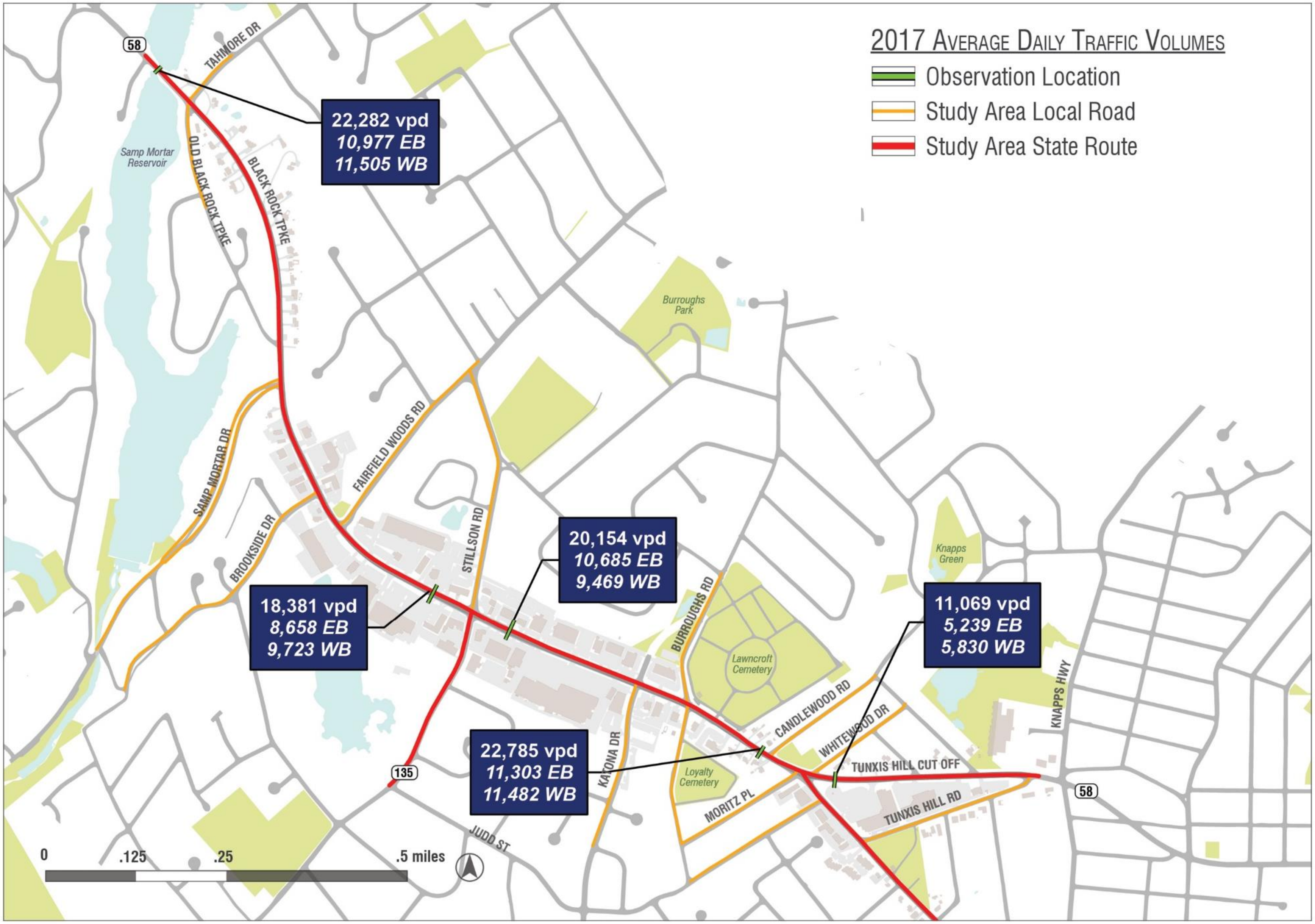

Figure 3-8: 2017 Average Daily Traffic Volumes *(Source: Tighe & Bond, September 2017)*

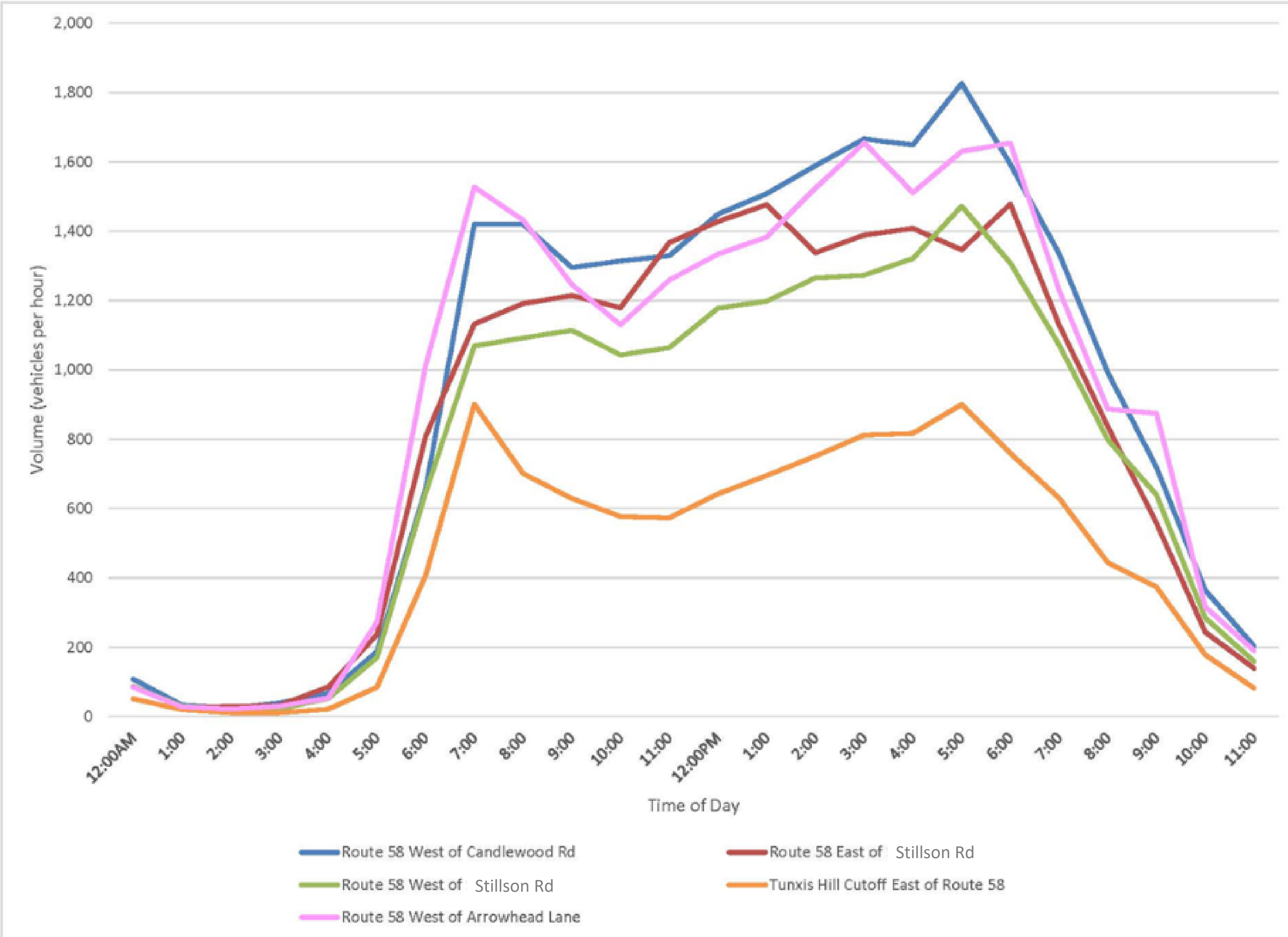

Figure 3-9: Weekday Daily Traffic Profiles Along Black Rock Turnpike *(Source: FHI May & June 2017 Traffic Counts)*

ii. Hourly Traffic Volumes

To understand the peak traffic characteristics, daily traffic trends specific to the corridor were analyzed. An average weekday daily traffic profile for the data collected along the Black Rock Turnpike during May and June 2017 is illustrated in Figure 3-9 on the previous page.

Typical of roadways serving as commuter routes, two pronounced peaks occur during the weekday, corresponding to the morning and afternoon peak periods, with traffic volume increasing sharply between 6:00 and 8:00 AM and 4:00 and 6:00 PM. Following the morning peak, the volumes decrease until around 11:00 AM, before gradually increasing through the afternoon. These traffic demand trends predominately reflect retail driven corridors where traffic builds and is maintained over the course of the day.

Traffic levels during the weekday afternoon and Saturday peak hours tend to be higher than other periods throughout the week, which reflects higher percentages of retail traffic mixing with the commuter traffic. Figures 3-10 through 3-13 illustrate the peak period flow of traffic on Black Rock Turnpike by segment during the peak period, illustrating where peak period traffic flow are highest. As shown, the busiest areas on Black Rock Turnpike occur during afternoon and Saturday peak periods along majority of the corridor proximate to the larger retail developments. Traffic is lighter north and south of the Study Area. This pattern is consistent with the intensity of land uses along Black Rock Turnpike.

iii. Peak Hour Traffic Volumes

In order to establish the 2017 Peak Hour Traffic Volumes in the study area, intersection turning movement counts were collected at the study intersections in May and June 2017. A total of 11 intersections (9 signalized, 2 unsignalized) were collected as part of this Study. Based on this data, the following peak hours were observed:

- Weekday Morning: 7:15 AM to 8:15 AM
- Weekday Afternoon: 4:30 PM to 5:30 PM
- Weekday Mid-Day: 12:00 PM to 1:00 PM
- Saturday Mid-Day: 5:00 PM to 6:00 PM

The intersection turning movement data was analyzed and balanced between the study area intersections utilizing the intersection turning movement counts and the ATR data during these peak hours. The balanced peak hour traffic volumes are illustrated on Figures 3-14 through 3-17 for the weekday morning, weekday midday, weekday afternoon, and Saturday midday peak hours, respectively.

In addition to the count data, the study team collected video footage of the corridor using several drones. This footage was taken for approximately 15 minutes at 5:00 PM on Wednesday, October 11th. Given the complexity of traffic conflicts along this corridor, the study team has been able to use this information to confirm the traffic count data that was collected via other sources as well as detailed operational characteristics. This footage will also be used to calibrate the study's traffic models during the next phase of the study in order to provide more accurate solutions.

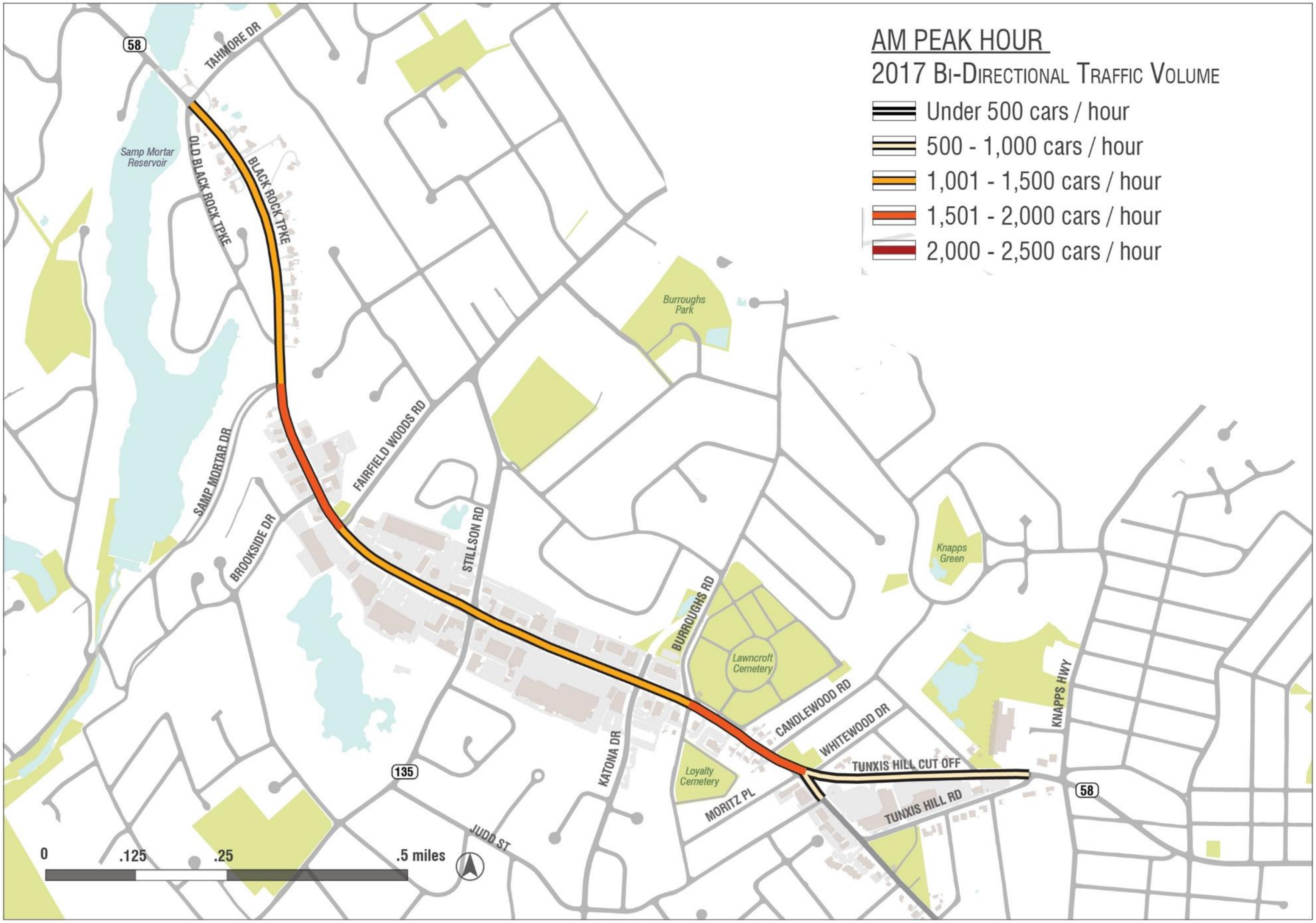

Figure 3-10: 2017 Weekday AM, Bi-Directional Peak Hour Traffic Volume *(Source: Tighe & Bond, September 2017)*

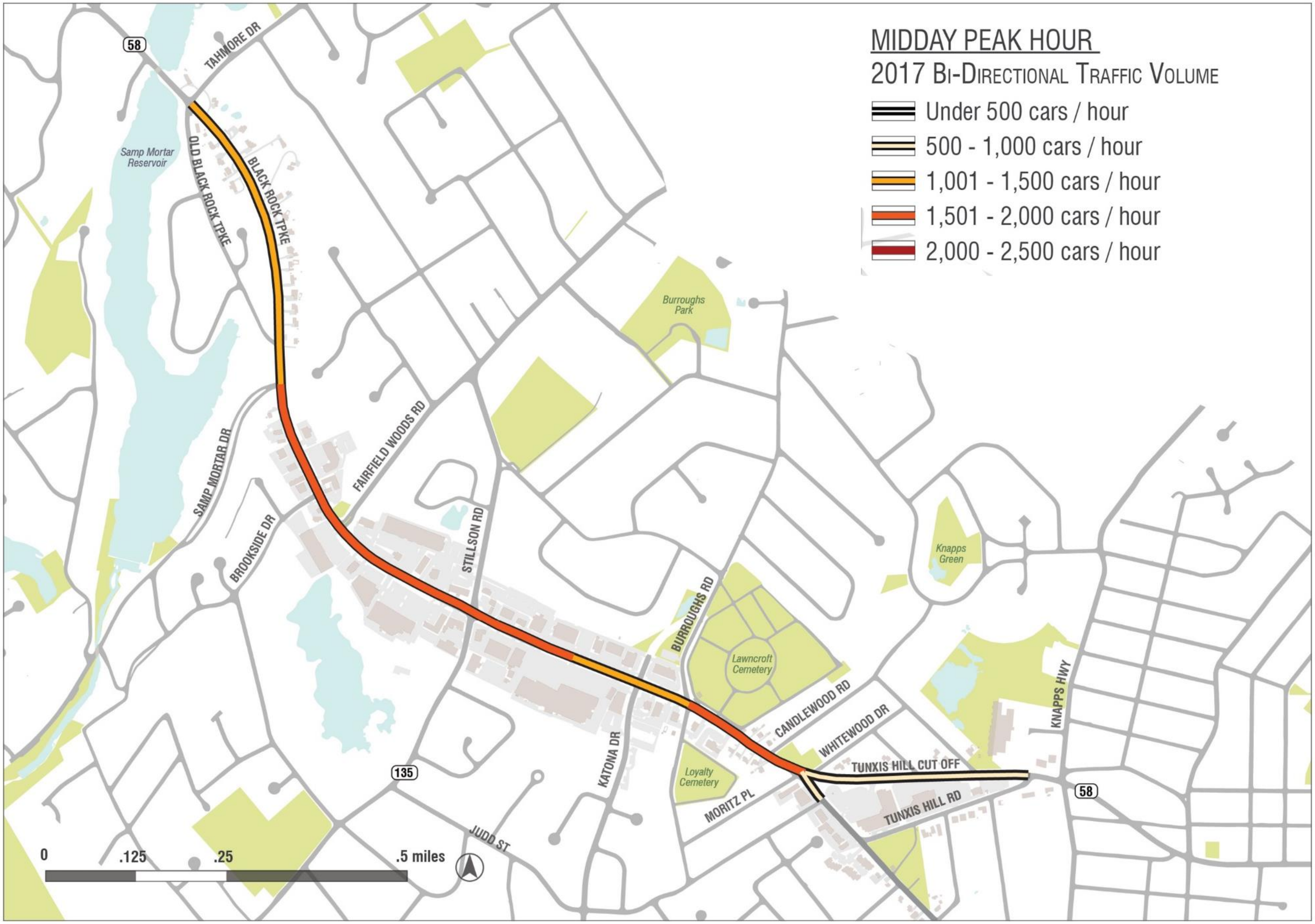

Figure 3-11: 2017 Weekday Midday Bi-Directional Peak Hour Traffic Volume *(Source: Tighe & Bond, September 2017)*

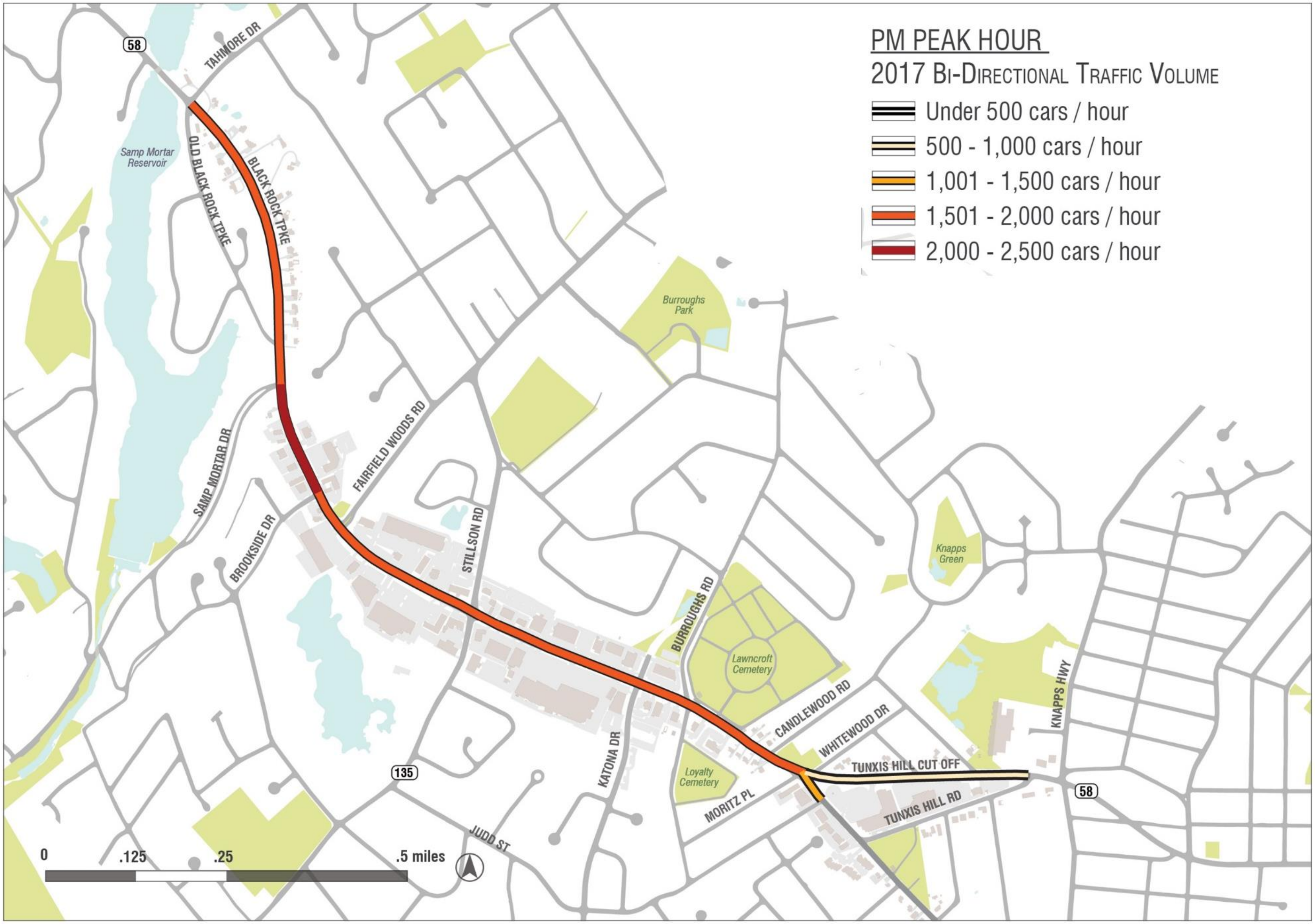

Figure 3-12: 2017 Weekday PM Bi-Directional Peak Hour Traffic Volume *(Source: Tighe & Bond, September 2017)*

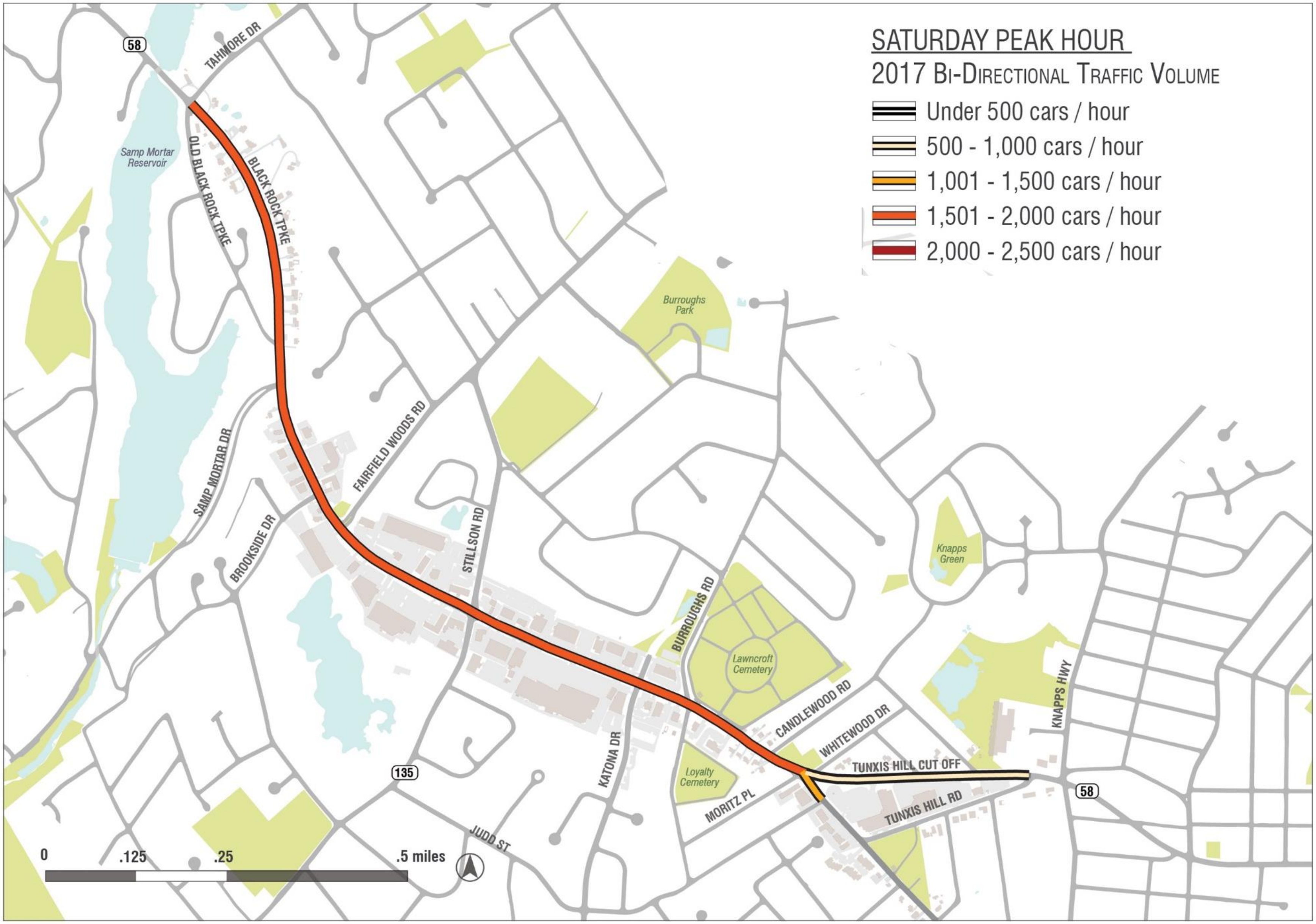

Figure 3-13: 2017 Saturday Bi-Directional Peak Hour Traffic Volume *(Source: Tighe & Bond, September 2017)*

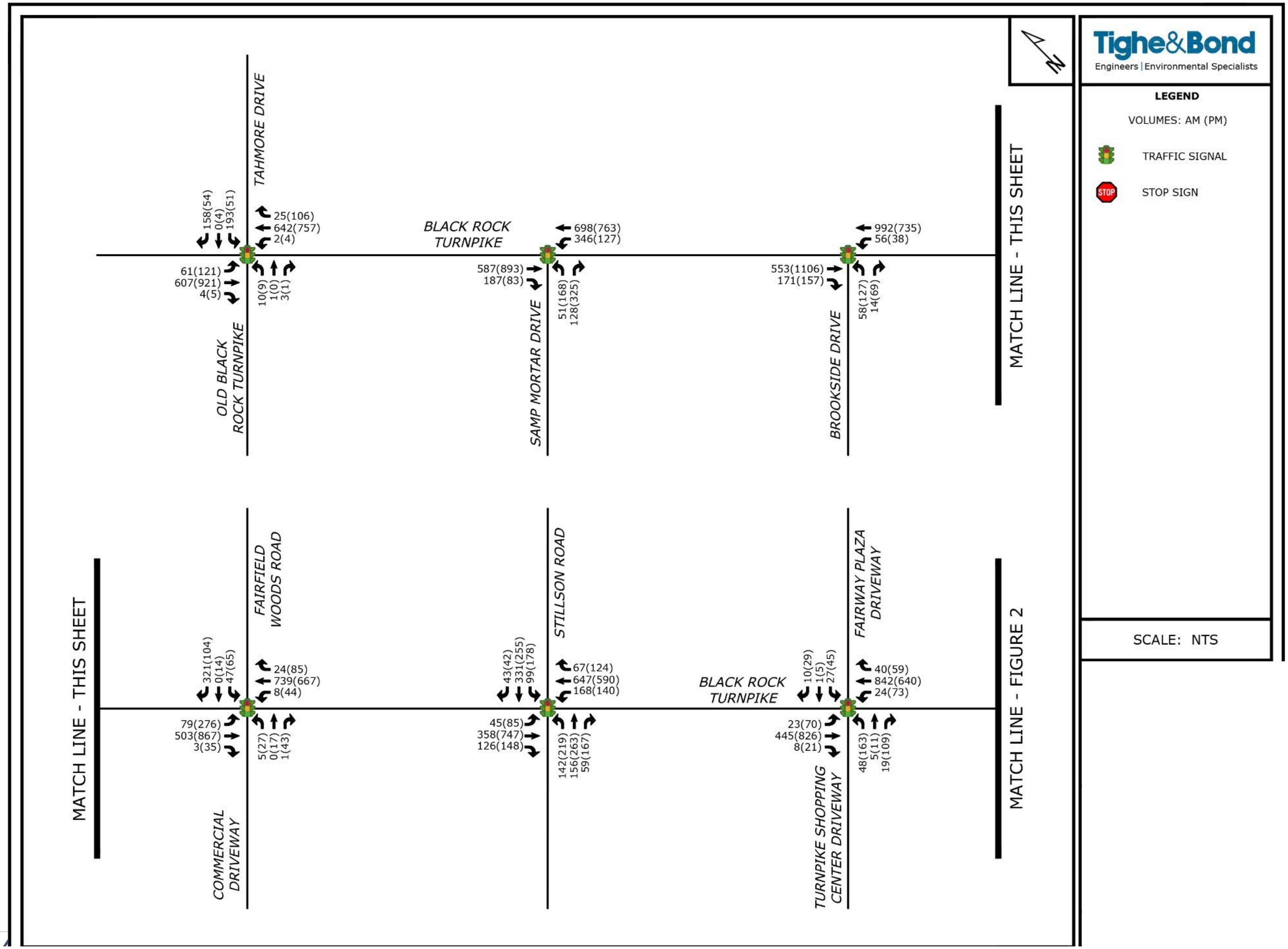

Figure 3-14: 2017 Existing Traffic Volumes Weekday Morning & Afternoon Peak Hour (Part 1) *(Source: Tighe & Bond, September 2017)*

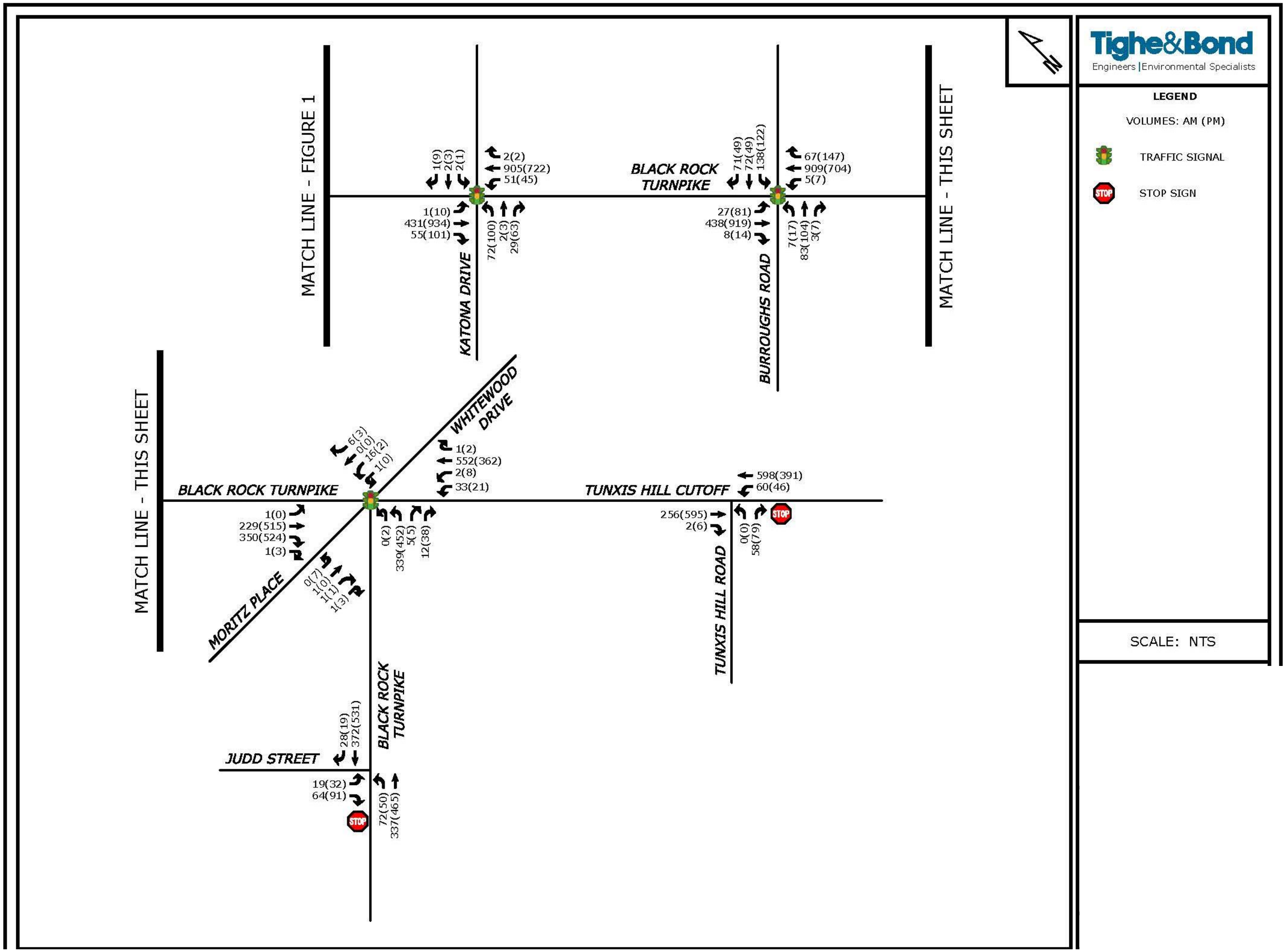

Figure 3-15: 2017 Existing Traffic Volumes Weekday Morning & Afternoon Peak Hour (Part 2) *(Source: Tighe & Bond, September 2017)*

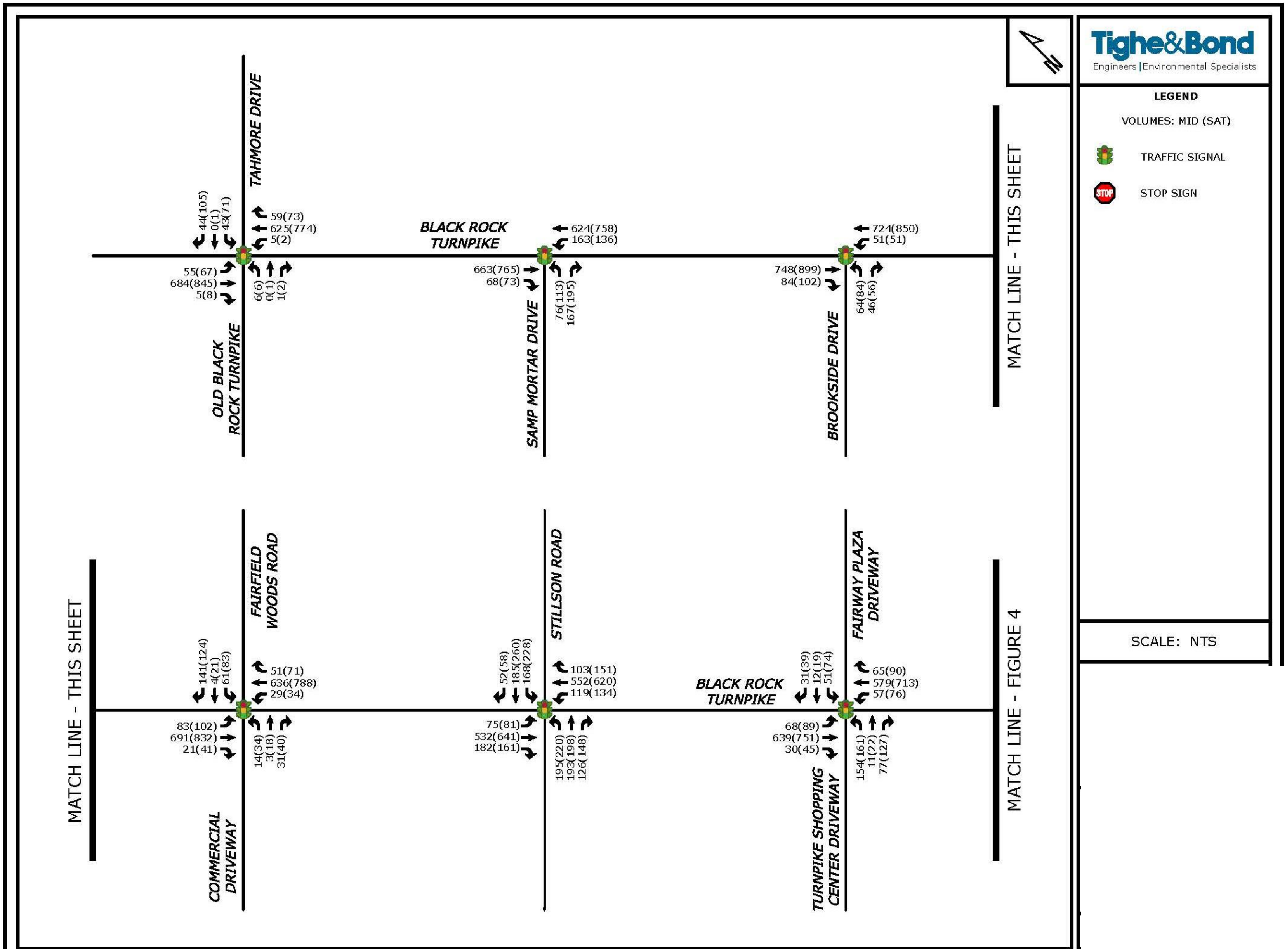

Figure 3-16: 2017 Existing Traffic Volumes Weekday Midday & Saturday Peak Hour (Part 1) *(Source: Tighe & Bond, September 2017)*

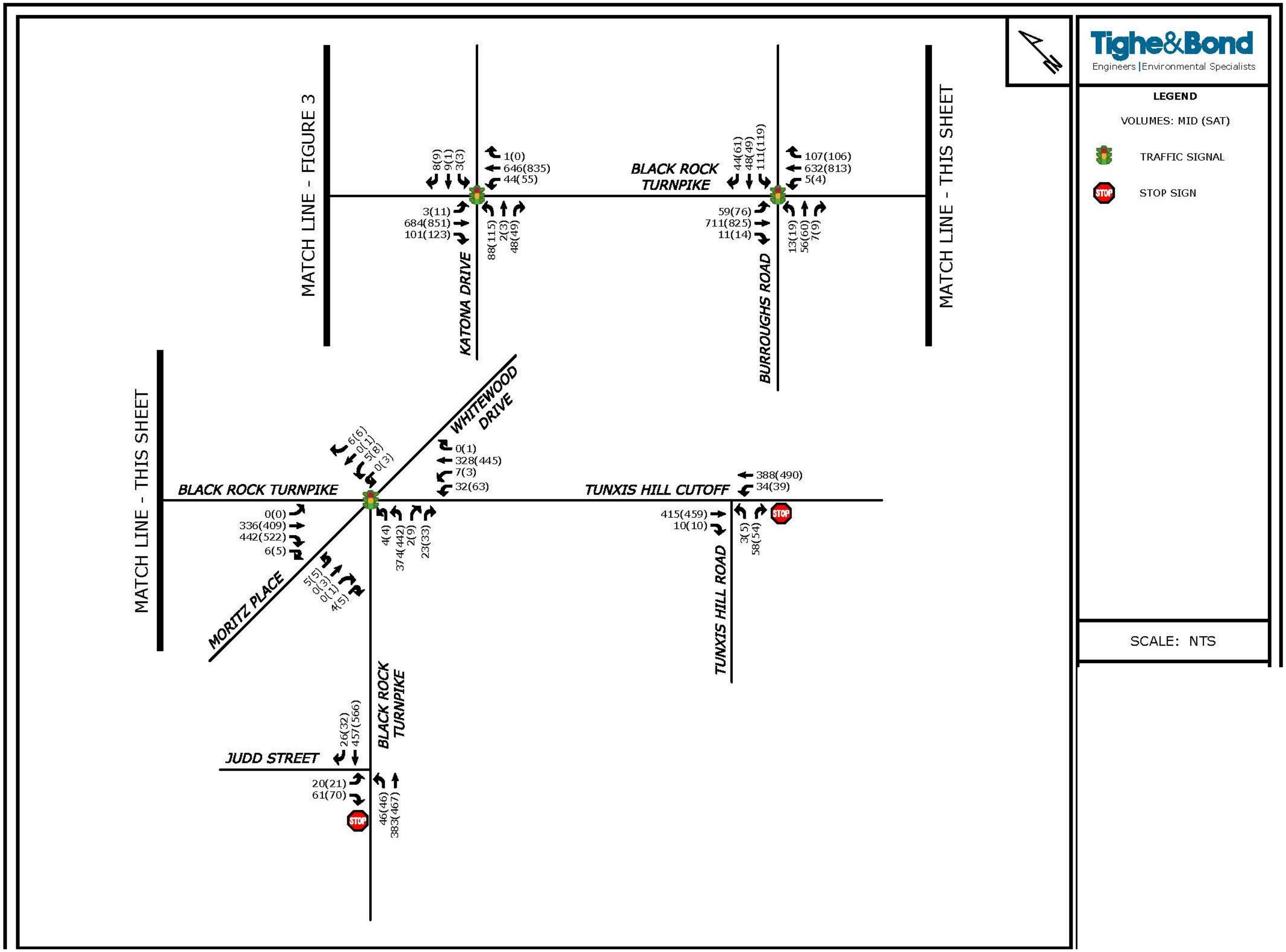

Figure 3-17: 2017 Existing Traffic Volumes Weekday Midday & Saturday Peak Hour (Part 2) *(Source: Tighe & Bond, September 2017)*

iv. Bicycle Use and Conditions

In general, the section of Black Rock Turnpike that is the focus of this study has minimal facilities for bicyclists. While there are no on-road facilities, such as a separated bike lane or signage, the section of the Turnpike between the intersection with Old Black Rock Turnpike/Tahmore Drive and the intersection with Samp Mortar Drive is relatively suitable for bicyclists. This section of the Turnpike is north of the main commercial area and is surrounded primarily by residential properties. The road is two-lanes wide in this area and there are shoulders of five feet or more on both sides throughout the entirety of this section. Despite ample shoulder width, traffic volumes and speeds are high along this stretch of roadway and there are few visual cues to encourage motorists to slow down and watch for cyclists.

South of Samp Mortar Drive, both the geometry and character of the Turnpike shift for the remainder of the study area until the intersection with Tunxis Hill Road. The road widens to accommodate four lanes and the shoulders on both sides are never wider than three feet, which is too narrow to be considered comfortable for most bicyclists. This is clearly illustrated in Figure 3-18. Additionally, the high frequency of curb cuts, high traffic volumes, and vehicular

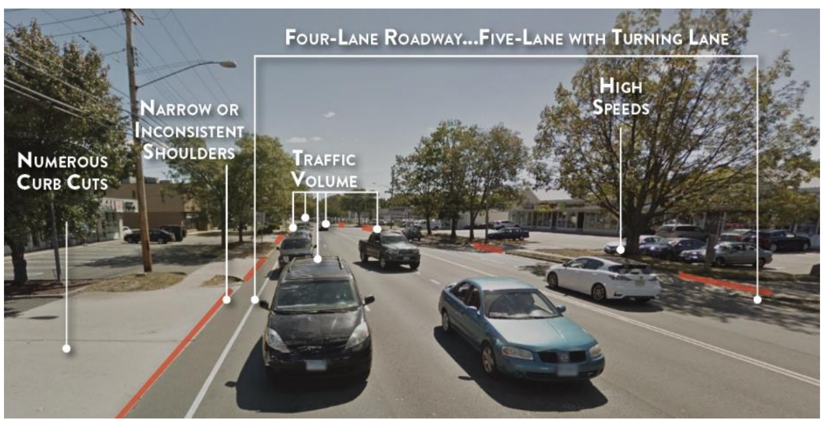

Figure 3-18: Existing Conditions for Bicyclists Along the Turnpike

conflicts further reduces the suitability of this section of the roadway for bicyclists.

Bicycle Ridership

Despite the lack of bicycle facilities along the Black Rock Turnpike, there are some bicyclists that still utilize it. As part of this study, field data was collected to count the number of vehicles, trucks, pedestrians, and bicyclists at eleven intersections at four different time periods as follows:

- Weekday, AM peak hours (7:00 AM – 9:00 AM)
- Weekday, midday (11:00 AM – 1:00 PM)
- Weekday, PM peak (4:00 PM – 6:00 PM)
- Weekend, midday (11:00 AM – 1:00 PM)

While some bicyclists were counted, as shown in Table 3-3, the numbers were minimal and typically accounted for no more than 0.1% of the overall traffic at any of the intersections during any of the time periods. The one exception is the intersection with Katona Drive between 11:00 AM and 1:00 PM when 11 bicyclists were counted, which made up a total of 0.3% of the overall traffic at that intersection during that time period. It's possible this was due to group ride and since the same number did not appear at any of the intersections, the bicyclists simply crossed the Turnpike and did not ride along it.

Another layer of data that was taken into consideration is Strava bicycle rides. Strava is a leading website and smartphone app that allows users to track their bicycle rides, runs, walks, and more, and to share their favorite routes with other users. The app also collects anonymous data from its users, including information when people are traveling and general origin and destination points. As part of this study, the project team analyzed two years of Strava data to gain a better understanding of where people are actually riding today.

While it provides a valuable baseline of information that has served as a starting point in assessing potential bicycle routes, it also has limitations in that it only includes information on people that use the Strava app. In addition, the data does not capture routes where people would prefer to ride if it was safe to do so. As such, it has been used in conjunction with other layers of data, technical expertise, and local input.

The Strava data for the study area is shown in Figure 3-19 on the following pages. The area along the Turnpike north of Samp Mortar Drive is much more suitable for bicyclists. and therefore has higher bicycle ridership (as shown in the dark purple color on the map). South of Samp Mortar Drive, where the roadway's geometry and character abruptly changes, the ridership along the Turnpike significantly drops, as indicated by the light yellow color of those roadways. It appears that bicyclist may be bypassing Black Rock Turnpike by utilizing Pansy Road and Judd Street.

Table 3-3: Intersection Count Data for Vehicles, Pedestrians, and Bicycles

Intersection	Date	Start	End	Vehicle Count	Pedestrian Count	Bicycle Count
Black Rock at Tahmore Dr/Old Black Rock	Wed May 31, 2017	7:00 AM	9:00 AM	3,322	1	-
	Thu Jun 8, 2017	11:00 AM	1:00 PM	2,944	5	-
	Wed May 31, 2017	4:00 PM	6:00 PM	3,891	4	-
	Sat Jun 3, 2017	11:00 AM	1:00 PM	3,969	1	-
Black Rock Tpk at Samp Mortar Dr	Thu May 4, 2017	7:00 AM	9:00 AM	3,862	1	-
	Thu May 4, 2017	11:00 AM	1:00 PM	3,286	-	1
	Thu May 4, 2017	4:00 PM	6:00 PM	4,634	3	1
	Sat May 6, 2017	11:00 AM	1:00 PM	4,069	3	-
Black Rock Tpk at Brookside Dr	Thu May 4, 2017	7:00 AM	9:00 AM	3,573	9	-
	Thu May 4, 2017	4:00 PM	6:00 PM	4,476	4	-
	Thu May 4, 2017	11:00 AM	1:00 PM	3,267	6	-
	Sat May 6, 2017	11:00 AM	1:00 PM	4,125	18	-
Black Rock Tpk at Fairfield Woods Rd	Thu May 4, 2017	7:00 AM	9:00 AM	3,368	11	-
	Thu May 4, 2017	11:00 AM	1:00 PM	3,344	8	-
	Thu May 4, 2017	4:00 PM	6:00 PM	3,817	14	3
	Sat May 6, 2017	11:00 AM	1:00 PM	4,348	19	2
Black Rock Tpk at Stillson Rd	Thu May 4, 2017	7:00 AM	9:00 AM	4,280	17	-
	Thu May 4, 2017	11:00 AM	1:00 PM	4,775	25	-
	Thu May 4, 2017	4:00 PM	6:00 PM	5,867	40	2
	Sat May 6, 2017	11:00 AM	1:00 PM	5,922	54	-
Black Rock Tpk at Party City/CVS Dr	Thu May 4, 2017	7:00 AM	9:00 AM	2,890	6	-
	Thu May 4, 2017	11:00 AM	1:00 PM	3,393	29	-
	Thu May 4, 2017	4:00 PM	6:00 PM	4,017	27	2
	Sat May 6, 2017	11:00 AM	1:00 PM	4,055	20	-

Intersection	Date	Start	End	Vehicle Count	Pedestrian Count	Bicycle Count
Black Rock Tpk at Katona Drive	Thu May 4, 2017	7:00 AM	9:00 AM	2,944	13	1
	Thu May 4, 2017	11:00 AM	1:00 PM	3,198	31	-
	Thu May 4, 2017	4:00 PM	6:00 PM	3,905	17	-
	Sat May 6, 2017	11:00 AM	1:00 PM	4,083	32	11
Black Rock Tpk at Burroughs Rd	Thu May 4, 2017	7:00 AM	9:00 AM	3,378	10	2
	Thu May 4, 2017	11:00 AM	1:00 PM	3,496	16	-
	Thu May 4, 2017	4:00 PM	6:00 PM	4,381	26	3
	Sat May 6, 2017	11:00 AM	1:00 PM	4,369	32	4
Black Rock Tpk at Moritz/Whitwood	Thu May 4, 2017	7:00 AM	9:00 AM	2,902	15	-
	Thu May 4, 2017	11:00 AM	1:00 PM	3,059	6	1
	Thu May 4, 2017	4:00 PM	6:00 PM	3,817	9	3
	Sat May 6, 2017	11:00 AM	1:00 PM	3,881	32	-
Black Rock Tpk at Judd St	Thu May 4, 2017	7:00 AM	9:00 AM	1,733	5	-
	Thu May 4, 2017	11:00 AM	1:00 PM	2,414	18	1
	Thu May 4, 2017	4:00 PM	6:00 PM	2,309	21	-
	Sat May 6, 2017	11:00 AM	1:00 PM	2,414	26	1
Tunxis Hill Cutoff at Tunxis Hill Rd	Thu May 4, 2017	7:00 AM	9:00 AM	1,783	7	-
	Thu May 4, 2017	11:00 AM	1:00 PM	1,719	5	-
	Thu May 4, 2017	4:00 PM	6:00 PM	2,187	6	-
	Sat May 6, 2017	11:00 AM	1:00 PM	2,120	1	-

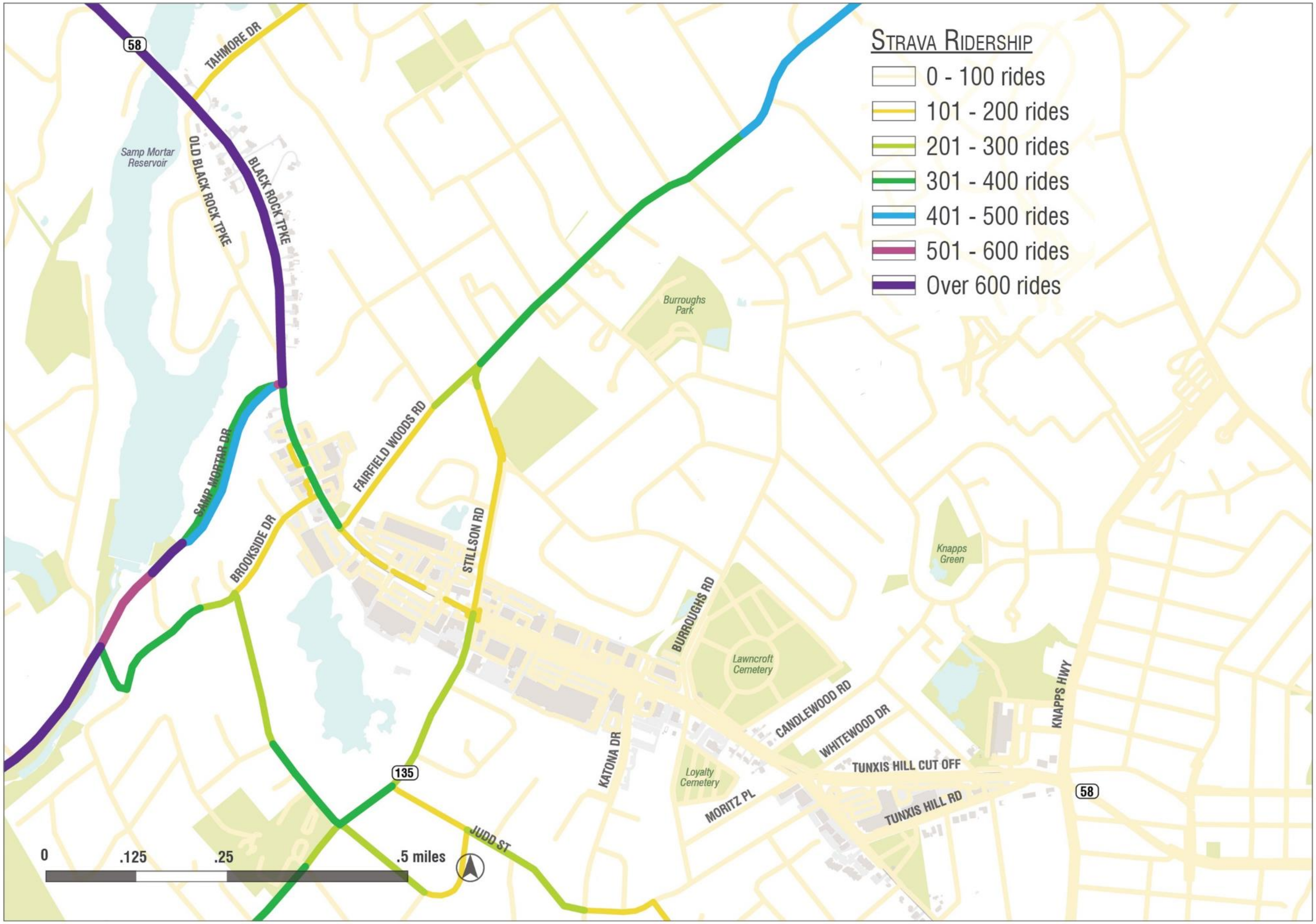

Figure 3-19: Strava Bicycle Ridership *(Source: Strava Data from November 1, 2014 through October 31, 2016)*

Potential Latent Demand

While there is relatively low bicycle ridership along the Black Rock Turnpike, it is difficult to determine whether this is because bicyclists do not prefer to take this route or whether they do not take the route due to the lack of safe and/or comfortable facilities. It's possible that bicyclists would ride on this route if facilities existed to make it safer, especially because the Turnpike does provide a convenient and quick connection between many key destinations in town.

Additionally, the bicycle culture in Fairfield is growing stronger as there has been a significant amount of progress in the development of facilities for bicyclists since the Town's *Bicycle and Pedestrian Master Plan* was approved in 2013. These new facilities will only encourage more ridership as well as a desire for a stronger, more connected bicycle network. Some of these new facilities are described below:

- The town has approved and created two new bike routes: the Mill Plain Bike Road Route, which was featured by the CDC as a success story, as well as the Shoreline Bike Route. Both routes feature "Bike Route" and "Share the Road" signage as well as sharrow pavement markings and/or widened shoulders.
- In addition, the town has recently introduced Air Pump and Bike Repair Stations that are available for free to cyclists. The stations are currently in two locations along each of the two bike routes with plans for a third location already in progress. The station includes all tools necessary to perform basic bike repairs and maintenance from changing a flat to adjusting brakes and derailleurs.
- Fairfield BikeShare was also launched with the Town's encouragement through the sponsorship of Fairfield University and Sacred University. It is operated by Zane's Cycle and citizens can borrow one of the ten available bikes for free to explore Fairfield.

Figure 3-20 illustrates the distance a typical bicyclist can ride within 10, 20 and 30 minutes. For example, Sacred Heart University is simply a 20-minute ride from the Turnpike. Given the number of destinations within riding distance, it seems likely that there is potential for additional bicycle usage along Black Rock Turnpike. This is also in line with the recommendation from Fairfield's *Bicycle and Pedestrian Master Plan* to create a shared lane north-south bicycle route via the Black Rock Turnpike.

***Figure 3-20: Bicycle Ride Times from Black Rock Turnpike** (Source: Google maps and directions)*

v. Pedestrian Use and Conditions

While the Black Rock Turnpike has been designed with a primary focus on vehicular traffic, there are sidewalks and crosswalks located along and within the corridor. This is important since the base of a strong pedestrian network depends on a consistent and safe pathway for pedestrians which allows for convenient connections to key destinations.

Concrete sidewalks that are in good condition and well-maintained exist along at least one side of the roadway throughout the entirety of the corridor included in this study. The northern section of the Turnpike between the intersection with Old Black Rock Turnpike/Tahmore Drive and the southern intersection with Old Black Rock Turnpike may have lower demand for pedestrian traffic due to its residential nature, but connectivity from these neighborhoods is nevertheless important. A sidewalk that ranges between three and four feet in width runs along only one side of the Turnpike throughout this section. The majority of this sidewalk is set back from the roadway with a grassy buffer area that is between four to eight feet wide.

Traveling south past the intersection with Old Black Rock Turnpike, sidewalks exist along both sides of the street throughout the rest of the study area. These sidewalks are approximately four to five feet wide with a buffer that ranges between five and 14 feet wide.

Although sidewalks exist along the entirety of the Turnpike, they are lacking along some of the intersecting streets that provide connections to nearby neighborhoods and other destinations, such as schools. These gaps in the sidewalk network are illustrated with thick black lines in Figure 3-21.

While the sidewalk is continuous along the Black Rock Turnpike, the significant number of driveways cause breaks in the pedestrian network which contribute to a high number of potential vehicle-pedestrian conflicts. Motorists along the Turnpike that turn into and out of driveways are focused on looking for gaps in traffic and not as aware of the presence of pedestrians. Hence, motorists pull into these driveways at relatively high speed, creating a safety issue for pedestrians that are trying to cross these driveways.

While none of the driveways feature crosswalks, all the signalized intersections have a pedestrian crossing across the Turnpike except for the intersection with Tahmore Drive. Traditional white painted crossings are used for the crosswalks and both sides connect to the sidewalk with a curb ramp, only some of which also have an ADA-accessible tactile strip. Many of the intersections also have pedestrian signalization with push buttons that indicate to pedestrians when it is safe to cross and more formally regulate the interactions between the pedestrian and the motorist.

While these crosswalks do help to increase safety for everyone along the Turnpike, there are still issues. Fatal crashes involving pedestrians have occurred as recently as 2016 at or near the intersection with Katona Drive. These events are devastating for those involved, their families, and the whole community and this study will urgently seek improvements to prevent such events in the future.

Figure 3-21: Pedestrian Network *(Source: MetroCOG Geodatabase June 2017, Fitzgerald & Halliday Field Data June 2017)*

Pedestrian Activity

While pedestrian activity accounts for a relatively small percentage of the total amount of transportation demand along the Black Rock Turnpike, there are still a number of people who walk to get around. The pedestrian count data collected through the fieldwork that was previously noted has been illustrated in Figure 3-22. As expected, there is little foot traffic during all four time-periods along the most northern part of the study area which is mainly residential. Pedestrian traffic is clearly concentrated between the intersection with Fairfield Woods Road and the intersection with Judd Street, which is where the main commercial shopping opportunities are located. The intersection which received the highest amount of pedestrian traffic was at Stillson Road, which is at a central point among the area with the largest number of commercial businesses. It is also notable that at nearly every intersection there was more pedestrian activity during the PM hours on the weekdays. There was also more activity during the midday hours on the weekend when compared to any time during the weekday, which could indicate that people are more likely to walk when they are less pressed for time.

Just as with bicycling, the demand for walking is likely greater than counts indicate. Anecdotal evidence and direct observation indicates that people often drive to adjacent businesses rather than walk. This is due to many factors, including lack of comfort and directness, as well as challenges associated with carrying groceries and purchased items. Those issues aside, some people have expressed a feeling that walking doesn't feel safe to them so they choose to drive to make even short trips across the street.

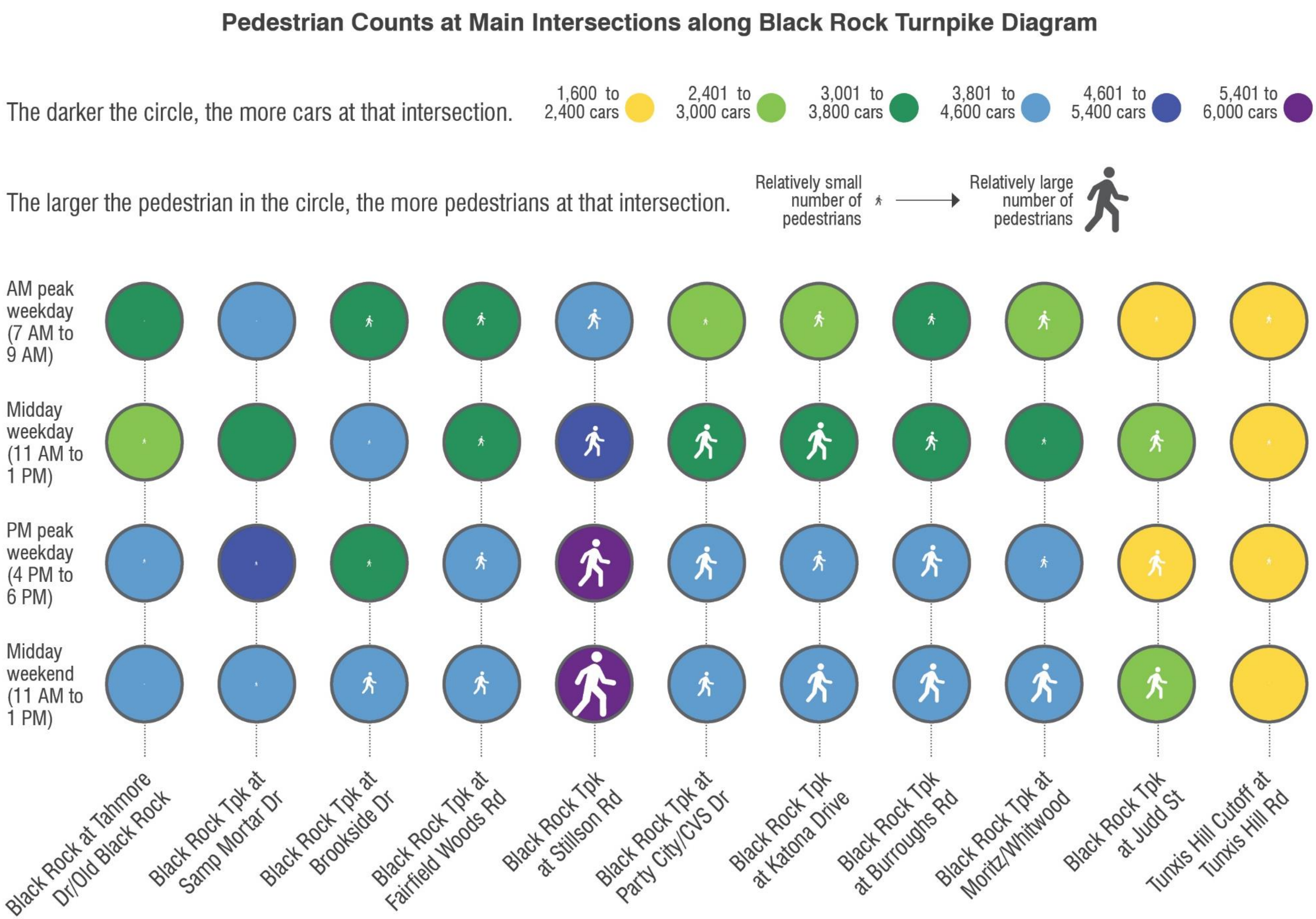

Figure 3-22: Pedestrian Counts at Main Intersections along Black Rock Turnpike Diagram *(Source: Fitzgerald & Halliday, Inc.; CT Counts, May and June 2017)*

vi. Transit Use and Conditions

Transit Facilities

Transit in the study area consists of a single bus, Route 10, operated by Greater Bridgeport Transit (GBT). Bus stops are provided throughout the corridor, most marked by a GBT sign including basic route information. Bus stops do not feature shelters or benches. All GBT buses are equipped to carry bicycles, with racks available on a first-come, first-serve basis.

Greater Bridgeport Transit Route 10

Greater Bridgeport Transit Route 10 provides local bus service from Stratford to Fairfield, via downtown Bridgeport and the Bridgeport Transportation Center Bus Station. Connecting bus services are available at the Bus Station, along with intermodal connections to regional buses, Metro-North Railroad and Amtrak.

At the western end of Route 10, buses turn around via a short clockwise loop around Fairfield Woods Road and Stillson Road.

The one-way cash fares on GBT buses is $1.75, valid for 90 minutes of unlimited travel on any bus (including transfers). Unlimited daily, weekly, and monthly passes are also available, along with discounts for youth and seniors.

Service span and frequency on Route 10 are as follows:

- Weekdays
  - 6 AM to 10 PM
  - 30 minute peak frequency
  - 60 minute off-peak
- Saturdays
  - 7 AM to 7 PM
  - 60 minute frequency
- Sundays
  - 8:30 AM to 7:30 PM
  - 60 minute frequency

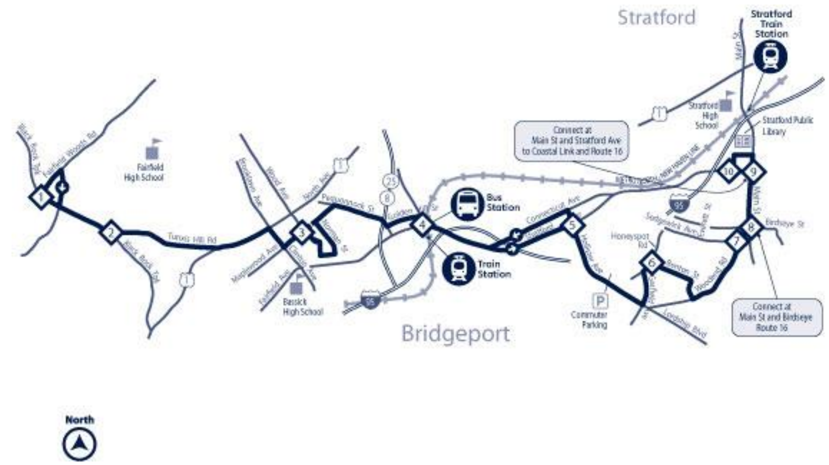

Figure 3-23: Greater Bridgeport Transit Route 10 Map *(Source: Greater Bridgeport Transit Route Maps)*

Ridership

Greater Bridgeport Transit provided ridership data in the corridor for a representative sample of days after Labor Day in September 2017.

Representative sample of several days in September (after Labor Day). Boarding activity at the bus stop level is clearly higher in the eastbound (inbound to Bridgeport) direction, as the study corridor is situated at the route's western end. Interestingly, outbound alighting activity (passengers getting off the bus) is often higher than inbound boarding, indicating that bus riders may make alternate arrangements for one leg of their travel.

Daily ridership activity is modest in the corridor. The busiest bus stops are located on Black Rock Turnpike between Stillson Road and Katona Drive. These stops see upward of 20 boardings and alightings each day. Most other stops in the study corridor see fewer than 10 boardings or alightings each.

Table 3-4: Average Daily Bus Boardings: Black Rock Turnpike Study

	Inbound to Bridgeport	Outbound to Fairfield	Total
Route 58 Part One*	36	2	38
Route 58 Part Two**	43	8	51
Minor Approaches	21	7	28

Of note for a study corridor with significant retail activity is that Saturday ridership exceeds weekday (and Sunday) volume. In this case, Black Rock Turnpike functions more as a destination than an origin for transit trips.

Transit Issues and Opportunities

Transit riders are also pedestrians, and thus issues pertaining to safety, comfort and accessibility at the street and sidewalk level apply to GBT bus riders. Some sidewalk gaps exist along the study corridor and numerous curb cuts affect the walking environment and safety for pedestrians.

Bus stop location plays an important role in access to and from destinations along the corridor, as bus riders making a round trip will use stops on both side of the street. Due in part to sidewalk gaps or intersection control, stop spacing in the study corridor is uneven; not all bus stops have a corresponding stop across the Turnpike for return travel.

Bus stops close to signalized intersections with crosswalks are inherently safer and more comfortable for bus riders, as mid-block crossings force a choice between a longer walk to destinations and a dangerous crossing of the Turnpike without any signal control. The busiest bus stops are along Black Rock Turnpike at and near Stillson Road and Katona Drive, which are signalized crossings.

Bus layover locations are an ongoing concern for Greater Bridgeport Transit, as transit reliability is dependent on scheduled down-time for bus operators at route ends. Currently, GBT uses the turnaround loop via Fairfield Woods Road and Stillson Road to lay over; however, community pressures over the years have often forced GBT operators to move buses or find new space. GBT would benefit from a formal, agreed upon layover location to ensure reliable operation of Route 10.

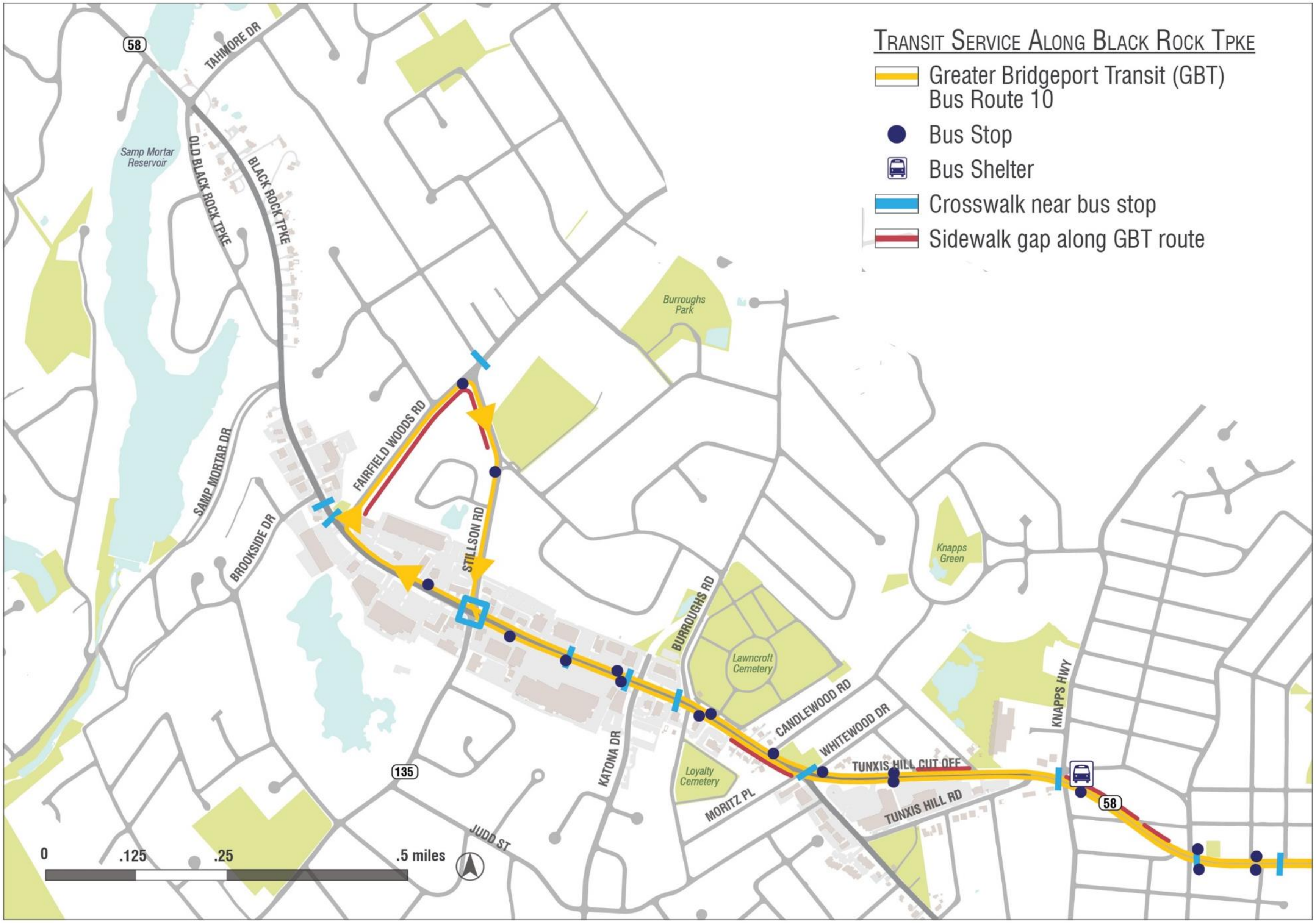

Figure 3-24: Transit Service Along Black Rock Turnpike *(Source: Greater Bridgeport Transit Route Maps; Fitzgerald & Halliday Field Data June 2017)*

D. Traffic Operations and Safety

i. Traffic Operations

A traffic analysis was conducted for the 11 study area intersections (9 signalized, 2 unsignalized) to measure the level of vehicle delay and queuing at intersections. The key measure of effectiveness for the peak hour traffic analysis is level of service (LOS) at the study area intersections. LOS is a qualitative measure of vehicular delay and takes into account a number of conditions related to intersection design and traffic volume, and the perception of those conditions by motorists. Six levels of service are defined with letter designations from A to F, with LOS A representing the best operating conditions and LOS F representing the worst. Conventional practices point to LOS C, describing a condition of stable traffic flow, as the minimum desirable level for peak traffic flow in rural and suburban areas. LOS D (and sometimes LOS E), with greater vehicle queues and delay, are often considered acceptable for urban areas because of the accessibility benefits and higher pedestrian interactions that result from increased density; however, these are subjective guidelines and tolerances for levels of delay vary from place to place.

Level of service designation is reported differently for signalized and unsignalized intersections. Thus, the delay ranges differ slightly between unsignalized and signalized intersections due to driver expectations and behavior for each LOS. For signalized intersections, LOS is defined in terms of average delay, which is a measure of driver discomfort and frustration, and lost travel time. For unsignalized intersections, the LOS analysis assumes that the traffic on the mainline is not affected by traffic on the side street. The LOS for each movement is calculated by determining the number of gaps that are available in the conflicting traffic stream. Based on the number of gaps, the capacity of the movement can be calculated. For unsignalized intersections, the highest delayed movement is reported in addition to an overall delay. Table 3-5, summarizes the LOS criteria, as specified by the Highway Capacity Manual.

Table 3-5: Level of Service (LOS) Criteria Summary

Level of Service	Signalized Intersection Criteria Average Control Delay (Seconds per Vehicle)	Unsignalized Intersection Criteria Average Control Delay (Seconds per Vehicle)	V/C Ratio >1.00[a]
A	≤10	≤10	F
B	>10 and ≤20	>10 and ≤15	F
C	>20 and ≤35	>15 and ≤25	F
D	>35 and ≤55	>25 and ≤35	F
E	>55 and ≤80	>35 and ≤50	F
F	>80	>50	F

Note: [a]For approach-based and intersection-wide assessments, LOS is defined solely by control delay.

Source: *HCM2010: Highway Capacity Manual.* Washington, D.C.: Transportation Research Board, 2010. Pages 18-6 and 19-2.

The traffic analysis for the study intersections was conducted using Trafficware's *Synchro plus SimTraffic 9 – Traffic Signal Coordination Software*, a computer-based intersection operations model, which implements procedures presented in the 2010 Highway Capacity Manual (HCM) methodology. Synchro is designed to evaluate the performance of arterials, signalized intersections, and unsignalized intersections (two-way stop, all-way stop, and roundabouts). The intersection LOS reported by Synchro reflects the average intersection delay per vehicle for all movements. The results of the analysis have been illustrated in Figures 3-25 and 3-26.

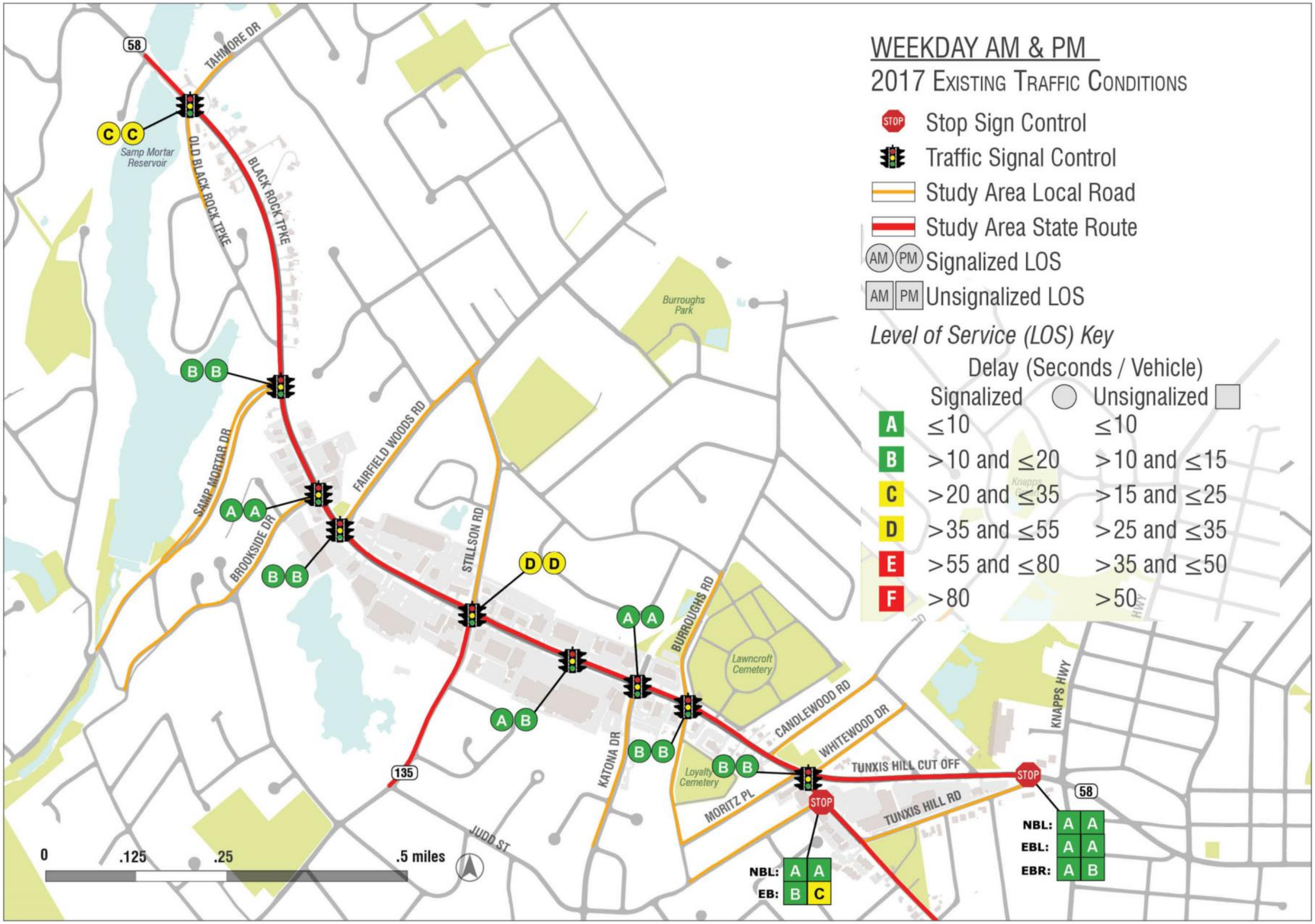

Figure 3-25: 2017 Weekday AM & PM Existing Traffic Operations *(Source: Tighe & Bond, September 2017)*

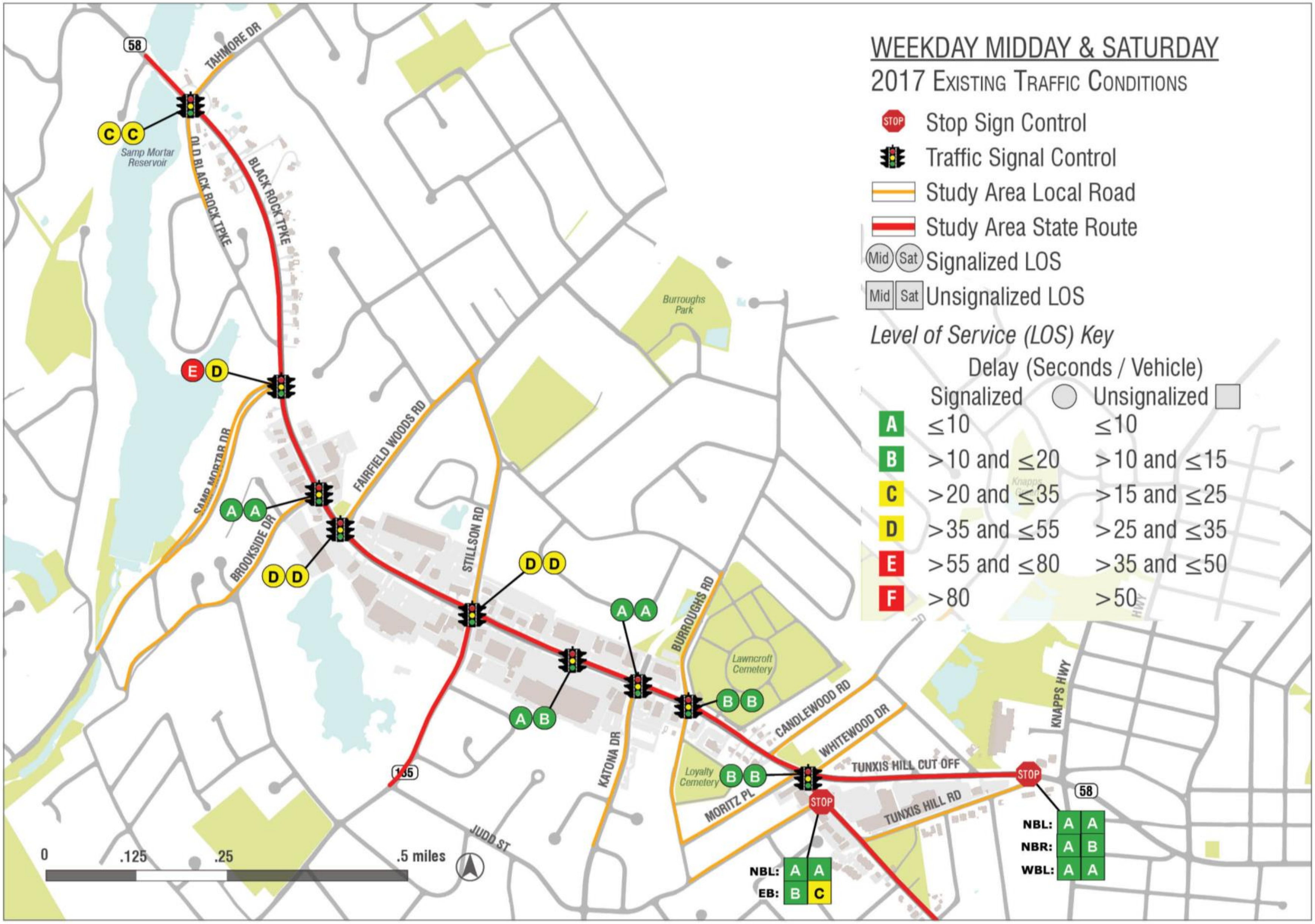

Figure 3-26: 2017 Weekday Midday & Saturday Existing Traffic Operations (Source: Tighe & Bond, September 2017)

Results of the traffic analysis indicate that most of the study intersections operate at LOS D or better during typical weekday morning and afternoon peak hours and at LOS B or better during typical weekday midday and Saturday peak hours. There are occurrences where a specific intersection approach or movement exceeds LOS D, even if the total intersection does not. Table 3-6 and 3-7 indicate the approaches that are LOS E or F with a yellow and red highlight, respectively. The detailed LOS analysis results for each study intersection is located in Appendix F.

According to the analysis results, drivers experience more extended delays (LOS E or worse) at the following locations in the weekday morning, weekday afternoon, weekday midday and/or Saturday peak hours:

- Black Rock Turnpike at Stillson Road
    - LOS E and F for eastbound and westbound lefts turn during all peaks
    - LOS E for eastbound through and right turns during afternoon
    - LOE F and E for northbound through and right turns during the afternoon and Saturday peaks
    - LOS E for southbound through and right turns in the morning peak

The delays experienced by drivers at these locations are a result of a combination of factors including closely spaced intersections and high levels of traffic from retail developments. Furthermore, most driveways along the corridor are not signalized and the delay from those can be high since available gaps (space between cars) in the traffic stream are infrequent. While utilizing computer-based models to assess traffic conditions provides a foundation for the existing conditions assessment, field observations and public input will also help facilitate concept development moving forward.

Table 3-6: Intersection Operation Summary – Vehicular Levels of Service / Average Delays (sec/veh) – Signalized Intersections

	Lane Use	Weekday Morning Peak Hour LOS	Weekday Morning Peak Hour Avg. Delay (s/veh)	Weekday Midday Peak Hour LOS	Weekday Midday Peak Hour Avg. Delay (s/veh)	Weekday Afternoon Peak Hour LOS	Weekday Afternoon Peak Hour Avg. Delay (s/veh)	Saturday Midday Peak Hour LOS	Saturday Midday Peak Hour Avg. Delay (s/veh)
Traffic Signal - Black Rock Turnpike at Old Black Rock Turnpike & Tahmore Drive									
Overall		**C**	**22.2**	**A**	**8.1**	**C**	**29.3**	**B**	**16.3**
Old Black Rock Turnpike	EB	B	17.1	A	0.1	A	1.0	B	20.0
Tahmore Drive	WB	D	44.5	B	15.0	C	20.2	C	22.1
Black Rock Turnpike	NB	B	13.2	A	6.7	A	7.8	B	10.9
	SB	B	18.5	A	8.6	D	47.4	B	19.9
Traffic Signal - Black Rock Turnpike at Samp Mortar Drive									
Overall		**B**	**16.7**	**B**	**13.1**	**B**	**16.4**	**B**	**14.5**
Samp Mortar Drive	EBL	C	33.9	D	35.9	D	38.8	D	37.7
	EBR	B	11.3	B	10.8	A	9.1	A	9.6
Black Rock Turnpike	NBL	A	9.4	A	6.9	A	9.7	A	7.8
	NBT	B	14.0	B	14.5	B	18.5	B	16.7
	SB	C	22.3	B	11.1	B	14.1	B	11.6
Traffic Signal - Black Rock Turnpike at Brookside Drive									
Overall		**A**	**2.9**	**A**	**3.7**	**A**	**8.0**	**A**	**5.4**
Brookside Drive	EB	C	29.4	C	24.7	C	33.5	C	28.7
Black Rock Turnpike	NB	A	2.5	A	2.9	A	4.4	A	3.6
	SB	A	0.6	A	1.6	A	5.4	A	3.3
Traffic Signal - Black Rock Turnpike at Fairfield Woods Road & Commercial Driveway									
Overall		**B**	**15.7**	**A**	**9.1**	**B**	**11.0**	**A**	**9.6**
Commercial Driveway	EBLT	B	19.8	C	24.3	C	29.7	C	28.5
	EBR	A	0.0	A	0.5	A	1.0	A	0.7
Fairfield Woods Road	WBLT	C	21.6	C	29.5	D	36.5	D	38.6
	WBR	D	53.7	D	39.5	D	38.5	D	38.9
Black Rock Turnpike	NB	A	8.8	A	5.7	A	5.1	A	5.7
	SB	A	3.2	A	4.1	A	9.8	A	4.3

(continued on following page...)

(Continued)

Table 3-6: Intersection Operation Summary – Vehicular Levels of Service / Average Delays (sec/veh) – Signalized Intersections

	Lane Use	Weekday Morning Peak Hour LOS	Weekday Morning Peak Hour Avg. Delay (s/veh)	Weekday Midday Peak Hour LOS	Weekday Midday Peak Hour Avg. Delay (s/veh)	Weekday Afternoon Peak Hour LOS	Weekday Afternoon Peak Hour Avg. Delay (s/veh)	Saturday Midday Peak Hour LOS	Saturday Midday Peak Hour Avg. Delay (s/veh)
Traffic Signal - Black Rock Turnpike at Stillson Road									
Overall		**D**	**44.5**	**D**	**37.7**	**D**	**53.9**	**D**	**48.5**
Black Rock Turnpike	SBL	E	60.0	E	61.1	E	68.3	E	69.5
	SBTR	D	37.5	D	38.2	E	56.2	D	51.9
	NBL	F	99.0	E	62.4	E	75.1	E	79.6
	NBTR	D	37.6	C	31.2	D	36.8	D	41.3
Stillson Road	EBL	C	25.7	C	23.9	C	28.4	C	27.9
	EBTR	C	32.3	D	46.1	F	86.1	E	60.5
	WBL	B	18.9	C	24.5	D	38.8	C	29.8
	WBTR	E	61.4	D	43.1	D	53.7	D	53.8
Traffic Signal - Black Rock Turnpike at Turnpike Shopping Center & Fairway Plaza Driveways									
Overall		**A**	**6.6**	**B**	**10.4**	**B**	**12.8**	**B**	**14.3**
Black Rock Turnpike	SB	A	3.0	A	7.7	B	11.3	B	13.2
	NB	A	6.1	A	7.9	B	11.6	B	13.7
Turnpike Shopping Center Driveway	EBLT	D	38.5	C	34.1	C	30.2	C	27.8
	EBR	A	0.4	A	0.9	A	3.7	A	3.9
Fairway Plaza Driveway	WBLT	C	32.5	C	25.1	C	22.2	C	23.2
	WBR	A	0.2	A	0.3	A	0.2	A	0.3
Traffic Signal - Black Rock Turnpike at Katona Drive & Katona Drive Extension									
Overall		**A**	**6.7**	**A**	**7.2**	**A**	**7.5**	**A**	**7.8**
Black Rock Turnpike	SB	A	2.3	A	3.0	A	3.4	A	3.5
	NB	A	6.6	A	6.6	A	7.0	A	8.1
Katona Drive	EBLT	D	42.9	D	45.7	D	48.2	D	47.0
	EBR	A	0.9	A	2.5	A	4.7	A	1.3
Katona Drive Extension	WBL	C	27.0	C	25.7	C	25.0	C	25.0
	WBTR	C	24.7	B	19.4	B	16.3	B	15.1

(continued on following page...)

(Continued)

Table 3-6: Intersection Operation Summary – Vehicular Levels of Service / Average Delays (sec/veh) – Signalized Intersections

	Lane Use	Weekday Morning Peak Hour LOS	Weekday Morning Peak Hour Avg. Delay (s/veh)	Weekday Midday Peak Hour LOS	Weekday Midday Peak Hour Avg. Delay (s/veh)	Weekday Afternoon Peak Hour LOS	Weekday Afternoon Peak Hour Avg. Delay (s/veh)	Saturday Midday Peak Hour LOS	Saturday Midday Peak Hour Avg. Delay (s/veh)
Traffic Signal - Black Rock Turnpike at Burroughs Road									
Overall		**B**	**14.8**	**B**	**10.3**	**B**	**10.8**	**B**	**10.4**
Black Rock Turnpike	SB	A	5.7	A	5.0	A	5.2	A	5.5
	NB	B	11.6	A	7.3	A	7.6	A	7.9
Burroughs Road	EB	C	20.5	C	22.2	C	26.2	C	23.2
	WB	D	37.7	C	34.8	D	38.5	C	34.3
Traffic Signal - Black Rock Turnpike at Tunxis Hill Cutoff, Moritz Place & Whitewood Drive									
Overall		**B**	**13.2**	**B**	**11.8**	**B**	**14.5**	**B**	**13.9**
Black Rock Turnpike	SBLT	B	15.3	B	17.7	C	21.9	B	18.8
	SBR	A	3.2	A	3.5	A	3.1	A	3.5
Tunxis Hill Cutoff	NB	B	16.8	B	13.9	B	14.1	B	16.7
Black Rock Turnpike	NWB	B	15.3	B	13.8	B	18.4	B	16.9
Moritz Place	NEB	C	25.5	C	24.3	C	29.8	C	28.1
Whitewood Drive	SWB	C	26.0	C	24.5	C	29.7	C	28.4

Table 3-7: Intersection Operation Summary – Vehicular Levels of Service / Average Delays (sec/veh) – Unsignalized Intersections

	Lane Use	Weekday Morning Peak Hour		Weekday Midday Peak Hour		Weekday Afternoon Peak Hour		Saturday Midday Peak Hour	
		LOS	Avg. Delay (s/veh)	LOS	Avg. Delay (s/veh)	LOS	Avg. Delay (s/veh)	LOS	Avg. Delay (s/veh)
Unsignalized TWSC - Tunxis Hill Cutoff at Tunxis Hill Road									
Tunxis Hill Road	EBL	A	0.0	C	20.7	A	0.0	C	24.5
	EBR	A	9.6	B	10.3	B	11.1	B	10.4
Tunxis Hill Cutoff	NBL	A	8.1	A	8.5	A	9.0	A	8.6
Unsignalized TWSC - Black Rock Turnpike at Judd Street									
Black Rock Turnpike	NBL	A	8.5	A	8.8	A	8.8	A	9.0
Judd Street	EB	B	13.8	C	15.2	C	18.6	C	17.6

In addition to the level of service, efficient traffic operations are also a function of vehicular queuing, the distance at which cars will line up at an intersection waiting to perform their desired movement. The queues are calculated for average queues (50th percentile) and design queues (95th percentile). Often times, particularly along busy corridors, average and design queues extend beyond the available storage space and will extend back to adjacent intersections and driveways, resulting in additional delays above that presented by the analyses. Table 3-8 and 3-9 provide a summary of the queues for the study area signalized and unsignalized intersections, respectively. In these tables, movements where queues exceed the available storage are highlighted in red.

As shown in Tables 3-8 and 3-9, queuing issues are present for specific approaches to the intersections in the central portion of the study area between the intersections with Samp Mortar Drive and the Turnpike Shopping Center and Fairway Plaza driveways. Along this segment the closely spaced intersections and high traffic volumes from the dense commercial development result in queues that extend beyond the available storage, resulting in additional congestion that may not be fully represented in the level of service results. It is important to recognize that when conducting traffic operations modeling that several factors need to be taken into account when measuring the effectiveness of a roadway to efficiently move traffic.

Table 3-8: 2017 Existing Conditions Queue Summary (Vehicular 50th/95th Percentile Queue in Feet) – Signalized Intersections

	Lane Use	Available Storage	Weekday Morning Peak Hour Avg. Queues	Weekday Morning Peak Hour Design Queues	Weekday Midday Peak Hour Avg. Queues	Weekday Midday Peak Hour Design Queues	Weekday Afternoon Peak Hour Avg. Queues	Weekday Afternoon Peak Hour Design Queues	Saturday Midday Peak Hour Avg. Queues	Saturday Midday Peak Hour Design Queues
Traffic Signal - Black Rock Turnpike at Old Black Rock Turnpike & Tahmore Drive										
Old Black Rock Turnpike	EB	500+	3	17	0	0	0	0	3	14
Tahmore Drive	WB	500+	97	314	10	50	20	62	43	86
Black Rock Turnpike	NB	500+	136	219	90	190	143	331	160	337
	SB	500+	156	263	113	249	518	769	218	581
Traffic Signal - Black Rock Turnpike at Samp Mortar Drive										
Samp Mortar Drive	EBL	50	26	55	41	72	82	134	61	96
	EBR	50	0	39	0	41	0	64	0	40
Black Rock Turnpike	NBL	100	66	153	30	62	37	68	24	59
	NBT	100	313	466	275	405	323	466	299	464
	SB	225	147	196	92	159	151	257	120	207
Traffic Signal - Black Rock Turnpike at Brookside Drive										
Brookside Drive	EB	500+	33	63	34	75	92	128	55	95
Black Rock Turnpike	NB	170	30	59	26	56	62	80	29	79
	SB	500+	8	7	8	8	215	27	11	12
Traffic Signal - Black Rock Turnpike at Fairfield Woods Road & Commercial Driveway										
Commercial Driveway	EBLT	35	2	9	9	22	23	45	24	51
	EBR	35	0	0	0	0	0	0	0	0
Fairfield Woods Road	WBLT	75	18	44	34	58	43	72	57	88
	WBR	75	156	299	77	111	58	89	68	101
Black Rock Turnpike	NB	500+	106	141	63	117	61	116	72	136
	SB	170	21	22	14	189	96	390	18	258
Traffic Signal - Black Rock Turnpike at Stillson Road										
Black Rock Turnpike	SBL	200	35	75	55	110	67	120	67	120
	SBTR	200	167	228	251	346	368	508	336	454
	NBL	175	138	287	86	175	108	213	111	218
	NBTR	175	270	354	210	305	249	330	300	391
Stillson Road	EBL	210	72	108	88	146	115	173	114	174
	EBTR	210	144	208	198	323	352	608	267	440
	WBL	170	48	78	75	125	93	157	121	178
	WBTR	170	314	472	150	250	240	335	258	381
Traffic Signal - Black Rock Turnpike at Turnpike Shopping Center & Fairway Plaza Driveways										
Black Rock Turnpike	SB	500+	31	50	81	125	119	171	114	166
	NB	405	62	125	54	70	65	83	65	82
Turnpike Shopping Center Driveway	EBLT	25	29	56	72	128	84	135	78	139
	EBR	25	0	0	0	3	0	21	0	30
Fairway Plaza Driveway	WBLT	25	14	36	27	57	21	46	42	72
	WBR	25	0	0	0	0	0	0	0	0

(continued on following page...)

***(Continued)** Table 3-8: 2017 Existing Conditions Queue Summary (Vehicular 50th/95th Percentile Queue in Feet) – Signalized Intersections*

	Lane Use	Available Storage	Weekday Morning Peak Hour Avg. Queues	Weekday Morning Peak Hour Design Queues	Weekday Midday Peak Hour Avg. Queues	Weekday Midday Peak Hour Design Queues	Weekday Afternoon Peak Hour Avg. Queues	Weekday Afternoon Peak Hour Design Queues	Saturday Midday Peak Hour Avg. Queues	Saturday Midday Peak Hour Design Queues
Traffic Signal - Black Rock Turnpike at Katona Drive & Katona Drive Extension										
Black Rock Turnpike	SB	405	8	30	44	58	54	77	60	90
	NB	300	53	61	40	51	43	53	49	61
Katona Drive	EBLT	250	36	73	48	84	56	93	54	100
	EBR	250	0	0	0	3	0	13	0	3
Katona Drive Extension	WBL	135	1	7	2	8	0	4	1	8
	WBTR	135	1	8	5	18	2	14	0	13
Traffic Signal - Black Rock Turnpike at Burroughs Road										
Black Rock Turnpike	SB	275	26	32	40	53	41	64	38	72
	NB	500+	139	232	72	135	90	167	98	178
Burroughs Road	EB	500+	41	63	34	56	56	93	36	66
	WB	500+	141	178	97	136	95	152	96	151
Traffic Signal - Black Rock Turnpike at Tunxis Hill Cutoff, Moritz Place & Whitewood Drive										
Black Rock Turnpike	SBLT	500+	41	130	56	199	95	341	74	253
	SBR	500+	0	78	0	109	0	120	0	134
Tunxis Hill Cutoff	NB	500+	60	161	30	99	36	114	49	155
Black Rock Turnpike	NWB	130	26	82	24	86	43	130	37	121
Moritz Place	NEB	500+	1	8	2	16	3	20	4	22
Whitewood Drive	SWB	485	5	30	3	18	2	13	5	27

Table 3-9: 2017 Existing Conditions Queue Summary (Vehicular 50th/95th Percentile Queue in Feet) – Unsignalized Intersections

	Lane Use	Available Storage	Weekday Morning Peak Hour Design Queues	Weekday Midday Peak Hour Design Queues	Weekday Afternoon Design Queues	Saturday Midday Peak Hour Design Queues
Unsignalized TWSC - Tunxis Hill Cutoff at Tunxis Hill Road						
Tunxis Hill Road	EBL	50	0	0	0	3
	EBR	50	8	8	13	8
Tunxis Hill Cutoff	NBL	200	5	3	5	3
Unsignalized TWSC - Black Rock Turnpike at Judd Street						
Black Rock Turnpike	NBL	25	5	5	5	5
Judd Street	EB	425	18	20	40	30

iii. Travel Speed

To gain an understanding of traffic and travel speeds, data was collected using pneumatic road tubes. Vehicle speeds are of particular importance to this study because as vehicle speeds increase, the driver's peripheral vision is narrowed, reaction time increased, stopping distance increased, and therefore safety compromised. These factors together lead to an increased crash risk.

Travel speed data was collected along the study area roadways during the data collection task concurrently with the Automatic Traffic Recorder (ATR) volume counts in May and June 2017. The travel speed observations provide the roadway operating speed, or 85th percentile speed, meaning 85 percent of vehicles are traveling at this speed or lower. Figure 3-27 summarizes the results of the travel speed observation along the study roadways with high 85th percentile speeds that exceed the posted speed limit by 10 miles per hour or more highlighted in red. Raw speed data is provided in the ATR data included in Appendix E.

As shown in Figure 3-27, travel speeds along the central portion of the study area were observed to be within 2 to 8 miles per hour of the speed limit of 30 miles per hour. To the north and south, travel speeds approaching the study area were observed to be above 10 miles per hour over the speed limit of 35 miles per hour and 30 miles per hour from the northwest and southeast, respectively.

To understand how vehicle speeds vary along Black Rock Turnpike in different traffic conditions, the average speeds during three different hours of the day were analyzed: the morning peak hour, afternoon peak hour, and the hour with the lowest volume between 6am-10pm (off-peak). Since the average speeds during the morning and afternoon peak hours of the day were similar, they were averaged together. The average peak-hour speed and the off-peak-hour speed were then compared. The results are shown in Table 3-10.

The vehicle speeds during the off-peak (low volume) hours of the day were consistently higher than during the peak (high volume) hours. Off-peak vehicle speeds had the highest variation from peak-hour speeds in the southbound direction, south of Stillson Road and in the northbound direction, north of Arrowhead Lane. Since commercial development and pedestrian activity also increases to the south of Stillson Road, higher vehicle speeds during the off-peak hour in this location are potentially hazardous. Pedestrians and other vulnerable road users in this area who may be accustomed to lower vehicle speeds during the busier times of the day may encounter high speed vehicles unexpectedly.

It should also be noted that vehicle speeds during both the peak and off-peak hours were highest at the far north and far south ends of the study area (west of Arrowhead Lane and east of Black Rock Turnpike). In the peak hours, average vehicle speeds were approximately 35mph in both of these locations, in both directions (southbound and northbound). In the off-peak hour, average vehicle speeds were approximately 40mph in both locations and in both directions. These higher speed conditions make pedestrian and bicycle crossings difficult and potentially hazardous.

Table 3-10: Average Vehicle Speeds During Peak and Off-Peak Hours

LOCATIONS		SOUTHBOUND			NORTHBOUND		
#	**Name**	*Peak (mph)*	*Off-Peak (mph)*	*Difference (mph)*	*Peak (mph)*	*Off-Peak (mph)*	*Difference (mph)*
1	*On Black Rock Turnpike, north of Arrowhead Lane*	37.3	42.0	+4.7	34.7	47.2	+12.5
2	*On Black Rock Turnpike, north of Stillson Road*	30.3	33.0	+2.7	29.4	35.4	+6.0
3	*On Black Rock Turnpike, south of Stillson Road*	22.0	32.3	+10.3	29.6	35.0	+5.4
4	*On Black Rock Turnpike, north of Candlewood Road*	32.6	34.4	+1.8	33.7	35.8	+2.0
5	*On Tunxis Hill Cutoff, south of Black Rock Turnpike*	38.8	41.7	+2.9	32.4	34.6	+2.2

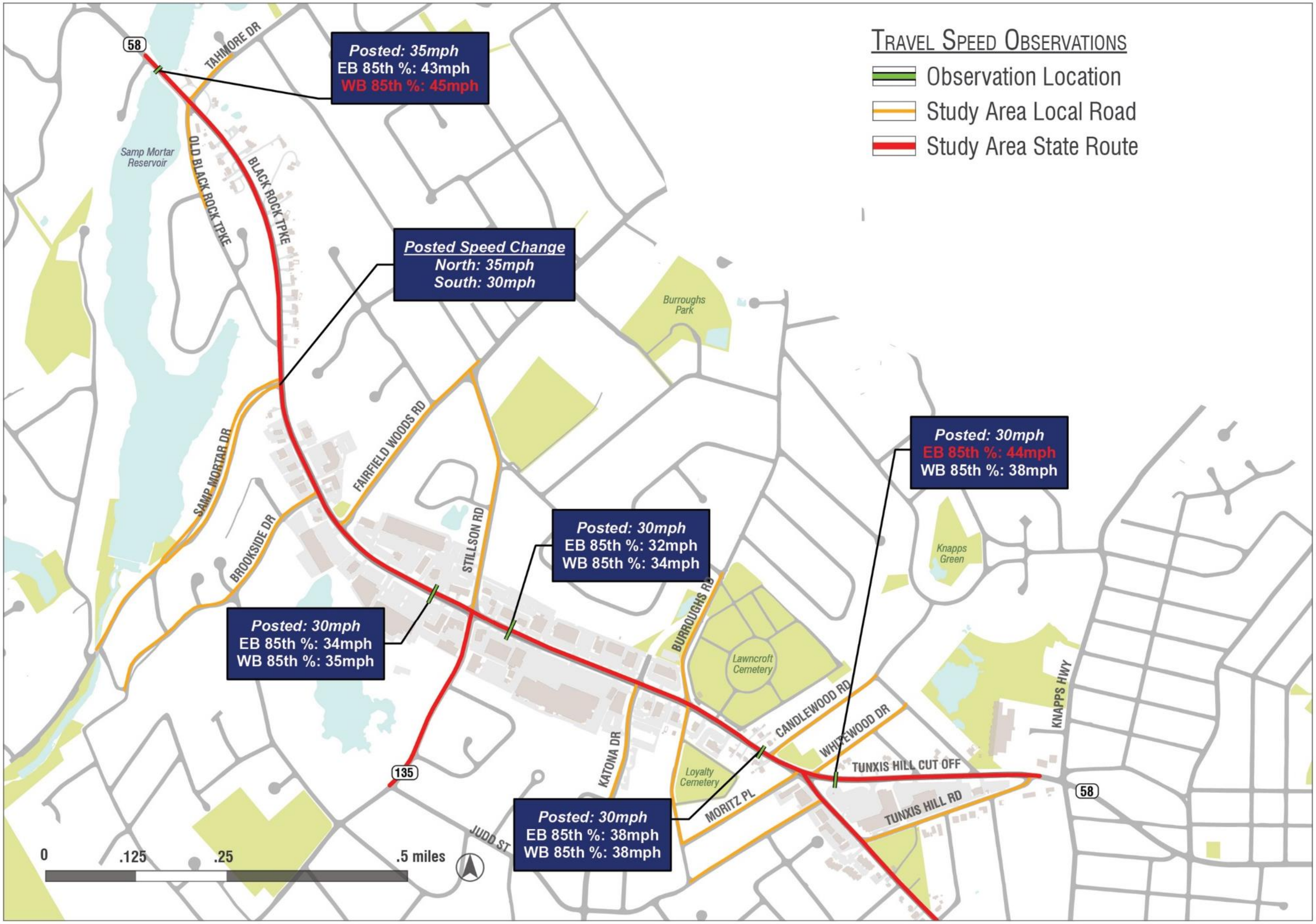

Figure 3-27: Travel Speed Operations *(Source: Tighe & Bond, September 2017)*

ii. Safety Analysis

A critical component of the Black Rock Turnpike safety study is a detailed analysis of the crashes that have occurred on Black Rock Turnpike. Crash data was downloaded from the Connecticut Crash Data Repository (CTCDR), which is maintained by the University of Connecticut. The CTCDR maintains records of crashes that have been reported by police officers. Only those crashes where a police report was filled out are shown in the CTCDR crash records. Individual crash records show details such as the crash date, location, severity, weather conditions, lighting conditions, and type of crash. An analysis of the crash data from the years of 2014, 2015, and 2016 is presented in the subsequent sections.

Crash Locations

Across the three-year analysis period (2014-2016), there were 428 total crashes that occurred within the study area—a road segment approximately 1.73 miles in length. A heat map showing where the crashes were concentrated is shown in Figure 3-28 on the following page. Dark red and warmer colored areas indicate a higher concentration of crashes, while cooler blue colors indicate areas with lower concentrations of crashes. Overall, most crashes have occurred along the segment that extends from the intersection with Whitewood Drive to the intersection with Samp Mortar Drive. This high-crash portion of Black Rock Turnpike is highlighted with a thick black line, as noted in the legend.

Figure 3-28 shows that the majority of the crashes have occurred at the intersection with Stillson Road. Other high crash locations are as follows:

- The exit of Lake Hills Shopping Center
- Near the intersection with Fairfield Woods Road
- The intersection with Samp Mortar Drive
- The intersection with Whitewood Drive
- The intersections with Katona Drive
- The intersection with Burroughs Road

A further discussion of each of these locations, and the types of crashes that occurred at each of them is provided in the "High Crash Locations" section.

Figure 3-28: Crash Heat Map *(Source: Fitzgerald & Halliday; Connecticut Crash Data Repository, September 2017)*

Crash Rate

Across the three-year analysis period (2014-2016), there were 428 total crashes that occurred within the study area—a road segment approximately 1.73 miles in length. Traffic counts taken by the CTDOT in 2013, indicate that an average of approximately 19,000 vehicles utilize Black Rock Turnpike each day. When taking into account the aforementioned figures, a crash rate of 11.9 crashes per million vehicle-miles of travel is calculated. This crash rate is approximately two times higher than the typical crash rate (5.8 crashes per million vehicle-miles) on an urban four-lane undivided roadway in Connecticut.

When adjusting the crash rate for only the high-crash segment of Black Rock Turnpike, from the Intersection with Whitewood Drive to the intersection with Samp Mortar Drive, a crash rate of 19.1 crashes per million vehicle-miles travelled is calculated. This adjusted crash rate is approximately three times higher than the typical crash rate on an urban undivided roadway in Connecticut.

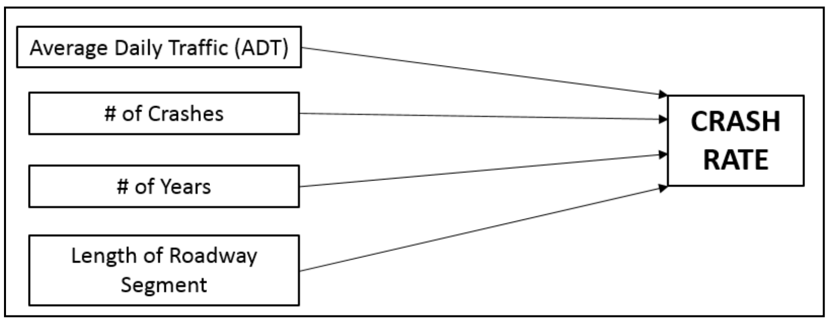

Figure 3-29: Crash Rate Components *(Source: Fitzgerald & Halliday, September 2017)*

Environmental Factors

Environmental conditions can sometimes contribute to the occurrence of a crash. Low light conditions can make it harder than usual for drivers to see. Snow and ice can make roadways more slippery than usual and both can lead to drivers losing control of their vehicles. Environmental conditions, however, do not appear to have played a large role in the crashes that occurred on Black Rock Turnpike. The majority of crashes occurred during daylight and clear weather conditions. Figure 3-30 shows the breakdown of crash conditions across the three-year study period.

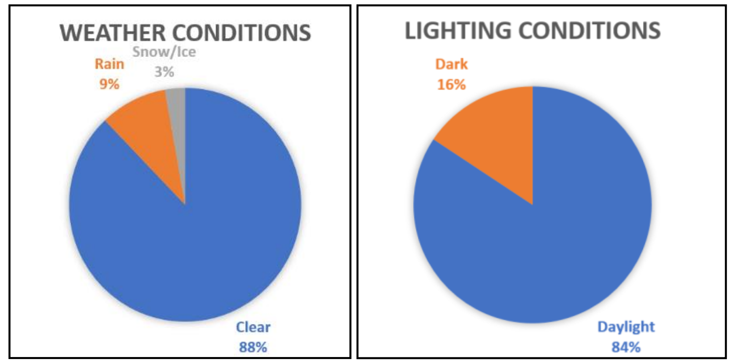

Figure 3-30: Overall Weather Conditions, Overall Light Conditions *(Source: Fitzgerald & Halliday; Connecticut Crash Data Repository, September 2017)*

Other potential causes for the crashes, besides poor weather and lighting conditions, are driver behavior (e.g. speeding and distracted driving) and roadway geometry at specific locations. A further investigation of vehicle speeds and roadway/intersection design at specific crash locations is therefore important.

Crash Types

Of the 428 crashes that occurred in the study area, rear-end crashes constitute the greatest percentage overall. Rear-end crashes made up approximately 34% of the total 428 crashes. Rear-end crashes are most often seen in areas with a large amount of stop-and-go traffic and significant vehicle congestion.

However, along many roads rear-end crashes make up a majority of crashes, and that is not the case along Black Rock Turnpike. Angle, sideswipe and turning crash types make up 53% of all crashes. These types of crashes are most pronounced along multilane roads with high levels of access to properties (aka driveways). In particular, angle crashes made up approximately 26% of the 428 crashes. Angle crashes are most typically seen at unsignalized intersections and driveways where vehicles turn across multiple lanes of traffic. The full breakdown by crash type is shown in Figure 3-31. This information is also illustrated on the study area map in Figures 3-32.

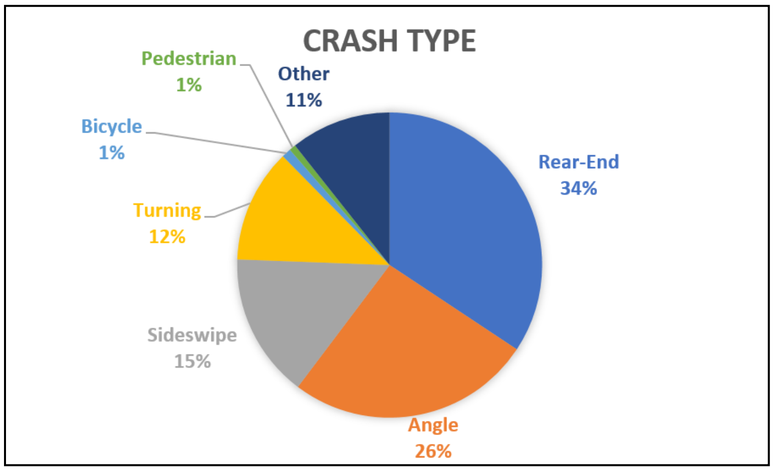

Figure 3-31: Overall Crash Types *(Source: Fitzgerald & Halliday; Connecticut Crash Data Repository, September 2017)*

As shown in the above diagram, a small percentage of the crashes involved pedestrians and bicyclists. Over the course of the three-year analysis period, there were a total of five pedestrian crashes and one bicycle crash. These pedestrian and bicycle crashes were cited as a motivating factor for this current Black Rock Turnpike Safety Study.

The locations of the pedestrian and bicycle crashes are shown in Figure 3-33. As can be seen, all of the pedestrian and bicycle crashes occurred on the segment of Black Rock Turnpike that extends from Burroughs Road to Stillson Road. Two of the pedestrian crashes were fatal. These fatal crashes are discussed in more detail in the "Overall Crash Severity" section.

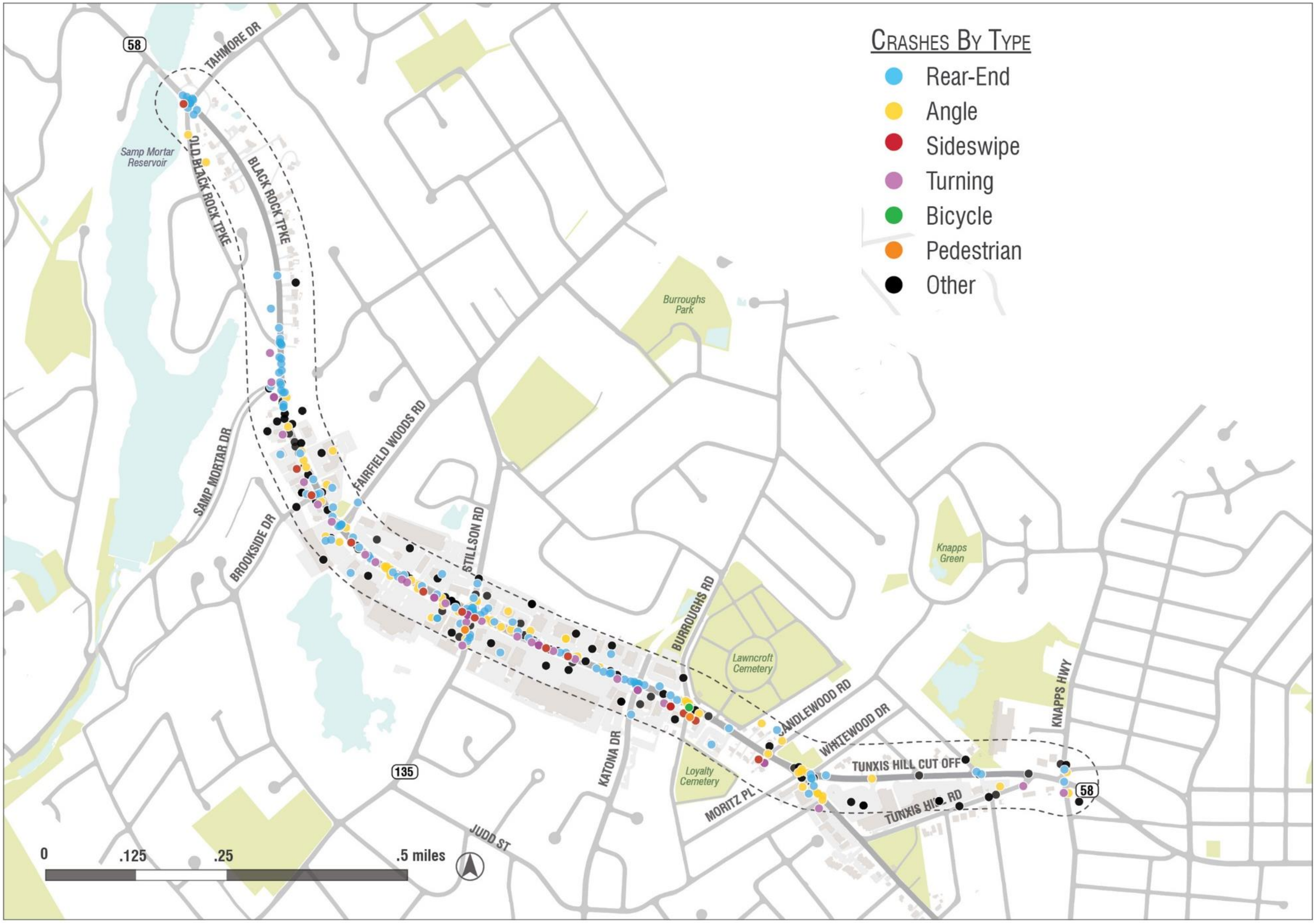

Figure 3-32: Locations of Crashes by Type *(Source: Fitzgerald & Halliday; Connecticut Crash Data Repository, September 2017)*

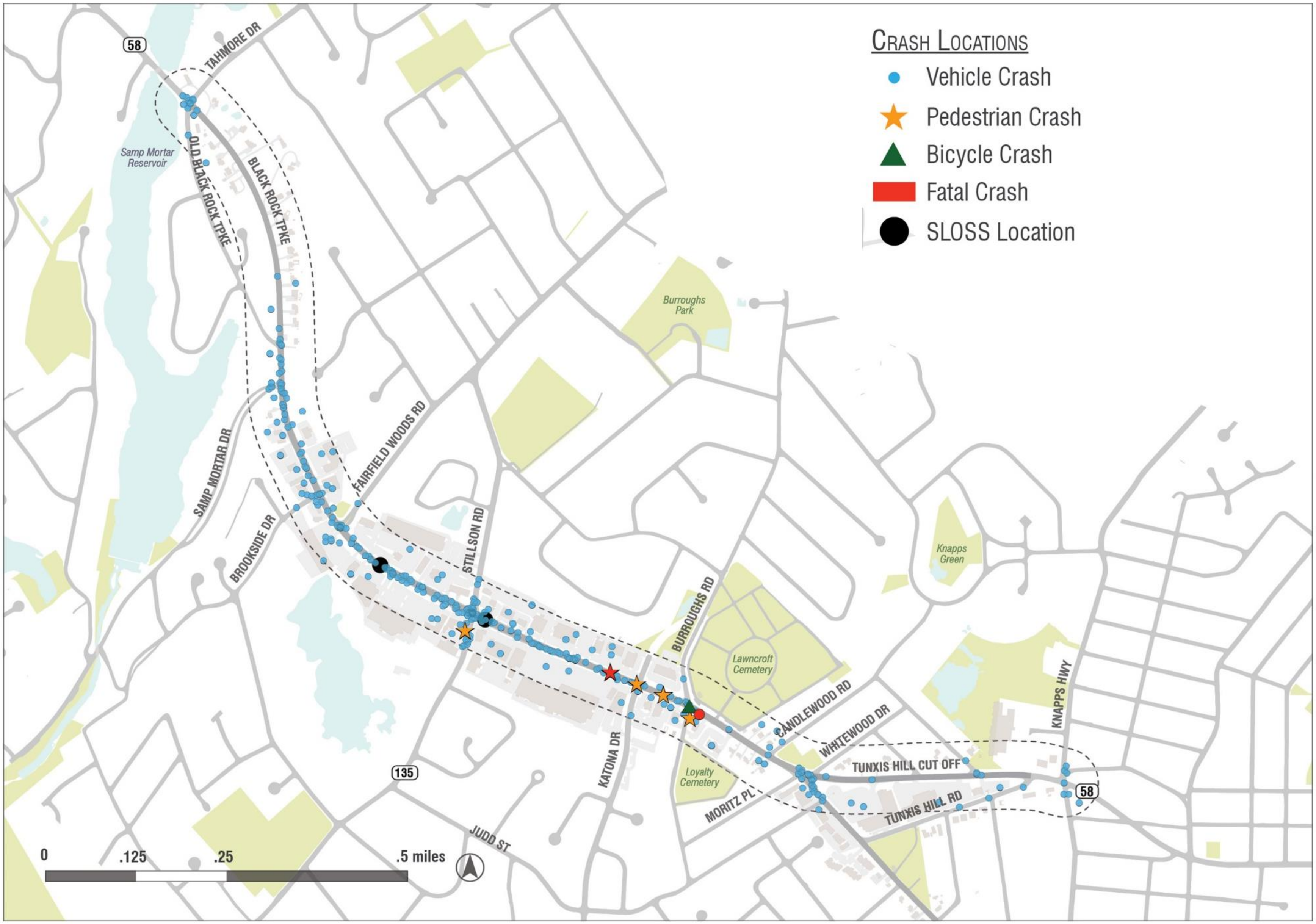

Figure 3-33: Locations of Crashes *by Mode and Severity (Source: Fitzgerald & Halliday; Connecticut Crash Data Repository, September 2017)*

Crash Severity

Over the course of the three-year study period, the majority (77%) of the crashes were property-damage-only crashes. Twenty-two percent (22%) of the crashes involved an injury. There were three fatal crashes, occurring in the three year period analyzed. Figure 3-34 shows a visual breakdown of the crash severity.

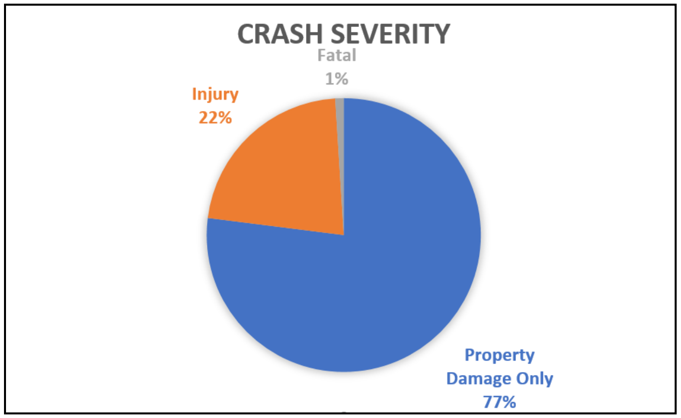

Figure 3-34: Overall Crash Severity *(Source: Fitzgerald & Halliday; Connecticut Crash Data Repository, September 2017)*

The first fatal crash occurred at the intersection of Black Rock Turnpike and Burroughs Road on December 6, 2014 at 9:47am in rainy weather. An 89-year-old pedestrian was crossing the roadway at this intersection with a pedestrian signal, and was struck by a vehicle travelling straight. The victim incurred serious injuries at the time of the crash, and passed away in the immediate days following the crash. A diagram of this crash is not available.

The second fatal crash also occurred at the intersection of Black Rock Turnpike and Burroughs Road. It happened on May 5, 2015 at 4:57am. A passenger vehicle travelling westbound on Burroughs Road was struck by a tractor-trailer truck as it crossed the intersection. A view of this intersection, taken from Google Street View is shown in Figure 3-35.

Figure 3-35: View of Burroughs Road and Black Rock Turnpike Intersection *(Source: Google Street View, September 2017)*

The third fatal crash occurred along Black Rock Turnpike, slightly east of the intersection with Katona Drive; just over 500 feet from the location of the other two fatal crashes. It happened on September 27, 2016 at 7:47pm. The crash occurred as a pedestrian was crossing Black Rock Turnpike between intersections, and was struck by a vehicle travelling eastbound on Black Rock Turnpike. A view of this area, from Google Street View, is provided in Figure 3-36.

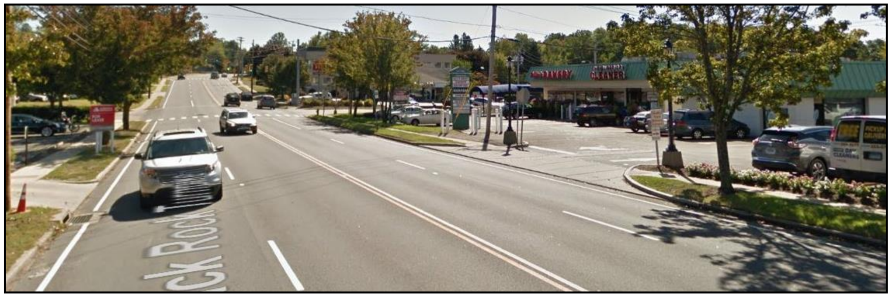

Figure 3-36: View of Black Rock Turnpike, just east of Katona Drive *(Source: Google Street View, September 2017)*

High Crash Locations

There were seven locations in the study area that were noted to have a significant concentration of crashes. The seven locations are listed below, in order from those that had the highest concentration of crashes to those that had the lowest.

- The intersection with Stillson Road
- The exit of Lake Hills Shopping Center
- Near intersection with Fairfield Woods Road
- The intersection with Samp Mortar Drive
- The intersection with Whitewood Drive
- The intersections with Katona Drive
- The intersection with Burroughs Road

Two of these locations were found to be near or on the Connecticut Department of Transportation's (CTDOT's) Suggested List of Surveillance Study Sites (SLOSSS). The SLOSSS is developed to identify locations that have higher than average crash rates. The two locations that were near or on the SLOSSS are listed below:

- The intersection with Stillson Road
- The exit of Lake Hills Shopping Center

Since the two locations on the the SLOSSS have been previously identified by CTDOTas due to these high crash rates, solutions to mitigate crashes will be prioritized.

A more in depth analysis of all seven locations is included in the following sections. For a more detailed visual examination of the crashes at each of these locations, please refer to Appendix G which features a large, high-resolution version of the map shown in 'Figure 3-32: Crashes by Type along Black Rock Turnpike for 2014, 2015, and 2016)'.

Intersection with Stillson Road:

This location is a signalized intersection. Along Black Rock Turnpike, both approaches have two through lanes and a turn lane. Along Stillson Road, both approaches have a through lane and a turn lane. At three of the four corners at the intersection there are parking lots, with unsignalized driveways leading onto both Stillson Road and onto Black Rock Turnpike. Vehicles must turn across at least four vehicle lanes when making left turns onto Black Rock Turnpike, and must turn across at least three vehicle lanes when making left turns onto Stillson Road. This creates numerous points for vehicle-vehicle conflicts. The majority of the crashes at this intersection were rear-end crashes and angle crashes. Rear-end crashes are most typically seen at intersections with traffic congestion and stop-and-go traffic. The rear-end crashes at this intersection appear to have occurred as vehicles stop suddenly due to slowed or stopped traffic. Reducing vehicle congestion and delay at this intersection could help reduce the number of rear-end crashes. Other potential causes of the rear-end crashes at this intersection are poor visibility of traffic signals and/or inadequate traffic signal timing.

Angle crashes are most typical at locations where vehicles make left turns out of unsignalized driveways onto busy cross streets. The majority of the angle crashes at this intersection appear to have occurred as vehicles turn out of the unsignalized driveways in close proximity to the intersection here. High vehicle volumes along both Black Rock Turnpike and Stillson Road combined with the fact that left-turning vehicles have to turn across multiple vehicle lanes are the major contributors to these angle crashes. Along Black Rock Turnpike, these circumstances are compounded by the fact that vehicle speeds and vehicle density vary by lane, making navigation out of the unsignalized driveways more difficult.

Exit of Lake Hills Shopping Center:

At this location, there are two unsignalized driveways directly across from each other. Along Black Rock Turnpike, there are two vehicle lanes in each direction, thus left-turning vehicles need to turn across at least three vehicle lanes. The majority of the crashes at this intersection were angle crashes.

Angle crashes are most typical at locations where vehicles make left turns out of unsignalized driveways onto busy cross streets. The majority of the crashes at this intersection appear to have occurred as vehicles attempt to turn left out of the unsignalized driveways, and are then struck by vehicles travelling in the inside lane in the direction of travel. When vehicles in the outside lane on Black Rock Turnpike are stopped to let vehicles turn left out of one of the unsignalized driveways, vehicles travelling in the centermost lane along Black Rock Turnpike have their view of the left-turning vehicles obstructed. This situation is a possible contributor to the angle crashes at this location.

Angle crashes at this location have also occurred as vehicles on opposite sides of Black Rock Turnpike are attempting to make left turns out of the unsignalized driveways simultaneously. Vehicles turning left out of both unsignalized driveways at this location are likely only expecting to have to watch for vehicles travelling along Black Rock Turnpike. Thus, left-turning vehicles from the opposite side of Black Rock Turnpike are an unexpected conflict. Relocation of one of these access points could help to minimize this sort of crash occurrence.

Near Intersection with Fairfield Woods Road:

At the intersection with Fairfield Woods Road, and the segment of Black Rock Turnpike just north of this intersection, there are two vehicle lanes in each direction along Black Rock Turnpike. Along Black Rock Turnpike, there are no dedicated left-turn lanes (except at Stillson Road). The traffic signal phasing allows vehicles to turn left onto Fairfield Woods Road from Black Rock Turnpike with a green ball traffic light-meaning that vehicles turning left must navigate their turns in front of oncoming traffic.

While there were a wide range of crash types on this segment of roadway, the majority were either sideswipe or angle crashes.

Angle crashes are most typical at locations where vehicles make left turns out of unsignalized driveways onto busy cross streets. This is likely the situation for the angle crashes that have occurred north of the intersection with Fairfield Woods Road, as left-turning vehicles turn across at least three vehicle lanes on Black Rock Turnpike.

Angle crashes that occurred directly at the intersection with Fairfield Woods Road are likely to have occurred as vehicles were turning with the green ball, where both northbound and southbound vehicles are moving through the intersection simultaneously. Sight line limitations due to the curvature along Black Rock Turnpike at this intersection could be preventing left-turning vehicles (turning left onto Fairfield Woods Road) from seeing oncoming northbound thru traffic along Black Rock Turnpike.

Sideswipe crashes are typical on roadways where there is a significant amount of lane changing. Distracted driving and high vehicle speeds also contribute to the occurrence of these crashes. The sideswipe crashes at this location appear to have occurred as vehicles in the inside lanes either stop or slow down, and following vehicles attempt to change lanes to go around them. Vehicles in the center-most lane are likely slowing or stopping in order to make left turns.

Intersection with Samp Mortar Drive:

The intersection with Samp Mortar Drive is controlled by a traffic signal. Along Black Rock Turnpike, the northbound approach has one thru lane and one left-turn-only lane while the southbound approach has two thru lanes.

The majority of the crashes here were either rear-end or sideswipe crashes.

Rear-end crashes are typical at congested intersections with high amounts of stop-and-go traffic. High vehicle speeds can also contribute to rear-end crashes. Efforts to alleviate the congestion and lower vehicle speeds at this location could help reduce the number of rear-end crashes.

The sideswipe crashes at this location appear to have occurred as vehicles in the left-turn-only lane, travelling northbound on Black Rock Turnpike have continued straight and have merged through the intersection.

Intersection with Whitewood Drive:

The geometry of this intersection is unconventional. The split of Black Rock Turnpike and Tunxis Hill Cut Off combined with the intersections of Whitewood Drive and Moritz Place result in a 5-legged intersection. Furthermore, the approaches to the intersection are skewed and do not form 90 degree angles, requiring motorists to make more complicated turns and contributing to more conflict points. Vehicles also are required to travel much farther than average to pass through the intersection completely, making pedestrian crossings particularly challenging.

The majority of the crashes that occurred at this location were angle crashes.

Angle crashes are most typical at locations where vehicles make left turns out of unsignalized driveways onto busy cross streets. Several of the angle crashes at this location have occurred along Black Rock Turnpike, on the southern side of the intersection, where there is a small shopping plaza with a very wide unsignalized driveway. Directly in front of this unsignalized driveway is a center median, which forces some drivers to exit the driveway directly into the center of the intersection. In addition, the non-standard geometry of the intersection contributes to poor sight lines for vehicle turning out of this driveway.

Typical causes of angle crashes that occur directly at signalized intersections include restricted sight lines, excessive speeds upon approaches, and inadequate signal timing. Due to the non-standard geometry of this intersection, all of these are possible causes of the angle crashes that have occurred at the center of this intersection.

Intersection with Katona Drive:

This location is a signalized intersection. There are four vehicle lanes along Black Rock Turnpike at this location, including a 56-foot crosswalk along the southbound approach of Black Rock Turnpike. Pedestrians cross Black Rock Turnpike at the same time that vehicles travel along Katona Drive through the intersection. This means that pedestrians are crossing Black Rock Turnpike as vehicles turn left and right onto Black Rock Turnpike. There is no exclusive pedestrian phase.

The majority of the crashes that occurred here were rear-end crashes. There were also three pedestrian crashes that occurred near this location.

Two of the pedestrian crashes that occurred near this intersection occurred as pedestrians were crossing Black Rock Turnpike at locations without crosswalks. Pedestrian crashes such as these could be reduced by installing more frequent crossings, reducing the roadway width so that pedestrians do not have to cross such a far distance, or creating a more inviting pedestrian atmosphere along

Black Rock Turnpike, so that walking to the nearest intersection where there is already a marked crosswalk does not feel as burdensome.

The third pedestrian crash that occurred at the crosswalk may have been a result of the fact that the signal plan directs pedestrians to cross Black Rock Turnpike simultaneously with vehicles turning left and right onto Black Rock Turnpike from Katona Drive.

Intersection with Burroughs Road:

This location is a signalized intersection. Black Rock Turnpike has four vehicle lanes and Burroughs Road has 1 lane in each direction. The majority of the crashes at this intersection were angle crashes. There was also one fatal pedestrian crash, one fatal angle crash and a bicycle crash.

Typical causes of angle crashes that occur at signalized intersections include restricted sight lines, excessive speeds upon approaches, and inadequate signal timing. The three angle crashes occurred as vehicles that were travelling along Burroughs Road entered the intersection when vehicles on Black Rock Turnpike had a green light.

E. Conclusion

i. Deficiencies and Needs

Black Rock Turnpike is a 4-lane state highway designed to facilitate regional travel with a modest level of access to private property. Over the years, the segment of the Turnpike between Samp Morter Drive and the Tunxis Hill Cutoff has evolved into a major commercial corridor with very high levels of access to property. The physical design of the road encourages high speed driver behavior, and the heavy traffic volume that results from a mix of shopping and commuter traffic creates an environment that is compromised for both travel mobility and accessibility to properties along the road. In fact, this segment of the Turnpike has a crash rate 2 to 3 times higher than that of a typical 4-lane urban road in Connecticut.

In addition to diminished safety and driver frustration stemming from congestion, Black Rock Turnpike also presents a hostile environment for pedestrians and bicyclists. Whether walking along the Turnpike or crossing it, pedestrians are often at a significant disadvantage. Crossings are infrequent and long, pedestrian visibility to motorists is low, and the frequent driveways pose a constant threat to those walking the sidewalks. Bicyclists, save the very skilled riders, appear to avoid Black Rock Turnpike in favor of other routes even though they aren't as direct.

Based on the data collected and analyses performed as part of this existing conditions evaluation, the study team concludes that Black Rock Turnpike requires a level of redesign that emphasizes safety for all users, while still maintain adequate access to the residences and businesses along its length. In areas with high crash frequencies and/or severe crashes, near-term mitigations are necessary. In the longer-term, a more system-wide solution to dealing with a wide range of stated deficiencies may be necessary.

4. Future Conditions

The purpose of this section is to set forth a future 20-year growth rate for traffic on Black Rock Turnpike since this is the time frame that the study team will be developing roadway solutions for. This growth rate has been submitted and approved by CTDOT in January 2018. As such, the study team will be able to apply this growth factor to the existing conditions traffic count data and perform a future year traffic operations analysis to help understand how Black Rock Turnpike is expected to perform.

A. Methodology

i. Traffic Data

Historic average daily traffic (ADT) was collected for Black Rock Turnpike and intersecting routes (e.g. Rt. 135 / Stillson Road and Rt. 732 Tunxis Hill Cut Off) from 2001 to 2013. This data was supplemented with 24-hour traffic counts collected in 2017, as shown in Figure 4.1.

Historic Average Daily Traffic (ADT)

			Year					
Town	**Station**	**Location**	**2001**	**2004**	**2007**	**2010**	**2013**	**2017**
50	33	Route 58 North of Candlewood Road	21,200	20,700	21,100	20,300	19,400	22,785
50	34	Route 58 South of Whitewood Drive	11,100	10,900	11,100	10,500	10,300	11,069
50	62	Route 732 North of Tunxis Hill Road #3	12,400	12,300	12,700	11,700	12,200	
50	71	Route 58 South of Stillson Road	22,600	23,700	23,000	21,400	19,100	20,154
50	72	Route 58 North of Stillson Road	19,500	24,000	23,300	21,500	18,400	18,381
50	41	Route 135 South of Black Rock Turnpike	14,900	14,700	14,300	14,200	12,000	

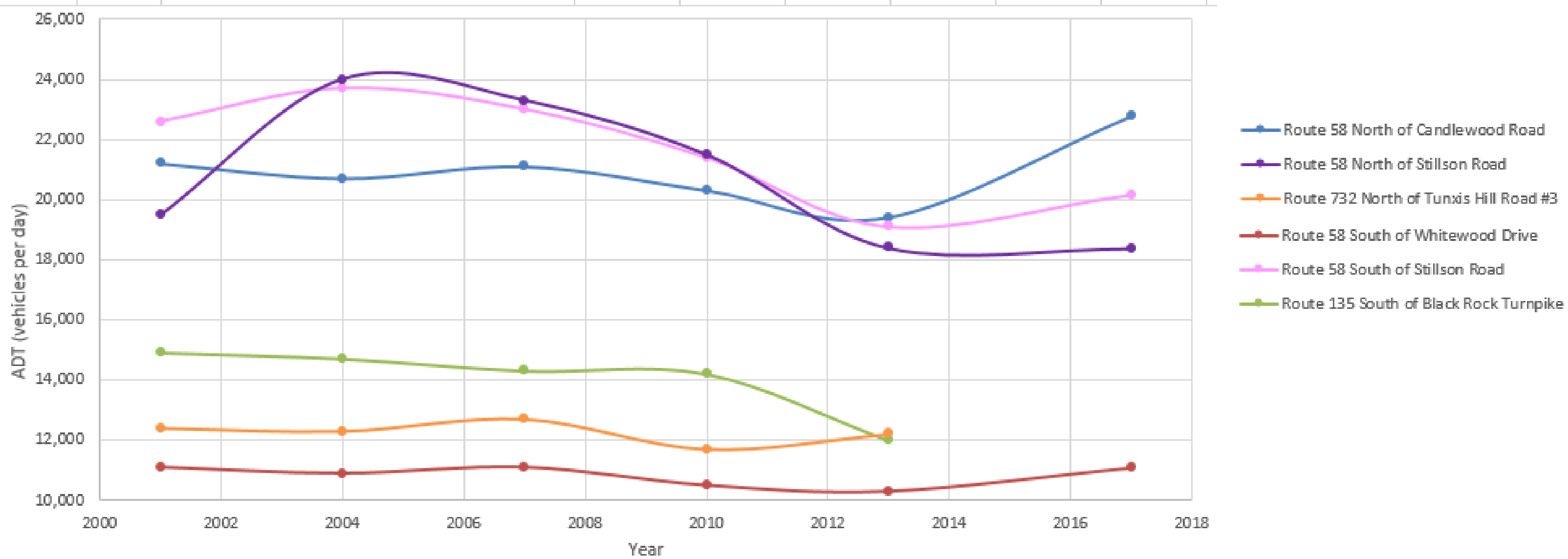

Figure 4.1: Historic Average Daily Traffic (ADT)

As shown in Figure 4.1, traffic along the corridor peaked around 2004 and then gradually tapered off from about 2007 until 2013, when it reached its lowest levels in 13 years. Counts rebound slightly in 2017, generally maintaining 2013 levels except for the segment north of Candlewood Road. That segment showed more dramatic growth in the order of 0.5% per year between 2001 and 2017.

Table 4.1 displays the annual average percent change (AAPC) between the various years of traffic collection. The AAPC between 2001 and 2017 for all count locations along Black Rock Turnpike is -0.2% per year.

ii. Retail Market Trends

In addition to this data, the study team conducted an interview with a property manager from Kleban Properties, which owns a significant portion of the retail space along the corridor. Their anecdotal assessment of future conditions is that the retail environment is changing with the intense competition from online retailers. This is resulting in lower demand for space that can be used for large shopping establishments and an increase in demand for fitness centers, such as yoga studios and health clubs, which have different traffic peaking characteristics. In summary, they don't see meaningful traffic growth as a result of changing retail into the future. If anything, they see more spreading of traffic throughout the day.

Figure 4.1: Annual Average Percent Change (AAPC)

				Annual Average Percent Change (AAPC)				
Town	Station	Location		2001-20	2004-20	2007-20	2010-20	2013-2017
50	33	Route 58 North of Candlewood Road		0.5%	0.7%	0.8%	1.7%	4.1%
50	34	Route 58 South of Whitewood Drive		0.0%	0.1%	0.0%	0.8%	1.8%
50	62	Route 732 North of Tunxis Hill Road #3		--	--	--	--	--
50	71	Route 58 South of Stillson Road		-0.7%	-1.2%	-1.3%	-0.9%	1.4%
50	72	Route 58 North of Stillson Road		-0.4%	-2.0%	-2.3%	-2.2%	0.0%
50	41	Route 135 South of Black Rock Turnpike		--	--	--	--	--
			Average	-0.2%	-0.6%	-0.7%	-0.2%	1.8%

B. Conclusion

i. Recommended Growth Rate

For reasons explained in this memorandum, it can be assumed that Black Rock Turnpike from Tahmore Road to the Tunxis Hill Cutoff will experience a flat growth rate over the next 20 years. However, the Town of Fairfield anticipates some additional housing development near the study corridor and would like to include some limited traffic growth in the future forecast. As a result, the study team recommends a modest growth rate of 0.25% per year from 2017 to 2027. This growth rate will be applied to the PM peak hour, which currently experiences the highest hourly traffic volume and greatest congestion on a typical weekday.

ii. Next Steps

Based on the future traffic operations results, the study team will work with project stakeholders to identify a range of potential solutions to addressing safety, congestion, and multimodal opportunities in the corridor. The list of options will be screened, and the best ideas taken forward into a more detailed evaluation process. Conceptual plans will ultimately be developed for the best performing alternatives, and a simulation model will be developed for the most promising option.