Traffic Impact and Access Study

Deer Street Parking Garage & Deer Street Associates Development

Portsmouth, New Hampshire

Submitted to: **City of Portsmouth, New Hampshire**
1 Junkins Avenue
Portsmouth, New Hampshire 03801

Prepared by: **TEC, Inc.**
169 Ocean Boulevard, Unit 101
Hampton, New Hampshire 03842

December 19, 2016

T:\T0666\Docs\Various\Traffic Impact and Access Study\T0666.01_Traffic Impact and Access Study.docx

CONTENTS

FIGURES

TABLES

APPENDICES

EXECUTIVE SUMMARY

TEC, Inc. (TEC) has been retained by the City of Portsmouth to prepare a Traffic Impact and Access Study (TIAS) for the redevelopment of the property located at #165 Deer Street (Lots #1-#6) in Portsmouth, New Hampshire. This study, which is part of a post-closing commitment between the City and Deer Street Associates (DSA), evaluates the separate and collective impacts of the two areas of public and private development. The site was formerly occupied by four small commercial stores, a branch bank, and an industrial supplies building. The two development proposals from the City and DSA are described below.

Building Program

The project is to be constructed as part of a phased building approach. Each phase is intended to build upon each other. The following summarizes the building program by phase for the project:

Phase 1 (Constructed by City of Portsmouth)

- 600-stall public parking garage, owned and operated by the City of Portsmouth;
- 4,700 SF of retail space housed within the first level of the parking garage; and
- 660-foot Deer Street Extension with associated street level parking.

Phase 2 through 4 (DSA)

- Lot 6 Building – 1,776 SF of retail space, 4,424 SF of general office space, 34 dwelling units, and 24,500 SF for associated in-building parking.
- Lot 3 Building – 4,379 SF of retail space, 2,334 SF of restaurant space, 4,648 SF of bar space, a 108-room hotel, 1 dwelling unit, and 11,936 SF of in-building parking.
- Lot 4 Building – 19,583 SF of general office space and 7,525 SF of restaurant space; and
- Lot 5 Building – 13,814 SF of retail space, 17,274 SF of general office space, a 2,702 SF bank, 45 dwelling units, and 17,906 SF of in-building parking.

Site Access

Access for the two sites is proposed via connections along Deer Street and the proposed Deer Street Extension. Access for the individual building layouts is to be provided during each associated phase. The proposed 600-stall parking garage will provide one full access and egress location at the northeastern corner of the parking garage on the proposed Deer Street Extension approximately 300-feet west of the current Deer Street and Bridge Street intersection. A secondary access/egress location will be provided at the south end of the parking garage. Access to Lots 3, 4, and 5 will be provided along the northerly side of Deer Street via an access driveway opposite Bridge Street and a full-access driveway approximately 200-feet west of Maplewood Avenue at the current location of the Eastern Bank driveway. Access to Lot 6 will be provided along the southerly side of the proposed Deer Street Extension approximately 350-feet west of the current Deer Street and Bridge Street intersection.

Study Area

The study area was selected to contain the major roadways providing local access to the project site. The following intersections were included in the study area:

1. Maplewood Avenue / Cutts Street / Route 1 Bypass Southbound Ramps
2. Maplewood Avenue / Route 1 Bypass Northbound Ramps
3. Maplewood Avenue / Dennett Street / Jackson Hill Street
4. Maplewood Avenue / Raynes Avenue
5. Maplewood Avenue / Vaughan Street / Railroad Driveway
6. Maplewood Avenue / Deer Street
7. Maplewood Avenue / Hanover Street
8. Maplewood Avenue / Middle Street / Congress Street / Islington Street
9. Middle Street / State Street
10. Deer Street / Russell Street
11. Russell Street / Green Street
12. Market Street / Russell Street
13. Market Street / Albacore Park Drive (Submarine Way)
14. Deer Street / Bridge Street / *Deer Street Extension [Proposed]*
15. Bridge Street / Hanover Street
16. Bridge Street / Islington Street

Summary of Trip Generation

The proposed Deer Street Parking Garage with associated retail as part of Phase 1 is anticipated to generate or redistribute 1,175 new vehicle trips during the average weekday. The proposed parking garage is expected to result in 108 new or redistributed vehicle trips (100 entering and 8 exiting) during the weekday morning peak period and 125 new or redistributed vehicle trips (45 entering and 80 exiting) during the weekday evening peak period. On a typical Saturday, the parking garage is anticipated to generate or redistribute 1,424 new vehicle trips while the

Saturday midday peak period will generate or redistribute 80 new or redistributed vehicle trips (50 entering and 30 exiting).

The proposed DSA Development, as part of Phases 2 through 4, is anticipated to generate 2,972 new vehicle trips during the average weekday. The whole DSA project is expected to result in 240 new vehicle trips (142 entering and 98 exiting) during the weekday morning peak period and 259 new vehicle trips (130 entering and 129 exiting) during the weekday evening peak period. On a typical Saturday, DSA is anticipated to generate 3,102 new vehicle trips while the Saturday midday peak period will generate 328 new vehicle trips (175 entering and 153 exiting).

Off-Site Improvements

The trips from the two projects will impact traffic operations in the downtown area if left unmitigated. Therefore, TEC identified off-site improvements separately for the proposed Deer Street Parking Garage and the DSA Development. The following section describes the improvements necessary to mitigate the impacts of the two projects.

Deer Street Parking Garage Mitigation - City of Portsmouth

The following improvements are necessary to improve traffic operations and safety as part of the Deer Street Parking Garage Project:

- Construct the Deer Street Extension near the existing apex of Deer Street / Bridge Street to provide access and egress for the proposed parking garage;
- Coordinate with the adjacent property and business operator, Redlon & Johnson, to investigate an opportunity to provide a new sidewalk (possibly with a landscape strip) and defined curb cuts and driveway aprons to create a more inviting walking environment on the west side of Bridge Street near the proposed parking garage;
- Restripe the Deer Street eastbound approach between the Deer Street Extension and Maplewood Avenue, within the existing curb lines, to include a westbound receiving lane, an eastbound left-turn lane, and an eastbound shared through / right-turn lane with shoulders on each roadway edge.
- Stripe dashed "tracking" pavement markings along Deer Street through the intersection to provide positive guidance for westbound motorists on Deer Street as they cross Maplewood Avenue;
- Replace the existing 'No Left Turn' signs for the Bridge Street southbound approach to Islington Street and apply new right turn arrow and 'ONLY' pavement markings;
- Modify existing traffic signal timing and coordination parameters along the Maplewood Avenue / Middle Street corridor, between Deer Street and State Street, to optimize operations and efficiency;
- Reestablish traffic signal coordination at the intersection of Middle Street / State Street to allow for improved vehicle progression along the Maplewood Avenue / Middle Street corridor;

- Consider additional dynamic parking garage message signs at key gateway locations within Downtown Portsmouth. TEC recommends dynamic signs be considered along the following Downtown gateway approaches:
    - Market Street southbound, north of Russell Street (enhance existing sign location);
    - Maplewood Avenue southbound, north of Raynes Avenue;
    - Middle Street northbound, south of Court Street; and
    - Memorial Bridge southbound, north of Bow Street
- Construct a sidewalk connecting the proposed Deer Street Parking Garage to the sidewalk network along Deer Street and Bridge Street. The sidewalk should provide curbing to vertically separate vehicular and pedestrian traffic flows;
- Construct or reconstruct accessible ramps and driveway aprons along Deer Street between the proposed Deer Street Parking Garage and Maplewood Avenue to comply with Americans with Disabilities Act (ADA) standards;
- Stripe shared-use lane markings "sharrows" along Deer Street and Bridge Street between Maplewood Avenue and Hanover Street;
- Provide opportunities for bicycle sharing at the parking garage;
- Provide bicycle racks to encourage bicycling, particularly for residents that may use the facility; and
- Post COAST and Wildcat Transit maps and schedules within the parking garage to identify opportunities for visitors to utilize public transportation to/from Downtown.

Deer Street Associates (DSA) Development Mitigation (Private)

The following improvements are necessary to improve traffic operations and safety as part of the DSA Development Project:

- Upon reconstruction of the sidewalk and other utility improvements along the northerly side of Deer Street specific to the new development, remove and reset the northerly curb line to provide a consistent cross-section along Deer Street, as restriped by the City's parking garage project, while providing a standardized curb reveal for the reconstructed sidewalk along the site frontage;
- Provide updated ADA accessible ramps on the northwest and southwest corners of the Maplewood Avenue / Deer Street intersection that would be affected by the proposed sidewalk or roadway construction; and
- In conjunction with the utility work for the DSA Development, provide a mill and overlay for the entire length of Deer Street and Bridge Street between Maplewood Avenue and Hanover Street.
- Install or provide funding for the installation of 'Do Not Block the Intersection' pavement markings and signage (R10-7) along the Maplewood Avenue / Middle Street corridor at the intersections with Deer Street, Hanover Street, Islington

Street, and State Street. This should be coordinated with the State's project to reconstruct the at-grade railroad crossing;

- Introduce or provide funding for the introduction of concurrent pedestrian phasing at intersections along the Maplewood Avenue / Middle Street corridor, between Deer Street and State Street;
- Replace or provide funding for the replacement of existing pedestrian signal heads at Middle Street / State Street with new countdown pedestrian signal heads;
- Install or provide funding for the installation of video detection infrastructure along the Maplewood Avenue / Middle Street corridor, between Deer Street and State Street to improve detection capabilities along the coordinated corridor. The video detection will include an added benefit of providing real-time traffic volume counting capabilities that can be utilized as traffic monitoring for the DSA Development project;
- Modify or provide funding for the modification of the vehicle signal phasing on the Middle Street northbound approach to Congress/Islington to provide a protected left-turn advance phase (with green arrow) to improve the northbound flow. This will require the replacement of one or more vehicle signal heads;
- Modify or provide funding for the modification of existing traffic signal timing, coordination parameters, and cycle lengths along the Maplewood Avenue / Middle Street corridor, between Deer Street and State Street, to optimize operations and efficiency in conjunction with the proposed concurrent pedestrian phasing;
- Reconstruct the sidewalk along the northerly side of Deer Street between the Deer Street Extension and Maplewood Avenue. Provide streetscape opportunities where applicable to enhance the plaza-style sidewalk along the site frontage;
- Construct or reconstruct accessible ramps along the building frontage, or other intersection corners, to comply with ADA standards if impacted by building construction or the intersection modifications noted above;
- Provide secure interior bicycle racks for residents or employees to encourage bicycling;
- Post COAST and Wildcat Transit maps and schedules within the several buildings as part of the development to identify opportunities for residents, patrons, and employees to utilize public transportation to and from Downtown;
- Provide contributory funds towards the Market Street Roundabout Project proportionally consistent with contributions made by the North End Portsmouth Development and at the discretion of the City; and
- Provide contributory funds towards the Downtown Traffic Modeling Study Project at the discretion of the City

Summary of Traffic Impact Analysis

Traffic impact capacity and queue analyses were conducted for the several intersections within the study area for the proposed Deer Street Parking Garage and DSA private development projects. The analysis shows that the intersections within the study area are anticipated to operate at acceptable levels-of-service with minor increases of delay on side-street approaches. The mitigation measures summarized above are expected to significantly improve the operations at these intersections beyond No-Build conditions. The Maplewood Avenue traffic signal enhancements may also provide other reserve capacity for other future projects, such as a Maplewood Avenue Road Diet, or other Downtown traffic flow changes.

Conclusions

TEC performed an extensive examination of the existing roadway and intersection conditions and the trip-generating characteristics, access locations, and the potential impacts of the new multi-modal trips from the proposed Deer Street Parking Garage and DSA private development projects. The full Traffic Impact and Access Study includes recommendations for physical improvements to certain intersections, transportation demand management techniques, intelligent parking and notification systems, and funding to mitigate the impacts of the public and private phases of development. The two closely-aligned projects are consistent with other planned City roadway and intersection projects such as the Maplewood Avenue Corridor Improvements, the Market Street Gateway and Roundabout projects, and the planned mitigation for the North End Portsmouth ("HarborCorp") project. The Maplewood Avenue traffic signal enhancements may also provide other reserve capacity for other future projects, such as a Maplewood Avenue Road Diet, or other Downtown traffic flow changes.

TEC recommends that the Technical Advisory Committee and Planning Board consider the mitigation recommendations provided in the prior section as conditions of approval for the two separate applications. If those improvements are implemented, the traffic generated by the proposed Deer Street Parking Garage and Deer Street Associates private development project can be efficiently and safely accommodated along the study area roadways with no noticeable impact to the long-term capacity of the study area roadways.

I. INTRODUCTION

PURPOSE OF STUDY

TEC, Inc. (TEC) has been retained by the City of Portsmouth to prepare a Traffic Impact and Access Study (TIAS) for the redevelopment of the property located at #165 Deer Street (Lots #1-#6) in Portsmouth, New Hampshire. This study, which is part of a post-closing commitment between the City and Deer Street Associates (DSA), evaluates the separate and collective impacts of the two areas of public and private development. The site was formerly occupied by four small commercial stores, a branch bank, and an industrial supplies building. The project consists of razing the existing structures on-site and constructing a 600-stall municipal public parking garage, with 4,700 square feet (SF) of retail accommodated inside the structure; and four mixed-use buildings proposed by DSA. The four mixed-use buildings include a combination of 80 residential apartments, 108 hotel rooms, 41,281 SF of office, 19,969 SF of retail, 9,859 SF of restaurants, a 4,648 SF bar, and a 2,702 SF bank. Collectively, the private project areas are referenced as the "Deer Street Associates Development" within this TIAS.

Building Program

The project is to be constructed as part of a phased building approach. Each phase is intended to build upon each other. The following summarizes the building program by phase for the project:

Phase 1 (Constructed by City of Portsmouth)

- 600-stall public parking garage, owned and operated by the City of Portsmouth;
- 4,700 SF of retail space housed within the first level of the parking garage; and
- 660-foot Deer Street Extension with associated street level head-in parking.

Phase 2 (DSA)

- Lot 6 Building – 1,776 SF of retail space, 4,424 SF of general office space, 34 dwelling units, and 24,500 SF for associated in-building parking.

Phase 3 (DSA)

- Lot 3 Building – 4,379 SF of retail space, 2,334 SF of restaurant space, 4,648 SF of bar space, a 108-room hotel, 1 dwelling unit, and 11,936 SF of in-building parking.

Phase 4 (DSA)

- Lot 4 Building – 19,583 SF of general office space and 7,525 SF of restaurant space; and
- Lot 5 Building – 13,814 SF of retail space, 17,274 SF of general office space, a 2,702 SF bank, 45 dwelling units, and 17,906 SF of in-building parking.

Site Access

Access for the two sites is proposed via connections along Deer Street and the proposed Deer Street Extension. Access for the individual building layouts is to be provided during each associated phase. The proposed 600-stall parking garage will provide one full access and egress location at the northeastern corner of the parking garage on the proposed Deer Street Extension approximately 300-feet west of the current Deer Street and Bridge Street intersection. A secondary access/egress location will be provided at the south end of the parking garage. Access to Lots 3, 4, and 5 will be provided along the northerly side of Deer Street via an access driveway opposite Bridge Street and a full-access driveway approximately 200-feet west of Maplewood Avenue at the current location of the Eastern Bank driveway. Access to Lot 6 will be provided along the southerly side of the proposed Deer Street Extension approximately 350-feet west of the current Deer Street and Bridge Street intersection.

METHODOLOGY

TEC has evaluated the traffic operations for the public parking garage and private mixed-use development projects on the existing roadway network. The future year planning horizon examines traffic operations under opening-year conditions (2018) as well as a 10-year design horizon (2028) for traffic-volume projections, consistent with New Hampshire Department of Transportation (NHDOT) standards. This includes an evaluation of the No-Build conditions (without the proposed projects) and Build conditions (with site traffic added). The Build conditions have been separated by phasing scenario, both public and private, based on the likely build-out of the site. These conditions are compared to determine what, if any, additional off-site mitigation is necessary for the City and DSA to provide reasonable traffic operations in the area after the projects are complete.

II. EXISTING CONDITIONS

TRAFFIC STUDY AREA

The study area was selected to contain the major roadways providing local access to the project site. The following intersections were included in the study area:

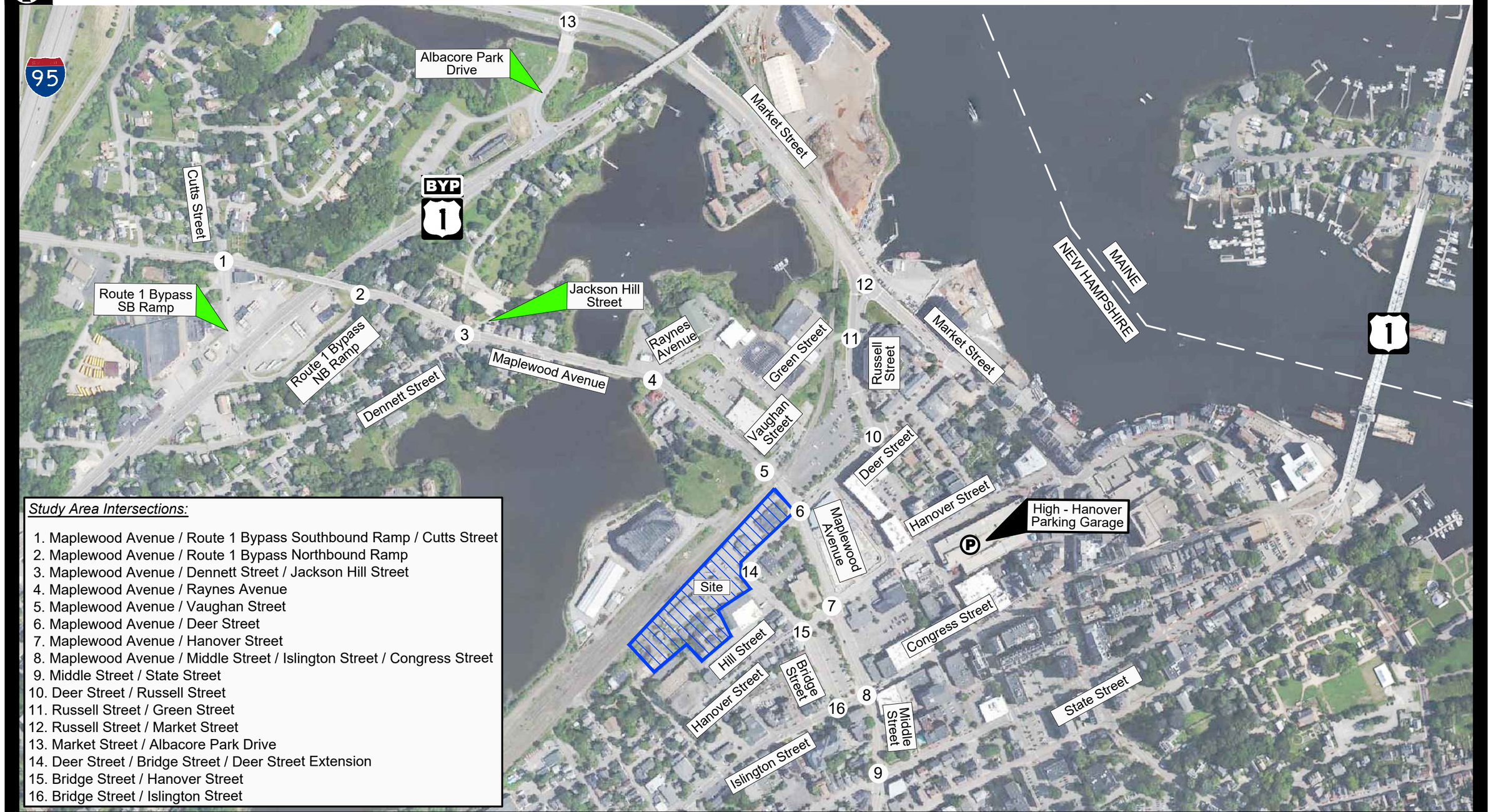
17. Maplewood Avenue / Cutts Street / Route 1 Bypass Southbound Ramps
18. Maplewood Avenue / Route 1 Bypass Northbound Ramps
19. Maplewood Avenue / Dennett Street / Jackson Hill Street
20. Maplewood Avenue / Raynes Avenue
21. Maplewood Avenue / Vaughan Street / Railroad Driveway
22. Maplewood Avenue / Deer Street
23. Maplewood Avenue / Hanover Street
24. Maplewood Avenue / Middle Street / Congress Street / Islington Street
25. Middle Street / State Street
26. Deer Street / Russell Street
27. Russell Street / Green Street
28. Market Street / Russell Street
29. Market Street / Albacore Park Drive (Submarine Way)
30. Deer Street / Bridge Street / *Deer Street Extension [Proposed]*
31. Bridge Street / Hanover Street
32. Bridge Street / Islington Street

The study area intersections are shown graphically in Figure 1.

GEOMETRY

A comprehensive field inventory of existing traffic conditions at the study area intersections was conducted by TEC staff in November 2016 to obtain information related to intersection geometry and lane usage. The field investigation consisted of an inventory of existing roadway geometrics, signal timings, operating characteristics, and safety characteristics. A description of the existing roadway and intersection inventory is provided below.

North



Study Area Intersections:

1. Maplewood Avenue / Route 1 Bypass Southbound Ramp / Cutts Street
2. Maplewood Avenue / Route 1 Bypass Northbound Ramp
3. Maplewood Avenue / Dennett Street / Jackson Hill Street
4. Maplewood Avenue / Raynes Avenue
5. Maplewood Avenue / Vaughan Street
6. Maplewood Avenue / Deer Street
7. Maplewood Avenue / Hanover Street
8. Maplewood Avenue / Middle Street / Islington Street / Congress Street
9. Middle Street / State Street
10. Deer Street / Russell Street
11. Russell Street / Green Street
12. Russell Street / Market Street
13. Market Street / Albacore Park Drive
14. Deer Street / Bridge Street / Deer Street Extension
15. Bridge Street / Hanover Street
16. Bridge Street / Islington Street

TEC, Inc.
65 Glenn Street
Lawrence, MA 01843
(978) 794.1792
169 Ocean Blvd, Unit 101
Hampton, NH 03842
(603) 601.8154
www.TheEngineeringCorp.com

Figure 1

Project Location Map & Study Area Intersections

Roadways

Bridge Street

Bridge Street is a two-lane, northwest-southeast local roadway maintained by the City of Portsmouth. For the purposes of this study, the cardinal direction of Bridge Street will be north-south. The roadway, approximately 0.15 miles in length, provides local connection between Deer Street to the north and Islington Street to the south. Bridge Street ranges in width from ±33-feet to ±36-feet, with one travel lane in each direction and metered on-street parking on the easterly and westerly sides (north of Hanover Street); and on the westerly side (south of Hanover Street). Directional flow is separated by a painted double-yellow centerline. Sidewalks are provided on both sides of Bridge Street. A speed limit sign is not posted on Bridge Street; however, the legal speed limit is 30 miles-per-hour (MPH). Land uses along Bridge Street are a mix of residential, commercial office, and light industrial, along with the City's Bridge Street public parking lot.

Deer Street

Deer Street is a two-lane, northeast-southwest local roadway maintained by the City of Portsmouth. For the purposes of this study, the cardinal direction of Deer Street will be referenced as east-west. The roadway, approximately 0.25 miles in length, provides local connection between Bridge Street to the west and Market Street to the east. The width of Deer Street varies from ±36-feet to ±52-feet, with one travel lane in each direction and metered on-street parking located on both sides of the roadway. Directional flow is separated by a painted double-yellow centerline. Sidewalks are provided on both sides of Deer Street. A speed limit sign is not posted on Deer Street; however, the legal speed limit is 30 miles-per-hour (MPH). Land uses along Deer Street are primarily hotel, commercial/retail, and residential in nature.

Maplewood Avenue

Maplewood Avenue is a two-to-four-lane, northwest-southeast local roadway maintained by the City of Portsmouth in the vicinity of the Project. For the purposes of this study, the cardinal direction of Maplewood Avenue will be north-south. The roadway, approximately 1.45 miles in length, provides local connection between Woodbury Avenue to the north and Middle Street to the south. The width of Maplewood Avenue varies from ±28-feet to ±52-feet, with one travel lane in each direction and auxiliary turn lanes provided at the signalized Deer Street, Hanover Street, and Middle Street / Islington Street / Congress Street intersections. Metered on-street parking is located on both sides of the roadway between Raynes Avenue to the north and Vaughan Street to the south. Directional flow is separated by a painted double-yellow centerline. Sidewalks are provided on both sides of Maplewood Avenue between Middle Street and Dennett Street, after which the sidewalk located along the easterly side of the roadway continues to Woodbury Avenue. The posted speed limit along Maplewood Avenue is 25 MPH within the study area. Land uses along Maplewood Avenue are primarily hotel, commercial, and office in nature within the Downtown Portsmouth area and primarily residential north of Route 1 Bypass.

Market Street

Market Street is a two-to-four-lane, northwest-southeast local roadway maintained by the City of Portsmouth. For the purposes of this study, the cardinal direction of Market Street will be referenced as north-south. The roadway, approximately 1.80 miles in length, provides local connection between Woodbury Avenue to the north and Downtown Portsmouth to the south. The width of Market Street varies from ±54-feet to ±78-feet wide, with one travel lane in each direction south of Russell Street and two travel lanes in each direction north of Russell Street. Metered on-street parking is located on both sides of the roadway south of Russell Street. Directional flow is separated by a raised concrete median north of Russell Street and a painted double-yellow centerline south of Russell Street. South of Hanover Street, Market Street operates one-way southbound toward Market Square. Sidewalks are provided on both sides of Market Street between Downtown and the NH State Port Authority Driveway, after which the sidewalk located along the easterly side of the roadway continues to Woodbury Avenue. The posted speed limit along Market Street is 25 MPH south of the New Hampshire State Port Authority Driveway and 25 MPH to the north. Land uses along Market Street are primarily hotel, commercial, industrial, and residential in nature.

Intersections

Maplewood Avenue / Cutts Street / Route 1 Bypass Southbound Ramps

Cutts Street and the Route 1 Bypass Southbound Ramps intersect Maplewood Avenue to form a four-legged, unsignalized intersection. All four intersection approaches consist of a single general-purpose lane. Traffic along Maplewood Avenue is free-flowing while traffic along Cutts Street and the Route 1 Bypass Southbound Ramps operate under STOP-control. A four-directional overhead flashing beacon is present at the intersection. Directional flow along each approach is separated by a painted double-yellow centerline; however, directional flow along the majority of Cutts Street is unmarked. Sidewalks are present along the northerly side of Maplewood Avenue and the westerly side of Cutts Street. This intersection was partially reconstructed as part of the recent Maplewood Avenue Bridge over Route 1 Bypass Project. Improvements are proposed at this intersection as part of the Maplewood Avenue Corridor Project and are described in the subsequent Chapter III – "Future Conditions."

Maplewood Avenue / Route 1 Bypass Northbound Ramps

The Route 1 Bypass Northbound Ramps intersect Maplewood Avenue to form a three-legged, unsignalized intersection. All three intersection approaches consist of a single general-purpose lane; however, left-turns are prohibited from Maplewood Avenue westbound. The Northbound Ramps approach also includes a short left-turn-only lane capable of storing one or two vehicles. Traffic along Maplewood Avenue is free-flowing while traffic along the Route 1 Bypass Northbound Ramps operates under STOP-control. A three-directional overhead flashing beacon is present at the intersection. Directional flow along each approach is separated by a painted double-yellow centerline with a short concrete median along the northbound approach. Sidewalks are present along the northerly side of Maplewood Avenue. This intersection was reconstructed as part of the recent Maplewood Avenue Bridge over Route 1 Bypass Project.

Maplewood Avenue / Dennett Street / Jackson Hill Street

Dennett Street and Jackson Hill Street intersect Maplewood Avenue to form a four-legged, unsignalized intersection. All four intersection approaches consist of a single general-purpose lane. Traffic along Maplewood Avenue is free-flowing while traffic along Dennett Street and Jackson Hill Street operate under STOP-control. A four-directional overhead flashing beacon is present at the intersection. Directional flow along Maplewood Avenue and Dennett Street is separated by a painted double-yellow centerline while directional flow along Jackson Hill Street is unmarked. Sidewalks are present along both sides of Maplewood Avenue and Dennett Street, with a crosswalk located across the Maplewood Avenue westbound approach.

Maplewood Avenue / Raynes Avenue

Raynes Avenue intersects Maplewood Avenue to form a three-legged, unsignalized intersection. Raynes Avenue meets Maplewood Avenue along the outside of the horizontal curve. All three intersection approaches consist of a single general-purpose lane. Traffic along Maplewood Avenue is free-flowing while traffic along Raynes Avenue operates under STOP-control. Directional flow along Maplewood Avenue is separated by a painted double-yellow centerline while directional flow along Raynes Avenue is unmarked. Sidewalks are present along both sides of Maplewood Avenue, and on-street parking is available on both sides of Raynes Avenue. A bicycle lane and on-street parking are available on both sides of Maplewood Avenue south of the intersection.

Maplewood Avenue / Vaughan Street / Railroad Access Driveway

Vaughan Street and a Railroad Access Driveway intersect Maplewood Avenue to form a four-legged, unsignalized intersection. All four intersection approaches consist of a single general-purpose lane. Traffic along Maplewood Avenue is free-flowing while traffic along Vaughan Street and the Railroad Driveway operate under STOP-control. A STOP-sign is not present along the Railroad Access Driveway approach. Directional flow along Maplewood Avenue is separated by a painted double-yellow centerline while directional flow along Vaughan Street and the Railroad Driveway is unmarked. Sidewalks are present along both sides of Maplewood Avenue and Vaughan Street. A bicycle lane is striped along both sides of Maplewood Avenue north of the intersection and along the Maplewood Avenue northbound approach south of the intersection. On-street parking is available on both sides of Vaughan Street and along both sides of Maplewood Avenue, north of the intersection. Parking meters are only present for the on-street parking stalls along the easterly side of Maplewood Avenue north of the intersection. The PanAm railroad tracks cross Maplewood Avenue immediately south of the intersection with signs and overhead warning lights but without gate controls.

Maplewood Avenue / Deer Street

Deer Street intersects Maplewood Avenue to form a four-legged, fully-actuated, signalized intersection. The Maplewood Avenue northbound approach consists of an exclusive left-turn lane, a through lane, and an exclusive right-turn lane while the Maplewood Avenue southbound approach consists of an exclusive left-turn lane and a shared through / right-turn lane. The Deer Street eastbound approach consists of a single general purpose lane while the Deer Street westbound approach consists of an exclusive left-turn lane and a shared through / right-turn

lane. Currently the Deer Street westbound through movement does not align across the intersection, forcing motorists to transition abruptly to the left to avoid the on-street parking lane. Directional flow along each approach is separated by a painted double-yellow centerline. Sidewalks are present along both sides of each roadway, and crosswalks are provided across all four intersection approaches. A bicycle lane is striped along the easterly edge of Maplewood Avenue north of the intersection. Metered on-street parking is available on both sides of each Deer Street approach. The PanAm railroad tracks cross Maplewood Avenue approximately 125 feet north of the intersection. Improvements are proposed at this intersection as part of the North End Portsmouth Development ("HarborCorp") Project and are described in the subsequent Chapter III – "Future Conditions."

Maplewood Avenue / Hanover Street

Hanover Street intersects Maplewood Avenue to form a four-legged, fully-actuated, signalized intersection. The Maplewood Avenue northbound approach consists of a shared left-turn / through lane and a shared through / right-turn lane while the Maplewood Avenue southbound approach consists of an exclusive left-turn lane and a shared through / right-turn lane. The Hanover Street eastbound approach consists of an exclusive left-turn lane and a shared through / right-turn lane while the Hanover Street westbound approach consists of a shared left-turn / through lane and an exclusive right-turn lane. Directional flow along each approach is separated by a painted double-yellow centerline. Sidewalks are present along both sides of each roadway, and crosswalks are provided across all four intersection approaches. Metered on-street parking is available on the northerly side of Hanover Street west of the intersection and on the southerly side of Hanover Street east of the intersection.

Maplewood Avenue / Middle Street / Islington Street / Congress Street

Islington Street and Congress Street intersect Maplewood Avenue and Middle Street to form a four-legged, fully-actuated, signalized intersection. The Middle Street northbound approach consists of a shared left-turn / through lane and a through lane while the Maplewood Avenue southbound approach consists of a through lane and an exclusive right-turn lane. The Islington Street eastbound approach consists of an exclusive left-turn lane and an exclusive right-turn lane while the Congress Street westbound approach consists of an exclusive left-turn lane, a through lane, and an exclusive right-turn lane. Directional flow along Maplewood Avenue, Middle Street, and Islington Street is separated by a painted double-yellow centerline. Congress Street operates with one-way flow entering the intersection. Sidewalks are present along both sides of each roadway. Crosswalks are provided across all four intersection approaches and two diagonal crosswalks span the opposing corners.

Middle Street / State Street

State Street intersects Middle Street to form a four-legged, fully-actuated, signalized intersection. The Middle Street northbound approach consists of a shared left-turn / through lane and an exclusive right-turn lane while the Middle Street southbound approach consists of an exclusive left-turn lane and a shared through / right-turn lane. The State Street eastbound approach consists of a single general-purpose lane. State Street operates with one-way flow eastbound exiting east of the intersection. Directional flow along Maplewood Avenue and the State Street eastbound approach is separated by a painted double-yellow centerline. Sidewalks

are present along both sides of each roadway, and crosswalks are provided across all four intersection legs. Metered on-street parking is available on both sides of each State Street intersection leg.

Deer Street / Russell Street

Russell Street intersects Deer Street to form a three-legged, unsignalized intersection. All three intersection approaches consist of a single general-purpose lane; however, the wide Russell Street southbound approach operates as an exclusive left-turn lane and an exclusive right-turn lane. Traffic along Deer Street is free-flowing while traffic along Russell Street operates under STOP-control. Directional flow along each approach is separated by a painted double-yellow centerline, and the Russell Street southbound approach also includes a short segment of raised concrete median. Sidewalks are present along both sides of each roadway, and a crosswalk is provided across the Deer Street southwest-bound approach. Metered on-street parking is available on both sides of each roadway. Improvements are proposed at this intersection as part of the North End Portsmouth Development Project and are described in the subsequent Chapter III – "Future Conditions."

Russell Street / Green Street

Green Street intersects Russell Street to form a three-legged, unsignalized intersection. All three intersection approaches consist of a general-purpose lane. Traffic along Russell Street is free-flowing while traffic along Green Street operates under STOP-control. Directional flow along Russell Street is separated by a marked centerline while directional flow along Green Street is unmarked. Green Street currently serves as a backdoor cut-through roadway between Russell Street and Vaughan Street. Sidewalks are present along both sides of Russell Street, and metered on-street parking is available on both sides of Russell Street south of the intersection. Non-gated railroad tracks cross Green Street immediately west of the intersection. Improvements are proposed at this intersection as part of the North End Portsmouth Development Project and are described in the subsequent Chapter III – "Future Conditions."

Market Street / Russell Street

Russell Street intersects Market Street to form a three-legged, unsignalized intersection. The Market Street northbound approach consists of a through lane while the Market Street southbound approach consists of a through lane and an exclusive channelized right-turn lane. The Russell Street eastbound approach consists of a single general-purpose lane; however, its width allows the approach to operate as an exclusive left-turn lane and an exclusive right-turn lane. Traffic along Market Street is free-flowing while traffic along Russell Street operates under STOP-control. Traffic signal equipment is present at the intersection, indicating the intersection previously operated under signalized conditions; however, it currently operates on flashing yellow and flashing red for the various approaches. Directional flow along Russell Street is separated by a landscaped median while directional flow along Market Street is separated by a painted double-yellow centerline south of the intersection and by a raised concrete median north of the intersection. Left-turns are prohibited from Market Street northbound to Russell Street westbound. Sidewalks are present along both sides of each roadway, and crosswalks are provided across the Russell Street eastbound approach and the Market Street northbound approach. Metered on-street parking is available on both sides of

Market Street south of the intersection. The City of Portsmouth has currently programmed improvements for this intersection which are described in the subsequent Chapter III – "Future Conditions."

Market Street / Albacore Park Drive (Submarine Way)

Albacore Park Drive (to be renamed Submarine Way) intersects Market Street to form a three-legged, fully-actuated, signalized intersection. The Market Street eastbound approach consists of a through lane and a shared through / right-turn lane while the Market Street westbound approach consists of an exclusive left-turn lane and two through lanes. Directional flow along Market Street is separated by a landscaped median. The Albacore Park Drive northbound approach consists of a single general-purpose lane with directional flow separated by a marked centerline. A sidewalk is provided along the northerly side of both Market Street approaches. Improvements are proposed at this intersection as part of the US Route 1 Bypass Bridge Project and the City's Market Street Gateway project, and are described in the subsequent Chapter III – "Future Conditions."

Deer Street / Bridge Street / Deer Street Extension

Deer Street, Bridge Street, and the former driveway to Gary's Beverages intersect to form a three-legged, unsignalized intersection. The driveway will be closed and a new roadway serving as an extension of the existing Deer Street will be constructed adjacent to the former driveway as part of the proposed redevelopment project. All three intersection approaches consist of a general-purpose lane. Traffic along Deer Street and Bridge Street is free-flowing while traffic along the private driveway operates under STOP-control. Directional flow along Deer Street and Bridge Street is separated by a painted double-yellow centerline. Sidewalks are present along both sides of each roadway, and metered on-street parking is available on both sides of Deer Street. For the purposes of the subsequent capacity and queue analysis, the alignment of the Bridge Street and Deer Street approaches will be noted as east-west to comply with analysis standards within *Highway Capacity Manual (HCM) 2010* calculations.

Bridge Street / Hanover Street

Hanover Street intersects Bridge Street to form a four-legged, unsignalized intersection. All four intersection approaches consist of a single general-purpose lane operating under STOP-control. Directional flow along Bridge Street and the Hanover Street westbound approach is separated by a painted double-yellow centerline; Hanover Street operates with one-way flow eastbound entering the intersection. Sidewalks are present along both sides of each roadway, with crosswalks provided across all four approaches. Metered on-street parking is available on both sides of Bridge Street north of the intersection, along the westerly side of Bridge Street south of the intersection, and along the northerly side of Hanover Street east of the intersection. Non-metered on-street parking is available on both sides of Hanover Street west of the intersection.

Bridge Street / Islington Street

Bridge Street intersects Islington Street to form a three-legged, unsignalized intersection. All three intersection approaches consist of a single general-purpose lane; however, motorists on

the Bridge Street southbound approach are prohibited from turning left due to the proximity of the signalized intersection of Maplewood, Middle and Congress. Traffic along Islington Street is free-flowing while traffic along Bridge Street operates under STOP-control. Directional flow along each approach is separated by a painted double-yellow centerline. Sidewalks are present along both sides of each roadway, and a crosswalk is provided across the Bridge Street approach. Metered on-street parking is available on the westerly side of Bridge Street.

EXISTING TRAFFIC VOLUMES

Turning Movement Counts

In order to establish existing traffic-volume conditions at the study area intersections, manual Turning Movements Counts (TMCs) were conducted during the weekday morning (7:00 AM – 9:00 AM) and weekday evening (4:00 PM – 6:00 PM) peak periods on Thursday, October 27, 2016 and during the Saturday midday (11:00 AM – 1:00 PM) peak period on Saturday, October 29, 2016. Areas schools were in regular session during the time of traffic counts. A detailed summary of the TMCs, partitioned into 15-minute intervals, is provided within Appendix A.

Traffic volumes at a number of study area intersections had been counted recently as part of other development or infrastructure projects in the recent past; including the North End Development Project (also referred to as the "HarborCorp Project") and the Maplewood Avenue Corridor study. Traffic counts for these projects were collected in June 2013 and January 2016, respectively. In both cases, TEC assessed that the past traffic counts were not necessarily reflective of the typical study area traffic volumes. This is due to the June 2013 traffic counts being conducted while the Memorial Bridge (US Route 1) was under construction and required a detour of a significant amount of traffic onto the Maplewood Avenue corridor via the Route 1 Bypass and Market Street/Russell Street/Deer Street. In addition, the recent January 2016 counts were conducted during an off-peak season, during which volumes appear to be as much as 12 percent lower than the current peak periods. To provide a consistent measure of traffic volumes throughout the traffic study area, the October 2016 traffic counts were utilized at all intersections.

Automatic Traffic Recorder Counts

In addition, Automatic Traffic Recorder (ATR) counts were conducted for a continuous 96-hour period from Thursday, November 3, 2016 through Sunday, November 6, 2016 to measure weekday and weekend daily traffic volumes, speeds, and vehicle classification along Deer Street, just east of Maplewood Avenue. ATR counts were also conducted for a continuous 72-hour period from Thursday, October 27, 2016 through Saturday, October 29, 2016 along Maplewood Avenue, just north of Deer Street. A summary of the Weekday ATR and Weekday ATR traffic data is presented in Tables 1 and 2, respectively. A detailed summary of the ATR data, partitioned into one-hour intervals, is provided within Appendix B.

Table 1 – Existing Weekday Traffic Volume Summary

Location	Weekday Traffic Volume[a]	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
		Traffic Volume[b]	K Factor[c]	Directional Distribution[d]	Traffic Volume	K Factor	Directional Distribution
Deer Street (east of Maplewood)	6,738	442	6.6	64.0% WB	610	9.1	55.4% WB
Maplewood Avenue (north of Deer)	10,309	725	7.0	60.4% SB	874	8.5	56.2% NB

Table 2 – Existing Saturday Traffic Volume Summary

Location	Saturday Traffic Volume[a]	Saturday Midday Peak Hour		
		Traffic Volume[b]	K Factor[c]	Directional Distribution[d]
Deer Street (east of Maplewood)	6,475	500	7.7	55.4% WB
Maplewood Avenue (north of Deer)	10,289	744	7.2	51.2% SB

[a] Daily traffic expressed in vehicles per day
[b] Hourly traffic expressed in vehicles per hour
[c] Percent of daily traffic volumes which occurs during the peak hour
[d] Percent of peak-hour volume in the predominant direction of travel

Adjustments to Existing Traffic Volumes

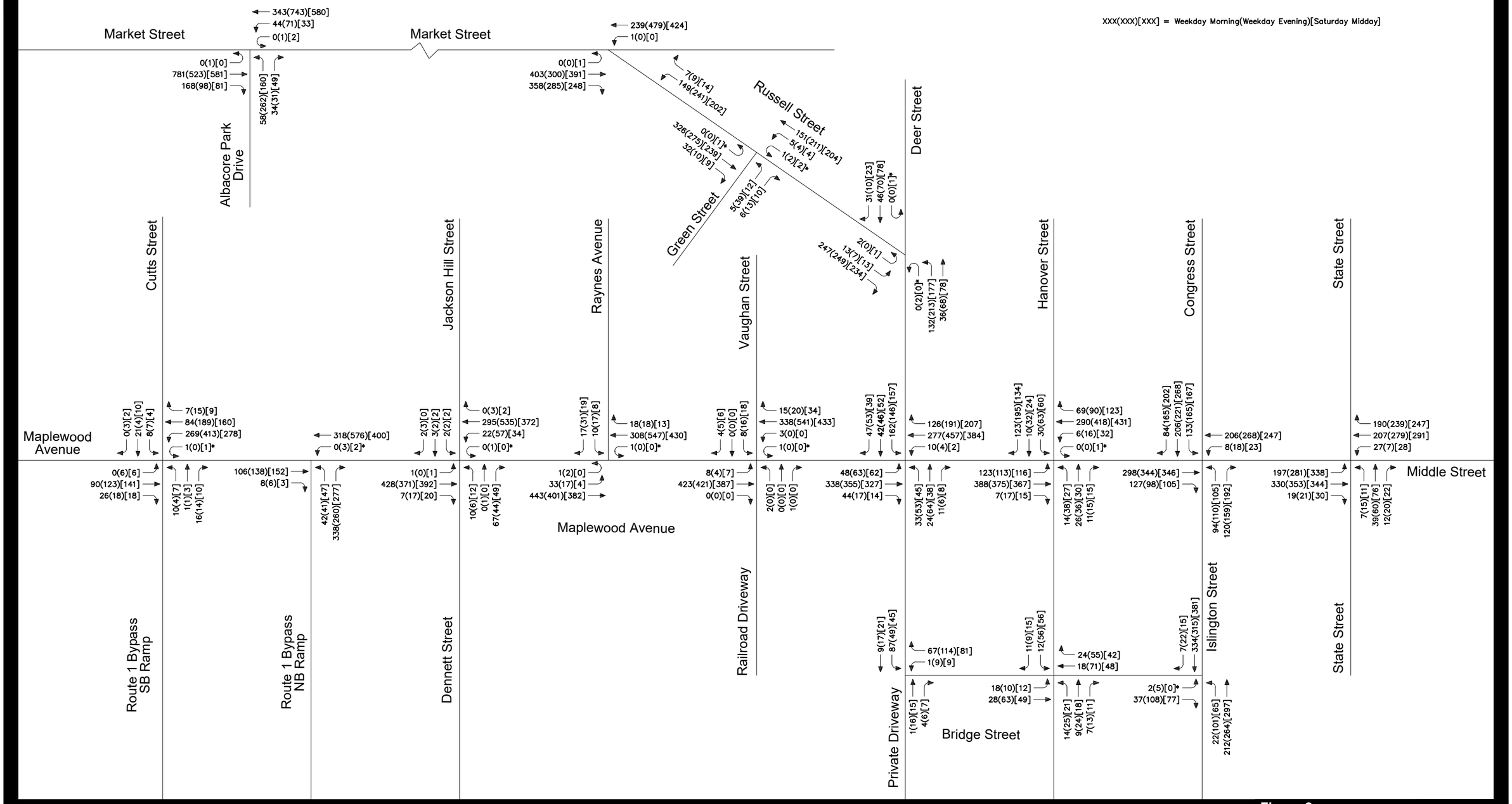
Seasonal Adjustment Factors

In accordance with New Hampshire Department of Transportation (NHDOT) standards, traffic volumes are typically adjusted to reflect peak-month conditions. Based on a review of historic traffic-volume counts collected by NHDOT at permanent count stations along the White Mountain Highway in Dover[1], US Route 4 in Durham[2], US Route 4 in Newington[3], and US Route 1 in North Hampton[4], traffic volumes in October are 2.4 percent lower than peak-month conditions during the weekday morning peak hour, 4.5 percent lower during the weekday evening peak hour, and 10.5 percent lower during the Saturday midday peak hour. Therefore, the October 2016 traffic volumes were upwardly adjusted by 2.4 percent, 4.5 percent, and 10.5 percent, respectively, to reflect peak-month conditions during each peak hour. Knowing the character of, and uses within, Downtown Portsmouth, TEC believes these adjustments are conservative for the month of October. The compiled seasonal adjustment data is provided in Appendix C. The resulting 2016 Existing Conditions weekday morning, weekday evening, and Saturday midday peak hour traffic-volume networks are illustrated in Figure 2.

[1] NHDOT Permanent Count Station 125001 – Dover – White Mountain Highway – South of Middlebrook Road
[2] NHDOT Permanent Count Station 133021 – Durham – US Route 4 – East of NH Route 108
[3] NHDOT Permanent Count Station 331001 – Newington – US Route 4 – East of General Sullivan Bridge
[4] NHDOT Permanent Count Station 345001 – North Hampton – US Route 1 – North of Boston & Maine Bridge

NOT TO SCALE

XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON-STREET PARKING

Figure 2

2016 Existing Conditions
Peak Hour Traffic Volumes

TEC, Inc.
65 Glenn Street | Lawrence, MA 01843 | (978) 794.1792
169 Ocean Blvd, Unit 101 | Hampton, NH 03842 | (603) 601.8154
www.TheEngineeringCorp.com

PUBLIC TRANSPORTATION

Cooperative Alliance for Seacoast Transportation (COAST) bus service is provided to the City of Portsmouth via multiple bus routes. Bus route and schedule data are included in Appendix D, and a summary of the routes are provided below:

- *Route 2 (Portsmouth / Newington / Dover / Somersworth / Rochester)* – Route 2 bus service provides a shuttle-mode connection between Market Square in Downtown Portsmouth and the Lilac Mall in Rochester. Major stops along the route include Market Square and Woodbury Avenue (Marshall's Plaza) in Portsmouth; Fox Run Mall in Newington; Dover Point Road (St. Thomas Aquinas High School), Dover Transportation Center, and Central Avenue (Shaw's) in Dover; NH 108 (Goodwin Community Health Center) in Somersworth; and Rochester Hill Road (Frisbie Memorial Hospital) and Lilac Mall in Rochester. Weekday northbound service from Portsmouth runs between 6:55 AM and 9:31 PM, and weekday southbound service to Portsmouth runs between 5:25 AM and 8:47 PM, with headways of approximately 30 minutes to 60 minutes on weekdays. Saturday northbound service from Portsmouth runs between 8:55 AM and 9:47 PM, and Saturday southbound service to Portsmouth runs between 7:25 AM and 8:17 PM, with headways of approximately 60 minutes to 180 minutes.
- *Route 40 (Pease Tradeport Trolley)* – Route 40 bus service provides a shuttle-mode connection between Market Square in Downtown Portsmouth and Fox Run Mall in Newington. Major stops along the route include Market Square, Plaza 800, Portsmouth Regional Hospital, Pease Airline Terminal, and Paddy's Restaurant in Portsmouth; and Fox Run Mall in Newington. Weekday outbound service from Downtown Portsmouth runs between 6:10 AM and 9:10 PM, and weekday inbound service to Downtown Portsmouth runs between 6:18 AM and 8:18 PM, with headways of approximately 30 minutes to 75 minutes on weekdays. Saturday outbound service from Downtown Portsmouth runs between 8:20 AM and 7:56 PM, and Saturday inbound service to Downtown Portsmouth runs between 7:14 AM and 8:35 PM, with headways of approximately 90 minutes to 150 minutes.
- *Route 100 / Route 41cc (Clipper Connection)* – Route 100 / Route 41cc bus service provides weekday morning and weekday evening commuter bus connections between Market Square in Downtown Portsmouth and Tri-City Plaza in Somersworth. The route passes through Portsmouth, Kittery, Eliot, South Berwick, Berwick, and Somersworth. One southbound trip from Somersworth to Downtown Portsmouth is provided on weekdays, departing Somersworth at 5:50 AM and arriving in Downtown Portsmouth at 6:45 AM. One northbound trip from Downtown Portsmouth to Somersworth is provided on weekdays, departing Downtown Portsmouth at 3:25 PM and arriving in Somersworth at 4:32 PM.

Wildcat Transit bus service is provided from the University of New Hampshire (UNH) to the City of Portsmouth. Bus route and schedule data are included in Appendix D, and a summary of the route is provided below:

- *Route 4 (Portsmouth)* – Route 4 bus service provides UNH students, faculty, and staff with bus service between the UNH campus in Durham and Downtown Portsmouth. Eleven roundtrip runs are provided on weekdays, with service running between 6:40 AM and 10:45 PM at headways of approximately 30 minutes to 150 minutes. Six roundtrip runs are provided on weekends, with service running between 10:05 AM and 8:25 PM at headways of approximately 60 minutes to 150 minutes.

CRASH DATA

Crash data for the study area intersections was compiled and analyzed for the most recent consecutive three-year period (2013-2015) on file with the City of Portsmouth Police Department. Additional crash data was provided for the first seven (7) months of 2016 (January through July). The motor vehicle crash data was reviewed to determine if any crash trends exist within the study area. A summary of the vehicle crash data and intersection crash rates are provided in Table 3. A detailed summary of the crash data and a compilation of the MEV rate calculation worksheets are provided in Appendix E.

Summary of Crash Data

TEC noted a significant number of angled crashes at the study area intersections. Angled crashes made up 55 percent (32 of 58) of all reported crashes at the study area intersections. Sixty-one percent (20 of 33) of the unsignalized intersection crashes were angled crashes, which are typical of unsignalized intersections or signalized intersections with permitted left-turn movements. Forty-eight percent (12 of 25) of the signalized intersection crashes were angled crashes, which could be attributed to a lack of protected left-turn phases and/or failure to yield the right-of-way when turning right-on-red.

Rear-end crashes represented the second most common type of crash throughout the study area. Rear-end crashes made up 28 percent (16 of 58) of all reported crashes at study area intersections, of which half were located at signalized intersections. Frequent rear-end crashes along a signalized and coordinated corridor typically indicates poor coordination parameters which may be out-of-date for the current traffic volume and distribution characteristics. This trend may be partially alleviated by updating the coordinated traffic signal timings and updated vehicular clearance intervals.

The intersection of Maplewood Avenue / Cutts Street / Route 1 Bypass Southbound Ramps experienced less than four crashes per year over the three-year (2013-2015) study period. Of these crashes, approximately 92 percent (12 of 13) were angled and rear-end collisions; 6 angled crashes and 6 rear-end crashes. In addition, approximately 38 percent (5 of 13) of the crashes occurred during the afternoon midday period. This may be attributed to the higher speeds along Maplewood Avenue that may be experienced external from the higher congestion commuter periods. The City should review the crash trends at this intersection once the planned corridor improvements are implemented since it had the highest average annual crash rate for the unsignalized intersections.

Table 3 – Crash History Summary

Parameter		Maplewood / Rt. 1 Byp. SB Ramps	Maplewood / Rt. 1 Byp. NB Ramps	Maplewood / Dennett St	Maplewood / Vaughan St	Maplewood / Deer St	Maplewood / Hanover St	Maplewood / Middle St	Middle St / State St	Deer St / Russell St	Market St / Russell St	Bridge St / Hanover St	Bridge St / Islington St
Crash Year	2013	2	0	0	0	1	0	1	0	0	1	0	1
	2014	3	1	0	0	1	3	3	2	2	2	1	2
	2015	0	0	1	1	2	0	2	2	1	1	1	1
	2016	8	1	1	0	2	2	2	2	0	0	0	2
	TOTAL	***13***	***2***	***2***	***1***	***6***	***5***	***8***	***6***	***3***	***4***	***2***	***6***
Average Annual		***3.63***	***0.56***	***0.56***	***0.28***	***1.67***	***1.40***	***2.23***	***1.67***	***0.84***	***1.12***	***0.56***	***1.67***
Manner of Collision	Angled	6	2	2	1	3	4	3	2	2	3	1	3
	Rear-end	6	0	0	0	2	1	4	1	1	0	1	0
	Sideswipe	0	0	0	0	0	0	1	3	0	1	0	2
	Single Vehicle	1	0	0	0	1	0	0	0	0	0	0	0
	Head-On	0	0	0	0	0	0	0	0	0	0	0	0
	Ped / Bike	0	0	0	0	0	0	0	0	0	0	0	1
	Not Reported	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	***13***	***2***	***2***	***1***	***6***	***5***	***8***	***6***	***3***	***4***	***2***	***6***
Weather Conditions	Clear	10	2	0	1	5	5	6	6	1	3	2	4
	Cloudy	1	0	0	0	0	0	1	0	0	0	0	2
	Rain	1	0	0	0	0	0	1	0	1	1	0	0
	Snow	0	0	1	0	1	0	0	0	1	0	0	0
	Other / Unknown	1	0	1	0	0	0	0	0	0	0	0	0
	TOTAL	***13***	***2***	***2***	***1***	***6***	***5***	***8***	***6***	***3***	***4***	***2***	***6***
Injury Status (Crash Severity)	Prop Damage	13	2	2	1	6	5	8	6	3	2	2	5
	Non-Fatal Injury	0	0	0	0	0	0	0	0	0	2	0	1
	TOTAL	***13***	***2***	***2***	***1***	***6***	***5***	***8***	***6***	***3***	***4***	***2***	***6***
Day of Week	Monday-Friday	8	1	0	0	4	5	6	4	1	3	2	4
	Saturday-Sunday	5	1	2	1	2	0	2	2	2	1	0	2
	TOTAL	***13***	***2***	***2***	***1***	***6***	***5***	***8***	***6***	***3***	***4***	***2***	***6***
Time of Day	6:00AM-9:00AM	0	0	0	0	0	2	0	0	0	0	1	0
	9:00AM-12:00PM	1	0	0	0	1	0	4	2	0	1	0	1
	12:00PM-3:00PM	5	1	1	0	1	3	2	2	1	0	0	2
	3:00PM-6:00PM	1	1	0	0	1	0	1	1	1	1	0	0
	6:00PM-9:00PM	3	0	1	0	1	0	0	0	1	1	1	3
	9:00PM-6:00AM	3	0	0	1	2	0	1	1	0	1	0	0
	TOTAL	***13***	***2***	***2***	***1***	***6***	***5***	***8***	***6***	***3***	***4***	***2***	***6***

The intersection of Maplewood Avenue / Middle Street / Congress Street / Islington Street experienced less than three crashes per year over the three-year study period. Of these crashes, approximately half (4 of 8) were rear-end collisions. In addition, half (4 of 8) of the crashes occurred during the morning midday period.

All other intersections experienced less than two (2) collisions per year during the three-year study period, indicating no noticeable crash trends exist. The crash data indicated that only one crash in the study area involved a pedestrian which occurred at the intersection of Islington Street / Bridge Street, an unsignalized location.

Sight Distance Measurements

TEC, Inc. visited the site on multiple occasions in October and November 2016 to measure the available sight distances at the proposed site driveway and the existing unsignalized intersections. The available sight distances were compared to minimum requirements established by the American Association of State Highway and Transportation Officials (AASHTO) and NHDOT.

Sight distance represents the length of roadway that is visible to a driver traveling within the roadway. Two types of sight distance are typically evaluated for driveways and intersections: stopping sight distance (SSD) and intersection sight distance (ISD). SSD is the minimum distance required for a driver traveling along a roadway to perceive an object in the roadway and stop safely in advance of the object when traveling on a wet pavement surface. SSD is measured from an eye height of 3.5 feet to an object height of two feet above the ground, which is equivalent to a driver viewing the taillight of a vehicle ahead. SSD is measured along the centerline of the travel lane approaching the driveway or intersection.

ISD represents the length of the roadway visible to a driver waiting to exit a driveway or minor street. Minimum ISD requirements are based on the distance required for a driver to exit a minor street onto a major street without requiring an approaching vehicle to reduce its speed from the design speed to less than 70 percent of the design speed. ISD is measured from an eye height of 3.5 feet to an object height of 3.5 feet, and is measured from a distance 15 feet off the edge of the travel-way of the major roadway to represent a driver waiting to exit a driveway or minor roadway.

SSD is typically considered the critical sight distance, as it represents the minimum distance required for safe stopping, while ISD represents an acceptable speed reduction for approaching vehicles. The ISD, however, must be at least equal to the minimum required SSD in order to prevent a driver from entering the roadway when an approaching vehicle is too close to safely stop. The guidance provided by AASHTO states:

> *"If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions. However, in some cases, this may require a major-road vehicle to stop or slow to accommodate the maneuver by a minor-road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road."*

Table 4 provides a summary of the available sight distances at the proposed site driveway and the existing unsignalized intersections.

Table 4 – Sight Distance Measurements

Approach / Direction	Speed	Minimum Required	Measured	
			Stopping Sight Distance	Intersection Sight Distance
Maplewood Ave at Cutts Street:				
West of Cutts Street	30 mph[a]	200 FT	>500 FT	300 FT
East of Cutts Street	30 mph[a]	200 FT	450 FT	450 FT
Maplewood Ave at Rte. 1 Bypass SB:				
West of Rte. 1 Bypass SB Ramps	30 mph[a]	200 FT	>500 FT	0 FT (>500 FT)[c]
East of Rte. 1 Bypass SB Ramps	30 mph[a]	200 FT	450 FT	450 FT
Maplewood Ave at Rte. 1 Bypass NB:				
West of Rte. 1 Bypass NB Ramps	30 mph[a]	200 FT	300 FT	300 FT
East of Rte. 1 Bypass NB Ramps	30 mph[a]	200 FT	315 FT	240 FT
Maplewood Ave at Jackson Hill Street:				
West of Jackson Hill Street	30 mph[a]	200 FT	400 FT	400 FT
East of Jackson Hill Street	30 mph[a]	200 FT	>500 FT	0 FT (>500 FT)[d]
Maplewood Ave at Dennett Street:				
West of Dennett Street	30 mph[a]	200 FT	400 FT	400 FT
East of Dennett Street	30 mph[a]	200 FT	>500 FT	>500 FT
Maplewood Ave at Raynes Avenue:				
North of Raynes Avenue	30 mph[a]	200 FT	>500 FT	>500 FT
South of Raynes Avenue	30 mph[a]	200 FT	>500 FT	350 FT[e]
Maplewood Ave at Vaughan Street:				
North of Vaughan Street	30 mph[a]	200 FT	400 FT	300 FT
South of Vaughan Street	30 mph[a]	200 FT	>500 FT	>500 FT
Deer Street at Russell Street:				
West of Russell Street	30 mph[b]	200 FT	400 FT (To Maple)	250 FT[f]
East of Russell Street	30 mph[b]	200 FT	>500 FT	165 FT[g]
Russell Street at Green Street:				
North of Green Street	30 mph[b]	200 FT	225 FT (To Market)	225 FT (To Market)
South of Green Street	30 mph[b]	200 FT	450 FT (To Deer)	450 FT (To Deer)
Market Street at Russell Street:				
North of Russell Street	30 mph[a]	200 FT	>500 FT	>500 FT
South of Russell Street	30 mph[a]	200 FT	>500 FT	380 FT
Deer / Bridge Street at Driveway:				
East of Driveway	30 mph[b]	200 FT	>500 FT	>500 FT
South of Driveway	30 mph[b]	200 FT	425 FT	385 FT
Islington Street at Bridge Street:				
West of Bridge Street	35 mph[a]	250 FT	>500 FT	100 FT
East of Bridge Street	35 mph[a]	250 FT	125 FT (To Maple)	125 FT (To Maple)

[a] Posted speed limit plus 5 MPH.
[b] Legal speed limit;.
[c] 0 FT sight distance 15-feet from edge of travel way due to overgrown foliage; > 500 FT from painted STOP bar.
[d] 0 FT sight distance 15-feet from edge of travel way due to building and telephone poles; > 500 FT 6-feet from edge of travel way.
[e] ISD limited by on-street parking along easterly side of Maplewood Avenue.
[f] ISD limited by crest in roadway along Deer Street.
[g] ISD limited by on-street parking along northerly side of Deer Street.

As shown in Table 4, the available SSD at each of the unsignalized study area intersections exceed AASHTO's minimum recommendations for safe operations. ISD looking west at the

Islington Street / Bridge Street intersection is only 100 feet, far less than the required 200-foot minimum. However, left-turn movements from Bridge Street onto Islington Street are prohibited, and the geometry does not present a significant concern given the lower speeds for turns from Maplewood Avenue and Middle Street onto Islington Street.

The ISD looking east at the Deer Street / Russell Street intersection is only 165 feet, less than the required 200-foot minimum under current conditions. The ISD is limited by on-street parking located along the northerly side of Deer Street. However, this intersection will be reconstructed as part of the planned North End Portsmouth project.

The ISD looking east at Jackson Hill Street and looking west at the Route 1 Bypass Southbound Ramps are almost entirely obscured when recorded from the recommended 15 feet back from the edge of travel way. However, when measured from the painted STOP bar, ISD improves to greater than 500 FT at both intersections.

III. FUTURE CONDITIONS

CURRENTLY PLANNED INFRASTRUCTURE PROJECTS

The City of Portsmouth is experiencing a significant amount of private redevelopment activity, and both the City and State have programmed several public infrastructure upgrades throughout the City limits. Much of the transportation related improvements within the City are currently proposed within the Downtown study area. The following section provides a summary of the transportation improvements for each potential or proposed project.

US Route 1 Bypass Bridge Project

The US Route 1 Bypass Bridge Project (NHDOT Project #13455) is a multi-bridge reconstruction project to replace or remove six bridges over the US Route 1 Bypass between US Route 1 (Lafayette Road) and Market Street. The NHDOT's five-phase project had proposed to address each bridge removal or replacement separately between 2013 and 2020. To date, the State has completed the new fly-over bridge at Lafayette Road (US Route 1) and reconstructed the bridges at Middle Road, Islington Street, and Maplewood Avenue. Bridge replacements for Woodbury Avenue and Stark Street are anticipated to be advertised for construction in October 2019.

Within the study area for this TIAS, the State proposes to reconstruct the Albacore Park Connector (also referred to as Submarine Way), including its intersection with Market Street. To date, the NHDOT has rejected the first round of bids for construction and plans to rebid the project for construction in 2017. The improvements include reconstruction of the Market Street median to include a pedestrian refuge island west of the intersection, providing new pavement markings along the intersection approaches, installation of new traffic signal infrastructure, and modifications to the traffic signal timings. These improvements have been reflected in the No-Build and Build conditions.

The North End Portsmouth Development Off-Site Improvements

As part of the proposed North End Portsmouth Development Project (also referred to as the "HarborCorp Project"), roadway improvements are proposed along Maplewood Avenue, Deer Street, and Russell Street along its entire site frontage. The Project approvals are currently being appealed. However, for the purposes of this study, the development and its planned off-site improvements are expected to be under construction within the following year.

As part of the TIAS, the project proposed to reconstruct parts of Deer Street and Russell Street between Maplewood Avenue and Market Street. The following provides a summary of improvements within the study area:

- *Maplewood Avenue / Deer Street* - Although the intersection will retain its existing lane configuration, the travel lane widths along Maplewood Avenue southbound and Deer Street westbound will be modified. In addition, a flush scored concrete median island is proposed to separate directional flow between Portwalk Place and Maplewood Avenue. Sidewalks will be reconstructed along the HarborCorp site frontage and a new accessible ramp will be constructed on the northwest corner of the intersection.
- *Deer Street* - New pavement markings will be provided along Deer Street, between Russell Street and Maplewood Avenue, with slight alterations to lane widths, to improve delineation between vehicular flow and on-street parking. In addition, new accessible ramps and a crossing will be installed across Deer Street east of the Portwalk Place approach. Shared-use lane markings "sharrows" will be striped along the corridor in both directions.
- *Deer Street / Russell Street* - Although the intersections will retain their existing lane configuration, the Russell Street southbound approach to Deer Street is proposed to be reconfigured to provide a perpendicular "T-type" intersection.
- *Russell Street* - Russell Street is proposed to be reconstructed between Deer Street and Green Street to generally provide a consistent cross-section, including accommodations for vehicular, bicycle, and bus traffic, as well as on-street parking stalls along both edges of pavement. A short left-turn lane will be provided along Russell Street northbound between Deer Street and the hotel access/egress driveway as part of the proposed development. Shared-use lane markings "sharrows" will be striped along the corridor in both directions.

These improvements have been reflected in the No-Build and Build conditions.

Maplewood Avenue Corridor Project

The Maplewood Avenue and Adjacent Areas Project (also referred to as the Maplewood Avenue Corridor Project) is a corridor-long improvement project to include full depth pavement construction/reclamation, sidewalk construction, drainage/water/sewer improvements, traffic calming measures, pavement striping, and improvements to bicycle accommodations. The Project will stretch between Woodbury Avenue to the west and Dennett Street to the east. Greenman-Pedersen, Inc. (GPI) submitted a Traffic Analysis Memorandum[5] and 35% Design Plans to the City of Portsmouth in October 2016.

[5] *Traffic Analysis Memorandum – Improvements to Maplewood Avenue & Adjacent Areas – Portsmouth, NH*; Greenman-Pedersen, Inc.; Portsmouth, NH; October 21, 2016.

As part of GPI's study, the City proposes to reconstruct three intersections along Maplewood Avenue between the US Route 1 Bypass SB Ramps and Dennett Street. The following provides a summary of improvements within the study area:

- *Maplewood Avenue / US Route 1 Bypass SB Ramps / Cutts Street* - Although the intersection will retain its existing lane configuration, the travel lane widths along Maplewood Avenue will be reduced to 10-feet. A new raised concrete median will be installed along Maplewood Avenue west of the intersection. Bicycle lanes, with a striped buffer, will be striped along Maplewood Avenue through the intersection. Sidewalks along the northerly side of Maplewood Avenue and the westerly side of Cutts Street are proposed to be reconstructed.
- *Maplewood Avenue / US Route 1 Bypass NB Ramps* - Although the intersection will retain its existing lane configuration, the travel lane widths along Maplewood Avenue will be reduced to 10-feet. The US Route 1 Bypass NB Ramp approach will be modified to provide perpendicular approach with mountable brick along the easterly corner radius to allow for heavy vehicle turning maneuvers. Bicycle lanes will be striped along Maplewood Avenue through the intersection. Sidewalks along the northerly side of Maplewood Avenue, east of the intersection, are proposed to be reconstructed.
- *Maplewood Avenue / Dennett Street / Jackson Hill Street* - Although the intersection will retain its existing lane configuration, the travel lane widths along Maplewood Avenue will be reduced to 10-feet Bicycle lanes, with a striped buffer, will be striped along Maplewood Avenue through the intersection. Sidewalks along both sides of Maplewood Avenue are proposed to be reconstructed with new crosswalks striped across each approach.

These improvements have been reflected in the No-Build and Build conditions.

Market Street Gateway Improvement Project

The City of Portsmouth is currently in the pre-construction phase for Phase 1 of the Market Street Gateway Improvement Project. The project will construct new medians, bicycle lanes, sidewalks, traffic signals, utilities, and provide enhanced recreational and streetscape aspects along Market Street in two phases. The most recent design plans for the project were submitted to the City by Resource Systems Group, Inc. (RSG) April 2016.

Within the study area, the project will provide improvements to the intersection of Market Street / Albacore Park Drive; including a standard cross-section of 11-foot travel lanes along Market Street and a lane drop along Market Street southbound, immediately south of Albacore Park Drive. These improvements have been reflected in the No-Build and Build conditions.

Market Street at Russell Street Improvement Project

The City is in the early planning stages for improvements to the intersection of Market Street / Russell Street. Based on the early planning, it is anticipated that the intersection will be reconstructed as a single-lane roundabout. The roundabout configuration of the intersection is expected to significantly improve the operations and safety of the intersection. At this time, no

detailed plans have been provided by the City of Portsmouth for the intersection; however, this study assumes a conceptual layout of a roundabout sized to be accommodated within the existing intersection footprint and land to be donated as part of the HarborCorp Project. Minor modifications to the roundabout geometry are not anticipated to significantly change the results of the capacity and queue analysis presented in this TIAS. These improvements have been reflected in the No-Build and Build conditions.

Maplewood Avenue Road Diet

The City of Portsmouth has conducted preliminary planning for a possible Maplewood Avenue Road Diet Project. The concept of the road diet would consider one through travel lane along Maplewood Avenue with auxiliary turn lanes provided, where necessary, at the intersections with Deer Street, Hanover Street, and Islington Street. This would present an opportunity for landscaped islands and/or improved bicycle accommodations. These improvements were not included in the future-year conditions as it will be the subject of a future City-commissioned study.

Downtown Portsmouth Traffic Modeling

The City of Portsmouth recently issued a Request for Proposals for services related to a Downtown Traffic Model. The Portsmouth Downtown Traffic Model will be an origin/destination traffic microsimulation model that reflects the existing roadway network, land uses, and existing traffic demands. This model will be used to project traffic impacts to roadways and intersections associated with (but not limited to) roadway infrastructure improvements, new developments, road closures, modifications to street directionality, and changes to parking facilities. Many of the study area intersections within this TIAS are identified within the scope of the model. This project will not directly alter the current existing or future conditions as identified in this TIAS.

Maplewood Avenue Railroad Crossing

The New Hampshire Department of Transportation is currently in the design stage for improvements for several rail crossings in the State. The Project is set to go to bidding in the spring of 2017 with 10 percent of funding designated to be covered by the respective City/Town. As part of the project, NHDOT is seeking to reconstruct the at-grade crossing along Maplewood Avenue immediately north of Deer Street, as well as the railroad crossing on Green Street immediately west of Russell Street. The improvements are set to include new signage, striping, railroad gates and signals where appropriate.

OPENING AND FUTURE YEAR TRAFFIC VOLUMES

Traffic volumes in the study area were projected to the years 2018 and 2028, which reflect a 2-year opening year and subsequent 10-year future year planning horizon per NHDOT standards. The traffic conditions for the years 2018 and 2028, under No-Build conditions, were developed to document the operating conditions independent of the proposed project, including all existing traffic, new traffic resulting from background growth, and traffic from specific development projects expected to be completed by 2018. Anticipated site-generated traffic volumes for the proposed DSA Development, as well as corresponding traffic redistributions, were superimposed

upon the No-Build traffic networks to reflect the Build conditions with the distinct phases of the public and private development areas of the project site.

Background Traffic Growth

Traffic growth is a function of the expected land development in the immediate area and the surrounding region. Several methods can be used to estimate this growth. Traffic engineers frequently employ an annual percentage increase in traffic growth, which is applied to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a higher or a lower rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This procedure produces a more realistic estimate of growth for local traffic. However, the drawback of this procedure is that the potential growth in population and development external to the study area would not be accounted for in the traffic projections.

To provide a conservative analysis framework, both procedures were considered.

General Ambient Growth

TEC reviewed the traffic volume data compiled by NHDOT from permanent count stations and historic traffic counts in North Hampton[6] and Portsmouth[7,8,9,10] along local roadways in the general vicinity of the project, in order to determine traffic growth trends. Based on the NHDOT traffic volume data, seacoast area traffic volumes in the area have been increasing at a rate of 0.7 percent per year since 2008. Therefore, to provide a conservative analysis scenario, a 1.0 percent per year compounded annual background traffic growth rate was used to account for potential future traffic growth external to the study area and presently unforeseen development. Additionally, TEC contacted the Rockingham Planning Commission and confirmed that a 1.0 percent growth rate was appropriate for the Portsmouth area. Count station data is included in Appendix F.

Route 1 Bypass Redistribution

During the summer of 2016, the existing Sarah Mildred Long Bridge (US Route 1 Bypass), connecting New Hampshire and Maine, was damaged and was closed in advance of the completion of the large-scale bridge replacement project. As a result of the bridge closure, vehicles accessing Downtown Portsmouth via Maplewood Avenue from the Route 1 Bypass (Maine) have migrated to alternate routes to access each side of the Piscataqua River. The primary route for the rerouting of traffic is along Interstate 95 to Market Street via Exit 7.

---

[6] NHDOT Permanent Count Station 345001 – North Hampton – US Route 1, north of North Road
[7] NHDOT Permanent Count Station 379021 – Portsmouth – US Route 1, at Rye Town Line
[8] NHDOT Permanent Count Station 379018 – Portsmouth – Woodbury Avenue, north of Cottage Street
[9] NHDOT Permanent Count Station 379037 – Portsmouth – Woodbury Avenue, south of Maplewood Avenue
[10] NHDOT Permanent Count Station 379142 – Portsmouth – Rockingham Avenue, east of Spaulding Turnpike

The new Sarah Mildred Long Bridge is currently slated for a fall 2017 opening, after which the detoured traffic volumes are anticipated to revert back to their original traffic pattern. To assess the volume of traffic that will need to be redistributed throughout the traffic-volume networks, TEC compared the seasonally-adjusted 2016 Existing traffic counts conducted in October 2016 at the Route 1 Bypass Ramps to the seasonally-adjusted traffic counts conducted in January 2016, as sourced from a *Traffic Analysis Memorandum* prepared by Greenman-Pedersen, Inc.[11] The January 2016 traffic volumes were conducted prior to the closure of the Sarah Mildred Long Bridge. The difference in traffic volumes accessing Maplewood Avenue from the north was redistributed from Market Street to Maplewood Avenue to simulate traffic-volume conditions after the Sarah Mildred Long Bridge is re-opened. The redistribution of the Route 1 Bypass traffic volumes during the weekday morning, weekday evening, and Saturday midday peak hours are illustrated in Figure 3.

Specific Developments by Others

TEC coordinated with the City of Portsmouth Planning Department to identify nearby private / public development projects in the vicinity of the study area that are either in the planning process or were recently approved but not yet occupied. Based on these discussions, the City of Portsmouth identified nine (9) projects that could contribute traffic volumes to the study area intersections.

- *#40 Bridge Street* – The proposed project, located approximately 0.1 miles southeast of the proposed DSA Development, consists of constructing a 4,025 SF restaurant and six residential condos. The project is currently under construction. TEC utilized standard trip rates published in the Institute of Transportation Engineers (ITE) publication *Trip Generation, 9th Edition* for Land Use Code (LUC) 230 – Residential Condominium / Townhouse and LUC 932 – High-Turnover (Sit-Down) Restaurant to estimate the trips to be generated by the development and distributed these trips throughout the study area traffic network accordingly.
- *#75 Congress Street* – The proposed project, located approximately 0.2 miles southeast of the proposed DSA Development, consists of constructing 10 residential condos. The project is currently under construction; however, due to the low traffic-generating nature of this land use and the limited number of units, all traffic generated by the development was assumed to be included as part of the 1.0 percent annual background growth rate.
- *Harbor Corp Redevelopment* – The proposed project, located on the opposite side of Maplewood Avenue from the Project site, consists of constructing a 98-room hotel and conference center, 14 condominium units, a 40,000 SF grocery store, and a 540-space parking garage. A *Traffic Impact and Access Study*, prepared by Vanasse & Associates, Inc. and dated September 2014 and other subsequent memoranda, identify the impacts on neighboring roads resulting from the proposed site-generated

[11] Improvements to Maplewood Avenue & Adjacent Areas – Portsmouth, New Hampshire; *Traffic Analysis Memorandum*; Greenman-Pedersen, Inc.; October 21, 2016.

traffic[12]. These site-generated trips have been added to the study area traffic network accordingly in 2018 and 2018.

- *#172 Hanover Street* – The proposed project, located approximately 0.1 miles east of the proposed DSA Development, consists of renovating a 7,000 SF restaurant. Because the former restaurant has been closed for multiple years, it is assumed that traffic generated by the #172 Hanover Street project would be new to the roadway network. TEC utilized standard trip rates published in the ITE publication *Trip Generation, 9th Edition* for LUC 932 – High-Turnover (Sit-Down) Restaurant to estimate the trips to be generated by the development and distributed these trips throughout the study area traffic network accordingly.
- *#30 Maplewood Avenue* – The project, located approximately 0.1 miles southeast of the Project site, is fully constructed; however, 4,600 SF of retail space and three residential condos remain vacant. TEC utilized standard trip rates published in the ITE publication *Trip Generation, 9th Edition* for LUC 230 – Residential Condominium / Townhouse, LUC 820 – Shopping Center, and LUC 826 – Specialty Retail Center to estimate the trips to be generated by vacant portions of the development and distributed these trips throughout the study area traffic network accordingly.
- *#46-64 Maplewood Avenue* – The proposed project, located approximately 0.1 miles northeast of the Project site, consists of constructing 22 residential apartments and 13,475 SF of retail space. The project is currently under Planning Department review. TEC utilized standard trip rates published in the ITE publication *Trip Generation, 9th Edition* for LUC 220 – Apartment, LUC 820 – Shopping Center, and LUC 826 – Specialty Retail Center to estimate the trips to be generated by the development and distributed these trips throughout the study area traffic network accordingly.
- *#173-175 Market Street* – The proposed project, located approximately 0.2 miles northeast of the Project site, consists of constructing 3,331 SF of commercial space, 1,759 SF of office space, and six residential condos. The project is currently under construction. TEC utilized standard trip rates published in the ITE publication *Trip Generation, 9th Edition* for LUC 230 – Residential Condominium / Townhouse, LUC 710 – General Office Building, LUC 820 – Shopping Center, and LUC 826 – Specialty Retail Center to estimate the trips to be generated by the development and distributed these trips throughout the study area traffic network accordingly.
- *#233 Vaughan Street* – The project, located approximately 0.1 miles north of the Project site, is fully constructed; however, two residential condos remain vacant. Due to the low traffic-generating nature of this land use and the limited number of vacant units, all remaining traffic generated by the #233 Vaughan Street development was assumed to be included as part of the 1.0 percent annual background growth rate.

[12] *Proposed North End Portsmouth – Portsmouth, New Hampshire*; *Traffic Impact and Access Study*; Vanasse & Associates, Inc.; Andover, MA; September 2014.

The distribution of traffic generated by specific developments by others is graphically depicted in Figure 4. A compilation of the specific developments by others traffic studies and trip generation estimates is provided in Appendix G.

Market Street at Russell Street Roundabout Redistribution

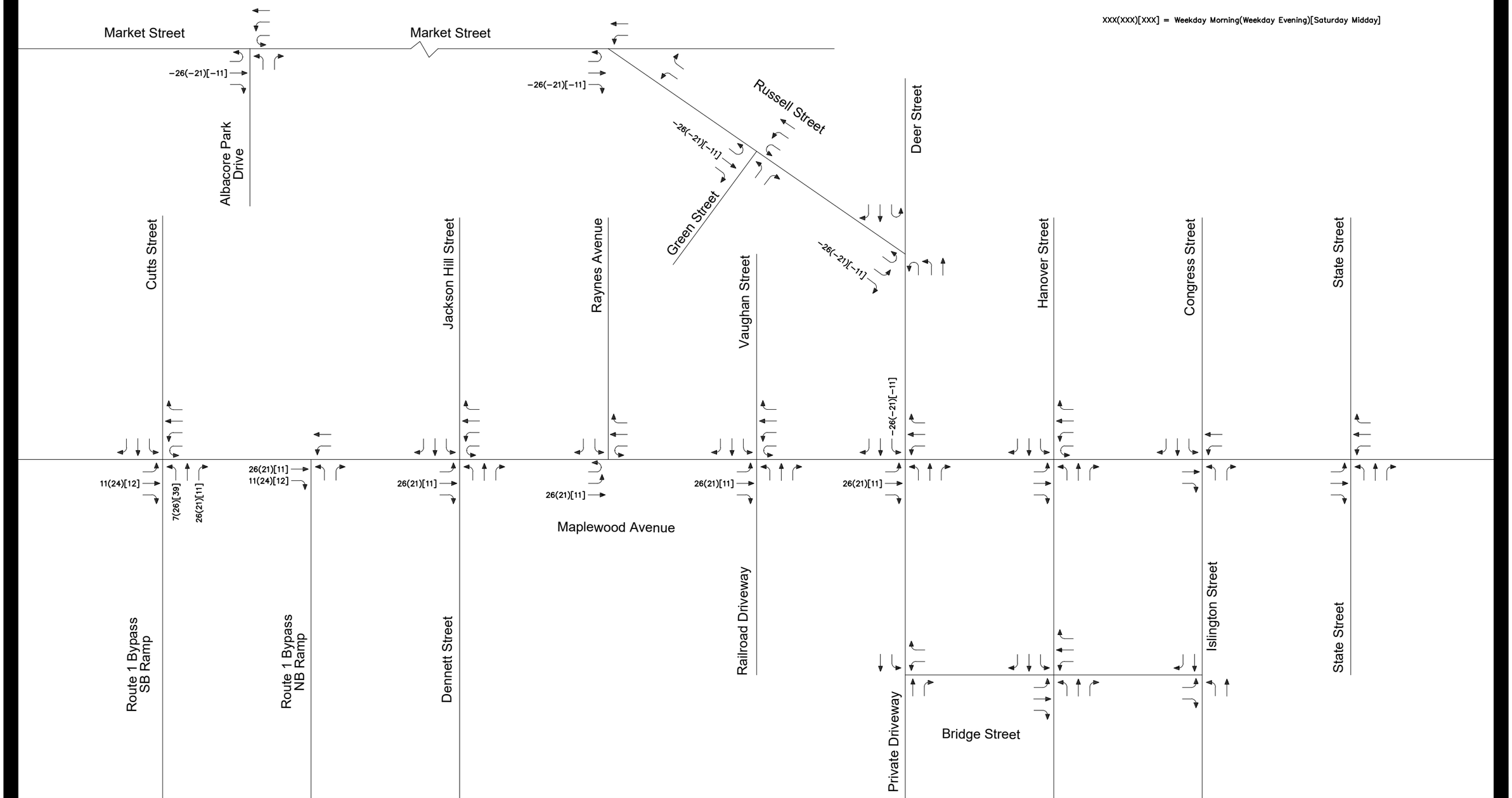
As previously stated, the City is in the early planning stages for improvements to the intersection of Market Street / Russell Street. Currently, left-turns from Market Street northbound are prohibited under the existing geometry. The construction of the roundabout at this location, will allow vehicles to turn left from Market Street onto Russell Street. It is anticipated that the redistribution of traffic will be include a limited number of trips attempting to access Greene Street or the proposed HarborCorp development. The traffic redistribution associated with the Market Street Roundabout project is presented in Figure 5.

No-Build Traffic Volumes

The 2018 Opening Year and 2028 Future Year No-Build weekday morning, weekday evening, and Saturday midday peak-hour traffic-volume networks were developed by applying the 1.0 percent per year compounded annual background traffic growth rate on the 2016 Existing peak-hour traffic volumes over opening-year and 10-year planning horizons, adding traffic to be generated by the specific developments by others, and redistributing the migrated Route 1 Bypass traffic volumes. The resulting 2018 Opening Year and 2028 Future Year No-Build weekday morning, weekday evening, and Saturday midday peak-hour traffic-volume networks are illustrated in Figure 6 and Figure 7, respectively.

NOT TO SCALE

XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON−STREET PARKING

TEC, Inc.
65 Glenn Street | Lawrence, MA 01843 | (978) 794.1792
169 Ocean Blvd, Unit 101 | Hampton, NH 03842 | (603) 601.8154
www.TheEngineeringCorp.com

Figure 3

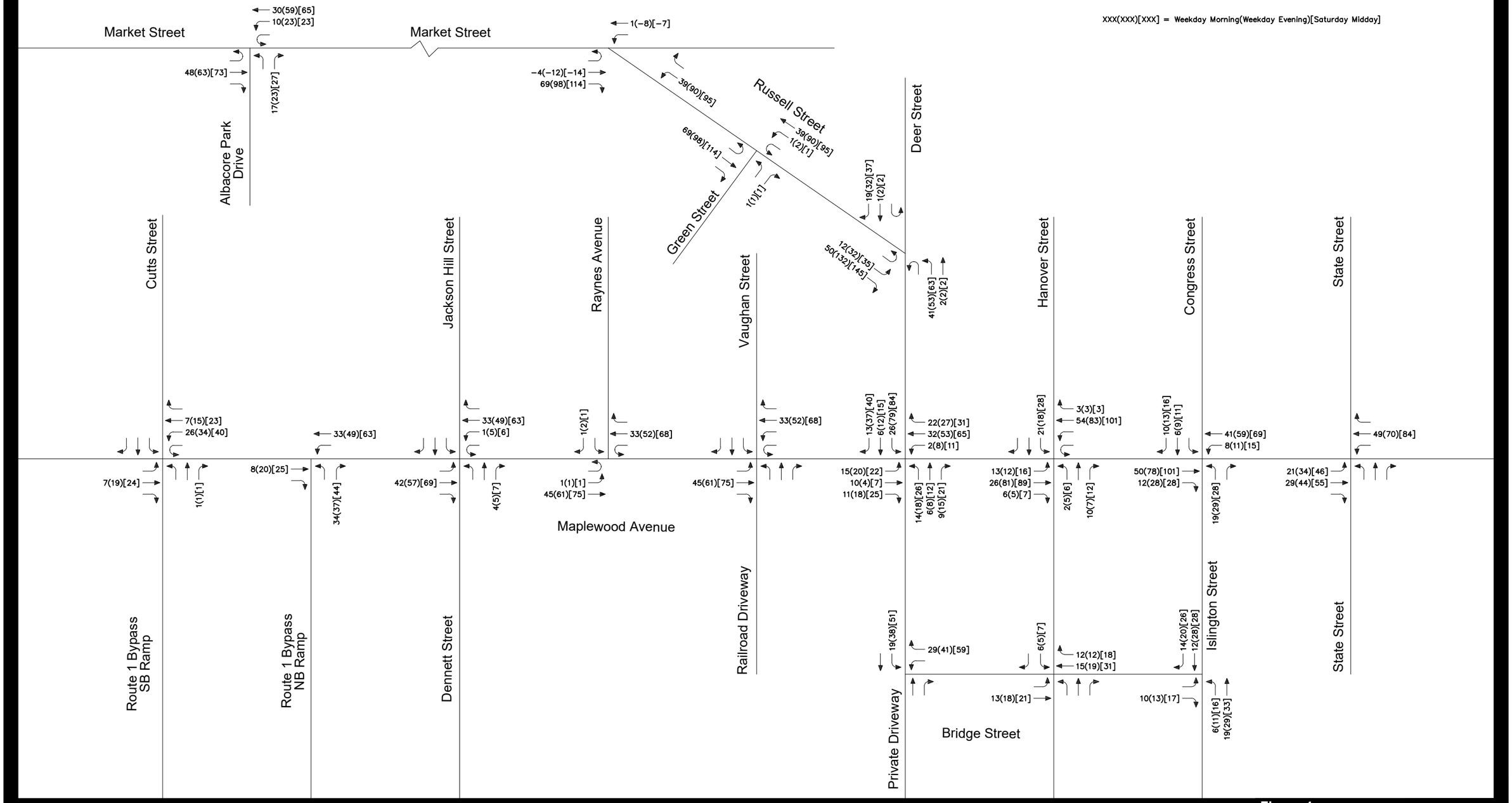
Redistribution of US 1 Bypass Traffic (Sarah Long Bridge Closure) Peak Hour Traffic Volumes Adjustments

NOT TO SCALE

Deer Street Parking Garage & Deer Street Development - Portsmouth, New Hampshire

Traffic Impact and Access Study

XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON-STREET PARKING

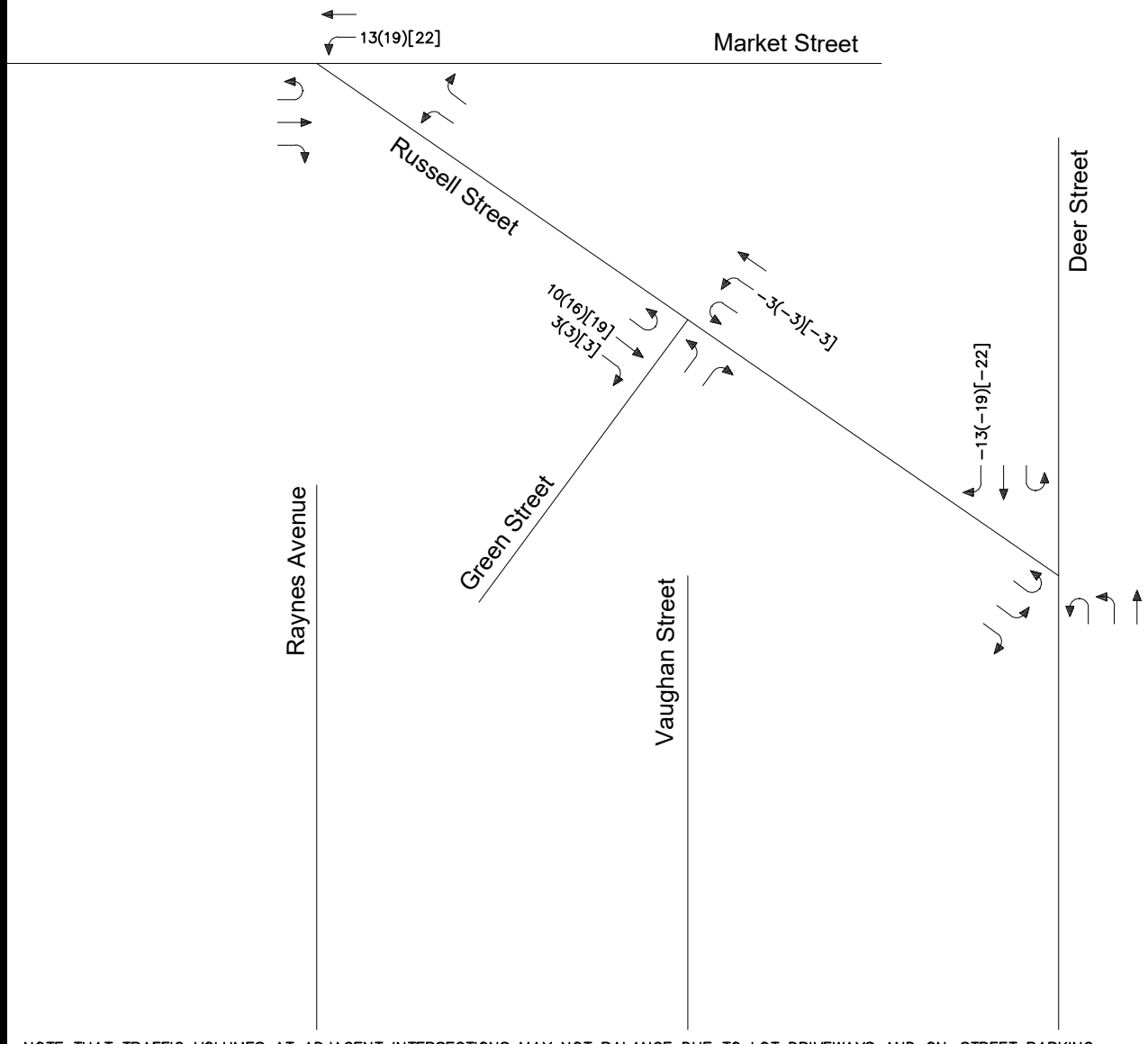
Figure 4

Specific Developments by Others
Peak Hour Traffic Volumes

*SEE APPENDIX G FOR DETAILS TRIP SUMMARIES FOR EACH DEVELOPMENTS

TEC, Inc.
65 Glenn Street | 169 Ocean Blvd, Unit 101
Lawrence, MA 01843 | Hampton, NH 03842
(978) 794.1792 | (603) 601.8154
www.TheEngineeringCorp.com

Not to Scale



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON-STREET PARKING

XXX(XXX)[XXX] = WEEKDAY MORNING PEAK HOUR(WEEKDAY EVENING PEAK HOUR)[SATURDAY MIDDAY PEAK HOUR]

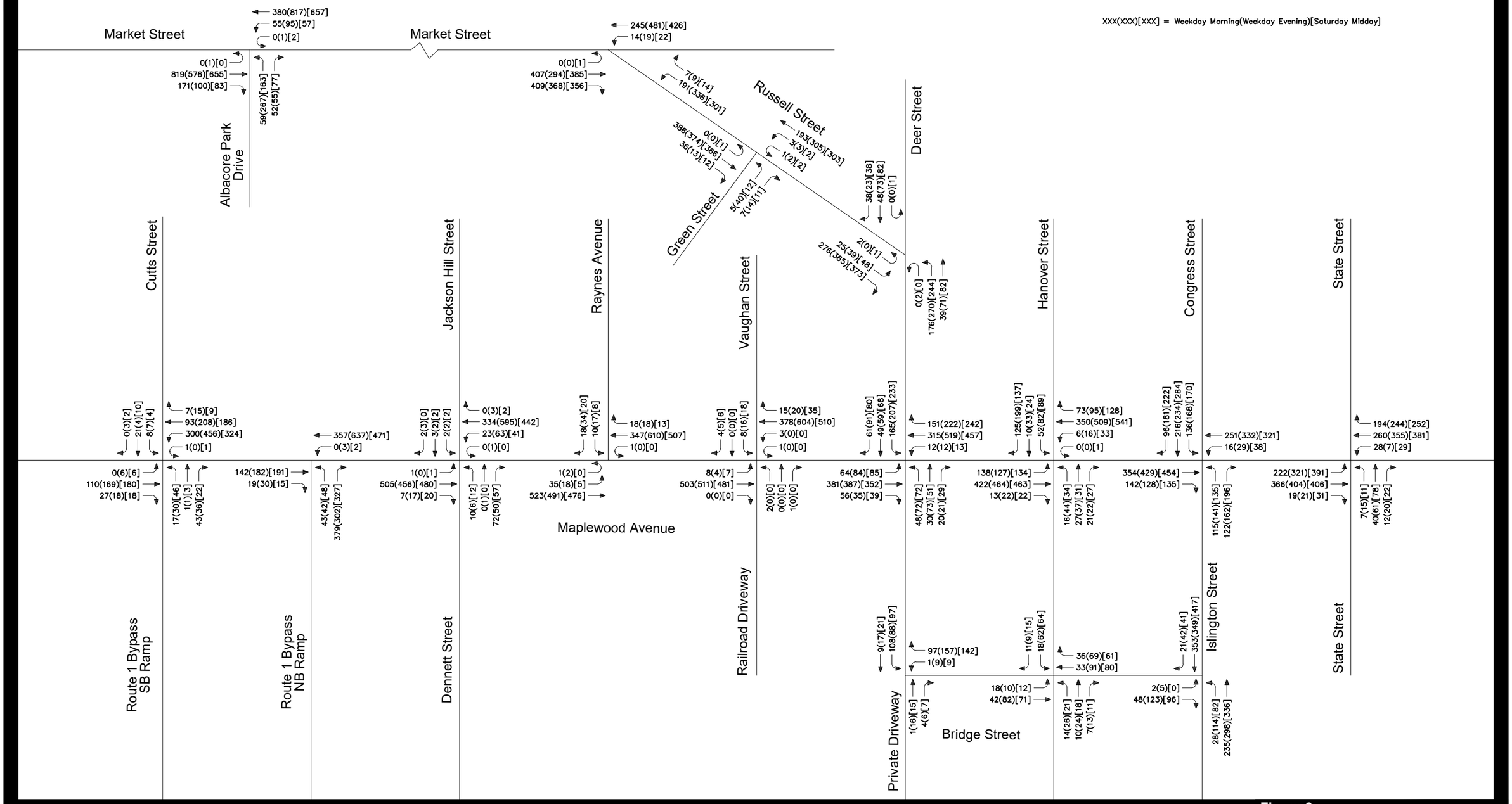
Figure 5

Redistribution of Market Street Roundabout Traffic - Peak Hour Traffic Volumes Adjustment

TEC, Inc.
65 Glenn Street | 169 Ocean Blvd, Unit 101
Lawrence, MA 01843 | Hampton, NH 03842
(978) 794.1792 | (603) 601.8154
www.TheEngineeringCorp.com

NOT TO SCALE

XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON-STREET PARKING

Figure 6

2018 Opening Year No-Build Condition Peak Hour Traffic Volumes

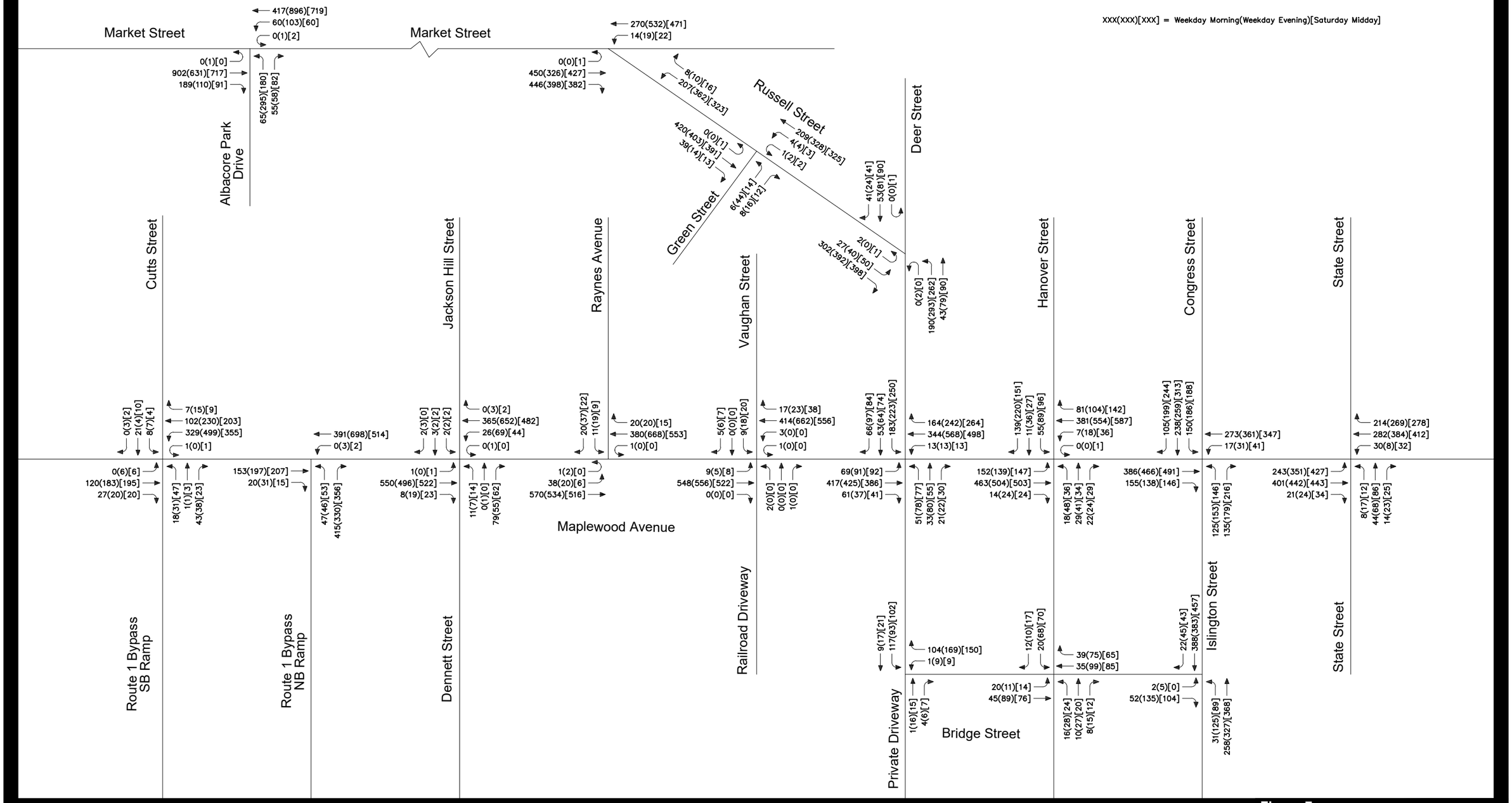
TEC, Inc.
65 Glenn Street | Lawrence, MA 01843 | (978) 794.1792
169 Ocean Blvd, Unit 101 | Hampton, NH 03842 | (603) 601.8154
www.TheEngineeringCorp.com

NOT TO SCALE

Deer Street Parking Garage & Deer Street Development - Portsmouth, New Hampshire

Traffic Impact and Access Study

XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON-STREET PARKING

Figure 7

2028 Future Year No-Build Condition Peak Hour Traffic Volumes

TEC, Inc.
65 Glenn Street, Lawrence, MA 01843, (978) 794.1792
169 Ocean Blvd, Unit 101, Hampton, NH 03842, (603) 601.8154
www.TheEngineeringCorp.com

Removal of Existing Tenant Traffic

Existing structures and multiple tenants still occupy the project site, including:

- Eddie B's Comfort Food and BBQ / Gary's Beverages (#165 Deer Street) – consists of a one-story 7,172 SF building. *[currently vacant]*
- Open Warehouse (#165 Deer Street) – consists of a one-story 3,300 SF warehousing building. *[currently vacant]*
- Eastern Bank (#163 Deer Street) – consists of a two-story 4,500 SF drive-in bank w/ 3,000 SF for banking services; *[currently occupied]*
- Wells Fargo / Studio 139 Frame Shop / Harbor EyeCare Center (#157-#159 Deer Street – consists of a one-story 7,200 SF multi-tenant commercial building; *[Approximately 5,400 SF currently occupied]*

The trips associated with the current land uses were removed from the study area intersection network. The site-generated traffic-volumes for these uses were estimated based on standard trip rates published in the Institute of Transportation Engineers (ITE) publication *Trip Generation, 9th Edition* for Land Use Code (LUC) 826 – Specialty Retail Center and LUC 912 – Drive-In Bank. No credit was taken for the existing multi-family homes with access to Hill Street because of the low trip characteristics. The removal of existing trips was based upon the existing traffic patterns within the study area, similar to the proposed retail distribution described in this chapter.

The resulting 'Removal of Existing Tenant Traffic' site-generated traffic-volume networks for the weekday morning, weekday evening, and Saturday peak periods are presented in Figure 8.

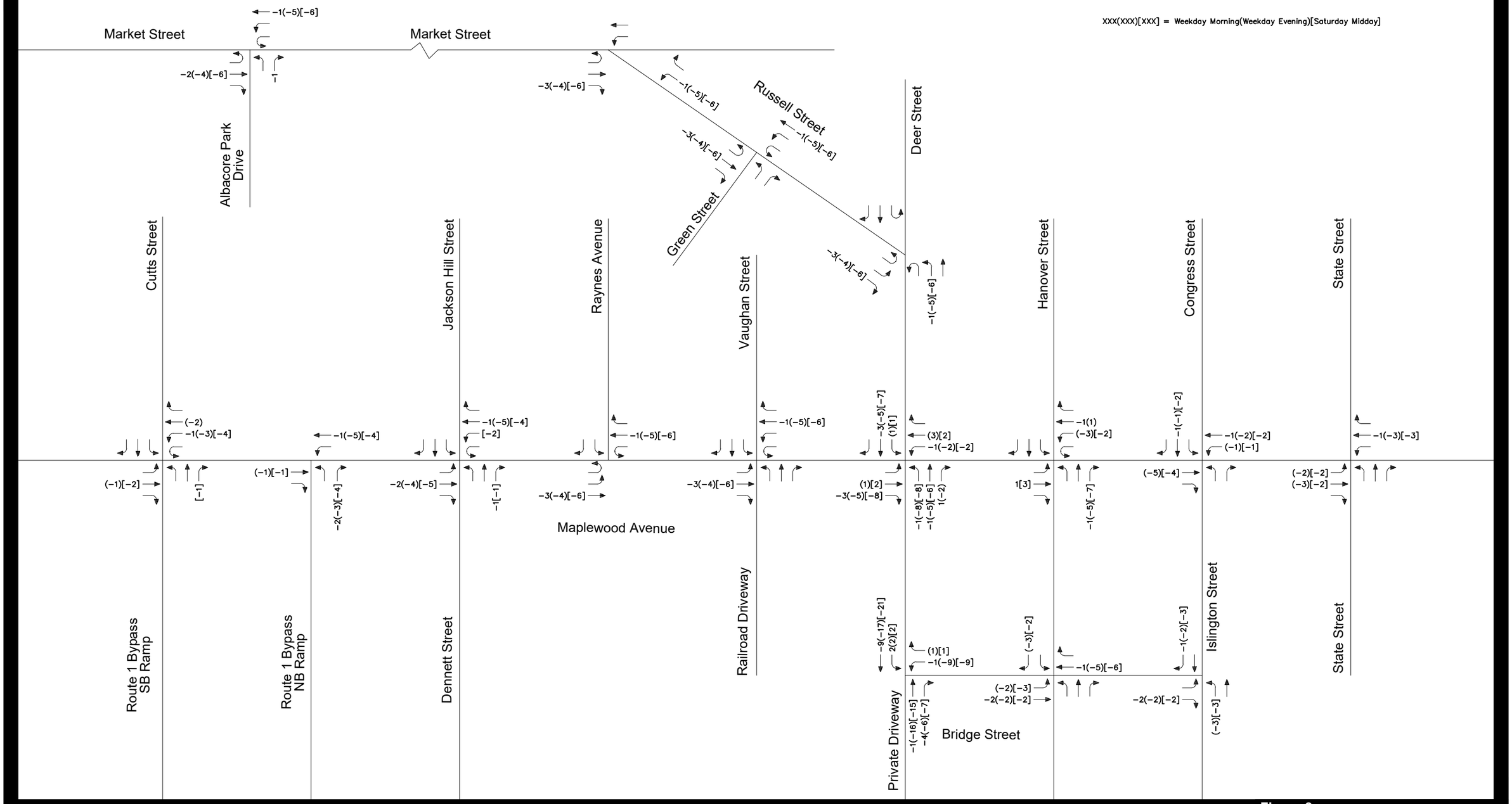
Site-Generated Traffic Volumes

The combined project consists of razing the existing structures on-site and constructing a 600-stall municipal public parking garage with 4,700 SF of integral retail; and four mixed-use buildings proposed by Deer Street Associates. The four mixed-use buildings include a combination of 80 residential apartments, 108 hotel rooms, 41,281 SF of office, 19,969 SF of retail, 9,859 SF of restaurants, a 4,648 SF bar, and a 2,702 SF bank. An illustration of the multi-phased development is presented in Figure 9.

The Project is to be constructed as part of a phased building approach. Each phase is intended to build upon each other and commences with the City's construction of the proposed parking garage. The following summarizes the building program by phase for the project:

NOT TO SCALE

XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON-STREET PARKING

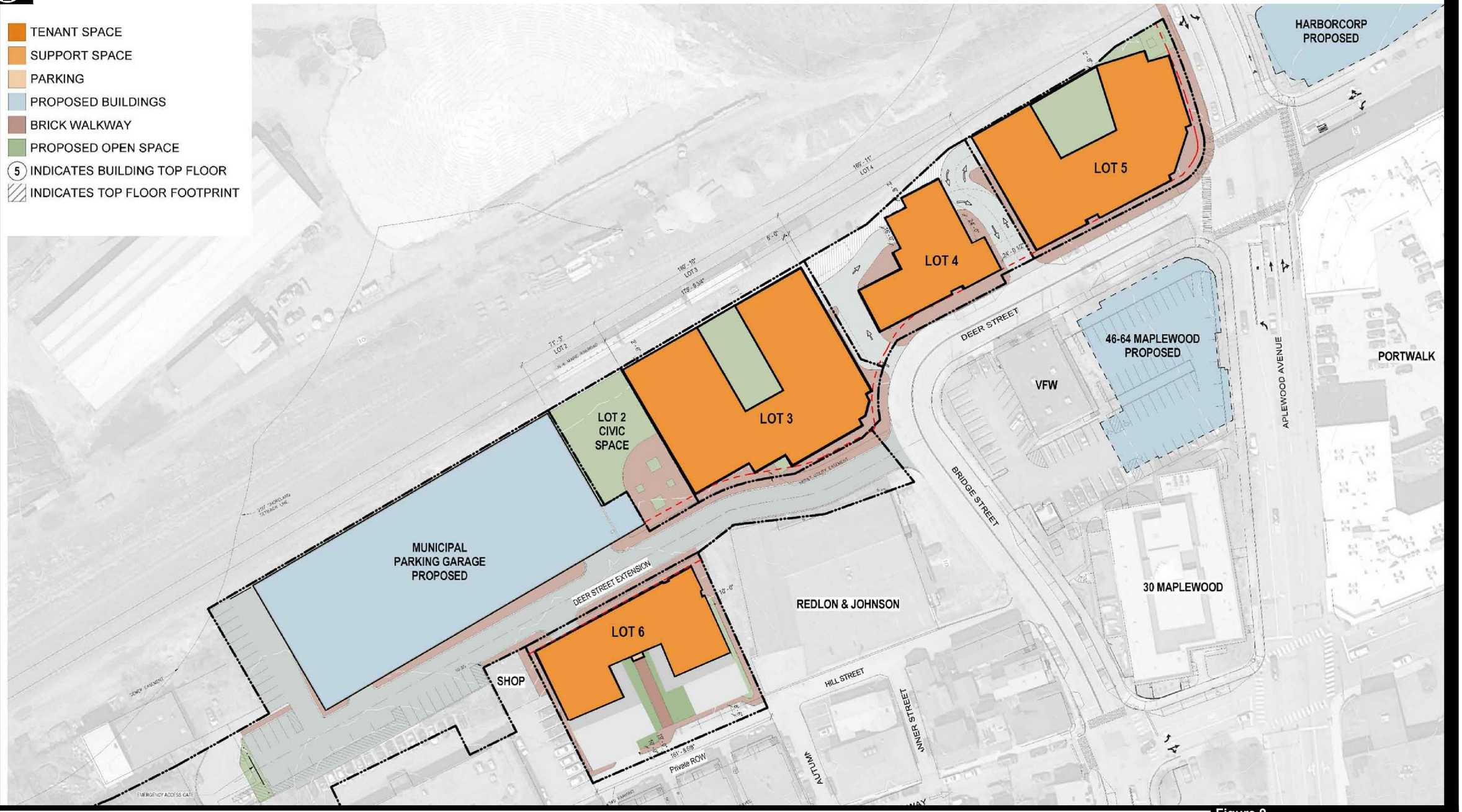
TEC, Inc.
65 Glenn Street | 169 Ocean Blvd, Unit 101
Lawrence, MA 01843 | Hampton, NH 03842
(978) 794.1792 | (603) 601.8154
www.TheEngineeringCorp.com

Figure 8

Removal of Existing Tenant Traffic
Peak Hour Traffic Volumes Adjustment

North **Not To Scale**

- TENANT SPACE
- SUPPORT SPACE
- PARKING
- PROPOSED BUILDINGS
- BRICK WALKWAY
- PROPOSED OPEN SPACE
- (5) INDICATES BUILDING TOP FLOOR
- INDICATES TOP FLOOR FOOTPRINT



TEC
TEC, Inc.
65 Glenn Street
Lawrence, MA 01843
(978) 794.1792
169 Ocean Blvd, Unit 101
Hampton, NH 03842
(603) 601.8154
www.TheEngineeringCorp.com

Prepared By JSA ARCHITECTS INTERIORS PLANNERS

Figure 9

Proposed Site Layout

Date: 10/04/2016

City of Portsmouth Public Parking Garage – Phase 1

The first phase of development, which may be constructed concurrently with other phases, consists of the construction of the City's Deer Street Parking Garage. The parking garage will serve as the second multi-story parking garage within Downtown Portsmouth to complement the High-Hanover Parking Garage. The new 600-stall parking garage will be owned and operated by the City of Portsmouth. Traffic to be generated by the parking garage is anticipated to be a combination of four sources; including:

- Existing parking trips currently accessing/egressing Downtown Portsmouth for parking at the High-Hanover Parking Garage along Hanover Street that would redistribute to the Deer Street Parking Garage for convenience of access and general parking availability. TEC, after coordination with the City's Parking Director, has assumed that 250 existing parked vehicles would migrate to the proposed Deer Street Parking Garage;
- Contracted parking currently provided on a wait-list for the High-Hanover Parking Garage. TEC has added trips assuming the designation of 50 proposed parking spaces within the proposed Deer Street Parking Garage associated with entities currently on the wait-list;
- Projected traffic-growth as a result of new available parking within Downtown Portsmouth. TEC has assumed that general background growth resulting from specific developments by others within Downtown and the availability of covered-structured parking will compel a migration of existing and new traffic to the parking facility. For the purposes of this study, TEC and the City have determined that 40 percent of the remaining non-redistributed or non-contracted parking supply, or 120 parking spaces, would generally be occupied during a typical day; and
- A percentage of traffic from the proposed DSA Development project development as part of Phases 2 through 4. These trips are further described in the subsequent section and were not superimposed on the traffic network as part of Phase 1.

The number of trips expected to be generated by the 420 parked vehicles (250 redistributed spaces from High Hanover Parking Garage, 50 wait-list contracted spaces, and 120 parking spaces for general background growth) was calculated based on a proportion of entering and exiting vehicle trips during the weekday morning, weekday evening, and Saturday midday peak hours as seen in gate traffic for the multiple driveways at the High-Hanover Parking Garage on multiple days in July and August 2016. Gate traffic counts from the High-Hanover Parking Garage are provided in Appendix H.

In addition to the general parking use, the City is proposing to include up to 4,700 SF of specialty retail space. The site-generated traffic-volumes for the project were estimated based on standard trip rates published in the Institute of ITE publication *Trip Generation, 9th Edition*

for LUC 826 – Specialty Retail Center. Based on information contained in the ITE publication *Trip Generation Handbook, 3rd Edition*, for LUC 820 – Shopping Center, approximately 26 to 34 percent of retail traffic is expected to be pass-by traffic[13]. Table 5 provides a summary of the site generated traffic associated with the Deer Street Parking Garage as part of Phase 1. In this situation, the pass-by traffic will be from motorists coming to the parking garage to park and then using the retail space.

Table 5 – Deer Street Parking Garage – Phase 1 Trip Generation Summary

Time Period / Direction	Parking Garage	Specialty Retail[a]	Pass-by Trips[b]	Total Trips
Weekday Daily	987	140	48	**1,175**
Weekday Morning Peak Hour				
Enter	98	1	1	**100**
Exit	6	1	1	**8**
Total	104	2	2	**108**
Weekday Evening Peak Hour				
Enter	40	4	1	**45**
Exit	74	5	1	**80**
Total	114	9	2	**125**
Saturday Daily	1,244	134	46	**1,424**
Saturday Midday Peak Hour				
Enter	40	7	3	**50**
Exit	20	7	3	**30**
Total	60	14	6	**80**

[a] *Assumes transit, walking, bicycle credit subtracted from retail total*
[b] *Pass-by trips represent 34 percent of retail trips during evening peak and 26 percent during all other periods.*

Access and egress to the parking garage will be provided along the proposed Deer Street Extension, proposed as a two-way roadway with one lane in each direction. The current site plans depict a garage access point at each end of the parking garage. Deer Street Extension will also provide direct full-access/egress to the DSA's Lot 6.

The Removal of High-Hanover Parking Garage traffic during the weekday morning, weekday evening, and Saturday peak periods is illustrated in Figure 10. The resulting Deer Street Parking Garage – Phase 1 site-generated traffic-volume networks during the weekday morning, weekday evening, and Saturday peak periods are presented in Figure 11 (A through C).

TEC did not assess any trip credit for a potential reduction in downtown traffic associated with motorists that may no longer recirculate along the network of streets seeking a parking stall because the High-Hanover Parking Garage was not at-capacity at the time of the traffic count program in October 2016.

[13] Source: *Trip Generation Handbook, 3rd Edition*; Institute of Traffic Engineers; Washington D.C.; 2014

Potential Full-Occupancy of Deer Street Parking Garage

The trip generation utilized to project traffic volumes to/from the proposed Deer Street Parking Garage on a typical weekday and Saturday assume an occupancy rate of approximately 70 percent; including redistributed spaces from High Hanover Parking Garage, wait-list contracted spaces, and parking spaces for general background growth. Table 6 provides a proportional trip comparison of the parking garage operating under 100 percent occupancy versus the anticipated 70 percent occupancy depicted in Table 5. It is important to note that upon the construction and of the proposed DSA Development Phases 2 through 4, a portion of the site generated traffic will utilize the parking garage, appropriating more of the unoccupied spaces in the parking garage.

Over time, other new development projects may utilize the parking garage on a regular basis increasing the baseline occupancy characteristics; those future (yet to be defined) projects should be reviewed for both parking and traffic impacts as part of project permitting. Assuming the maximum trip generation characteristics, the assumed full occupancy of the parking garage would result in approximately one additional vehicle entering or exiting the parking garage every minute during the peak hours.

Table 6 – Parking Garage Occupancy & Trip Comparison

Time Period / Movement	New Normal Occupancy Trips[a]	New Full Occupancy Trips	Net Increase
Weekday Daily	987	2,467	1,480
Weekday Morning Peak Hour			
Enter	98	110	12
Exit	6	7	1
Total	104	117	13
Weekday Evening Peak Hour			
Enter	40	84	44
Exit	74	94	20
Total	114	178	64
Saturday Daily	1,244	3,111	1,867
Saturday Midday Peak Hour			
Enter	40	69	29
Exit	20	37	17
Total	60	106	46

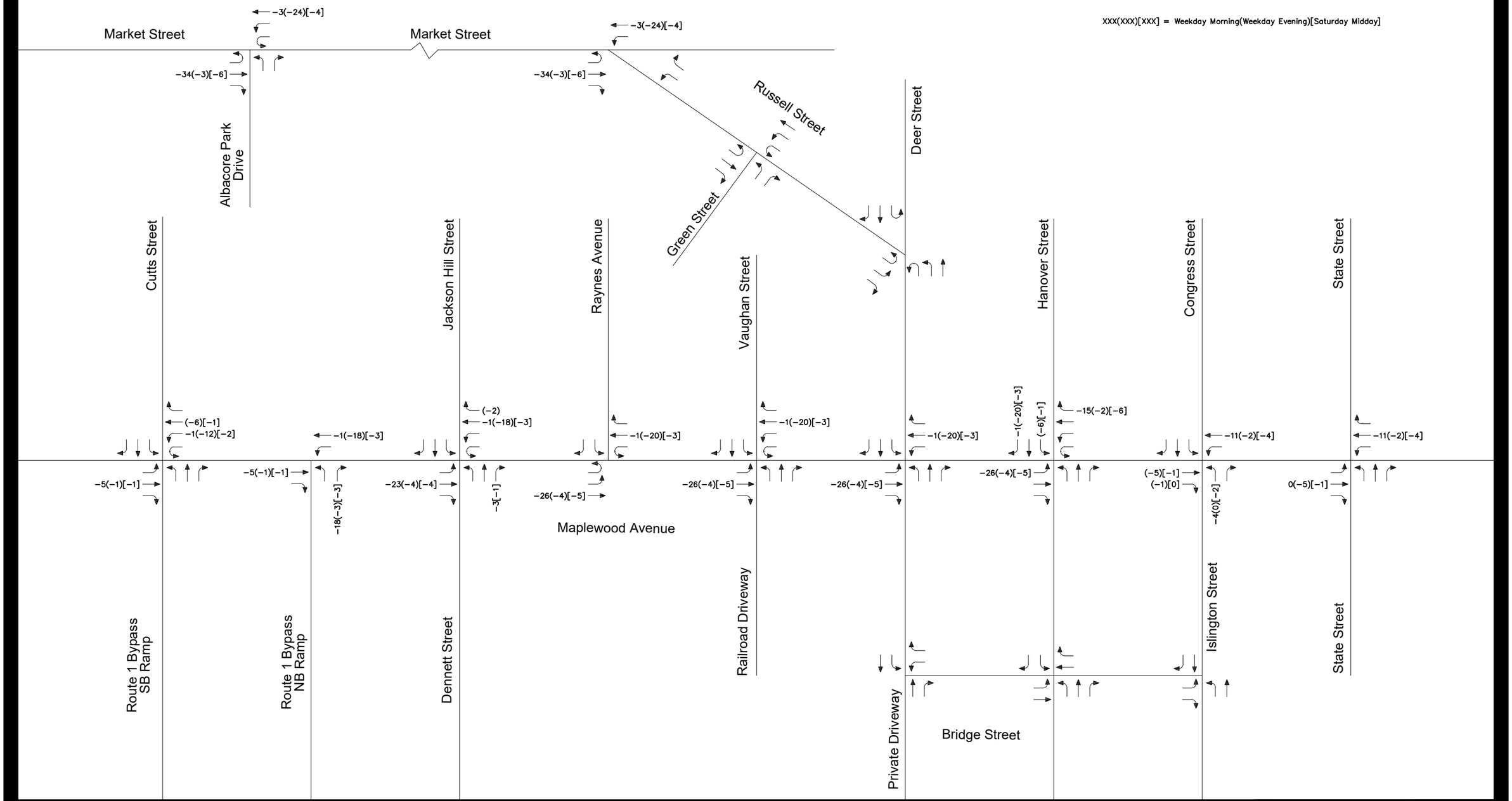
[a] *From Table 5*

Phase 1 Build Traffic Volumes

The Phase 1 trips associated with the City's construction of the new parking garage are overlaid onto the 2018 and 2018 No-Build conditions and assume the removal of trips for the existing on-site tenants, the adjustment of trips to be redistributed from the High-Hanover Public Parking Garage, and the addition of other baseline parking garage-generating traffic. The resulting 2018 Opening Year and 2028 Future Year Build - Phase 1 weekday morning, weekday evening, and Saturday midday peak-hour traffic-volume networks are presented in Figure 12 and Figure 13, respectively.

NOT TO SCALE

XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON-STREET PARKING

Figure 10

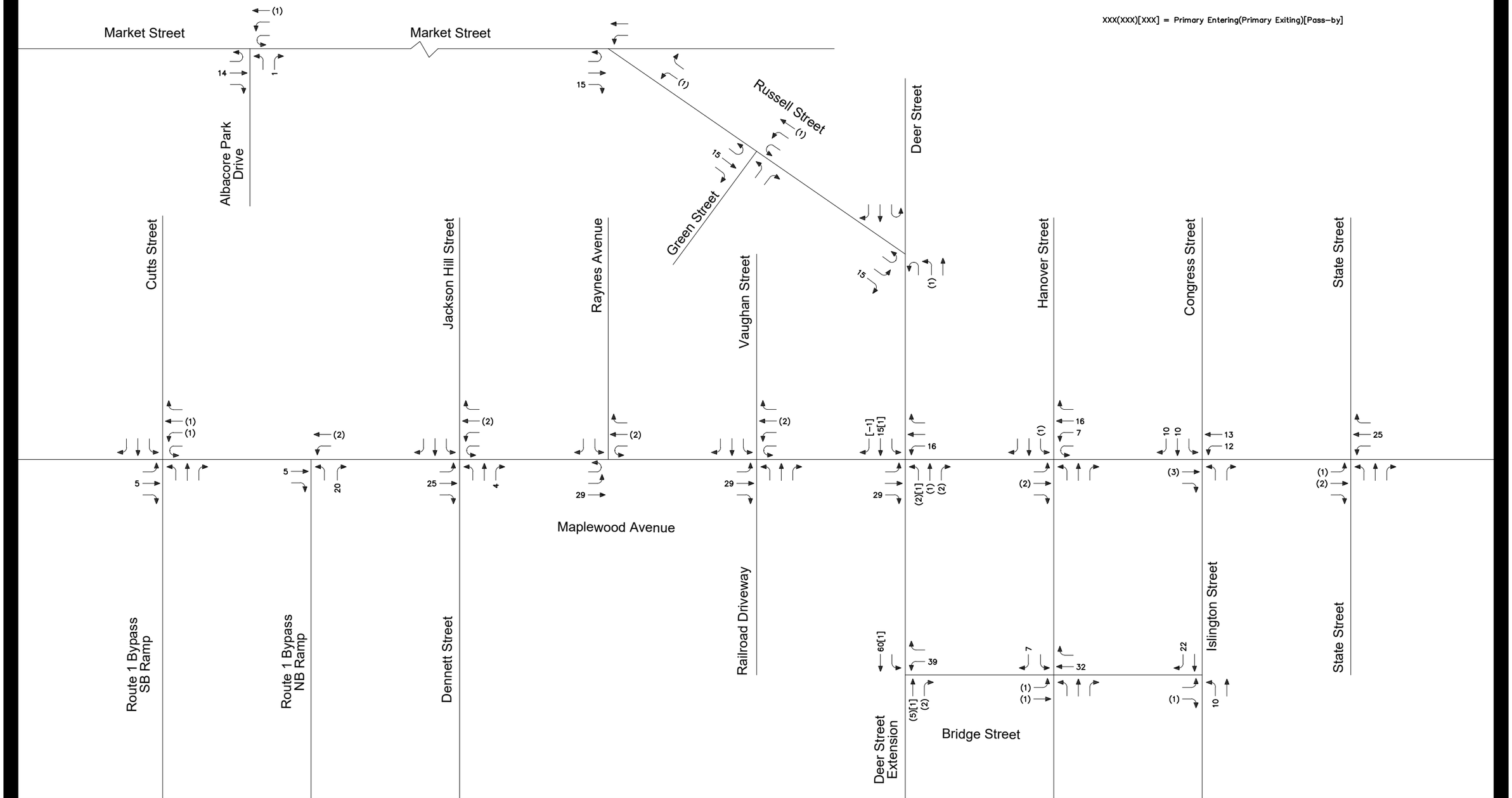
Redistribution of Existing High-Hanover Parking Garage Traffic Peak Hour Traffic Volumes Adjustment

TEC, Inc.
65 Glenn Street, Lawrence, MA 01843, (978) 794.1792
169 Ocean Blvd, Unit 101, Hampton, NH 03842, (603) 601.8154
www.TheEngineeringCorp.com

NOT TO SCALE

Deer Street Parking Garage & Deer Street Development - Portsmouth, New Hampshire
Traffic Impact and Access Study

XXX(XXX)[XXX] = Primary Entering(Primary Exiting)[Pass-by]



TEC, Inc.
65 Glenn Street | Lawrence, MA 01843 | (978) 794.1792
169 Ocean Blvd, Unit 101 | Hampton, NH 03842 | (603) 601.8154
www.TheEngineeringCorp.com

Figure 11A

Phase 1: Deer Street Parking Garage
Site Generated Trip Assignment
Weekday Morning
Peak Hour Traffic Volumes

NOT TO SCALE

XXX(XXX)[XXX] = Primary Entering(Primary Exiting)[Pass-by]

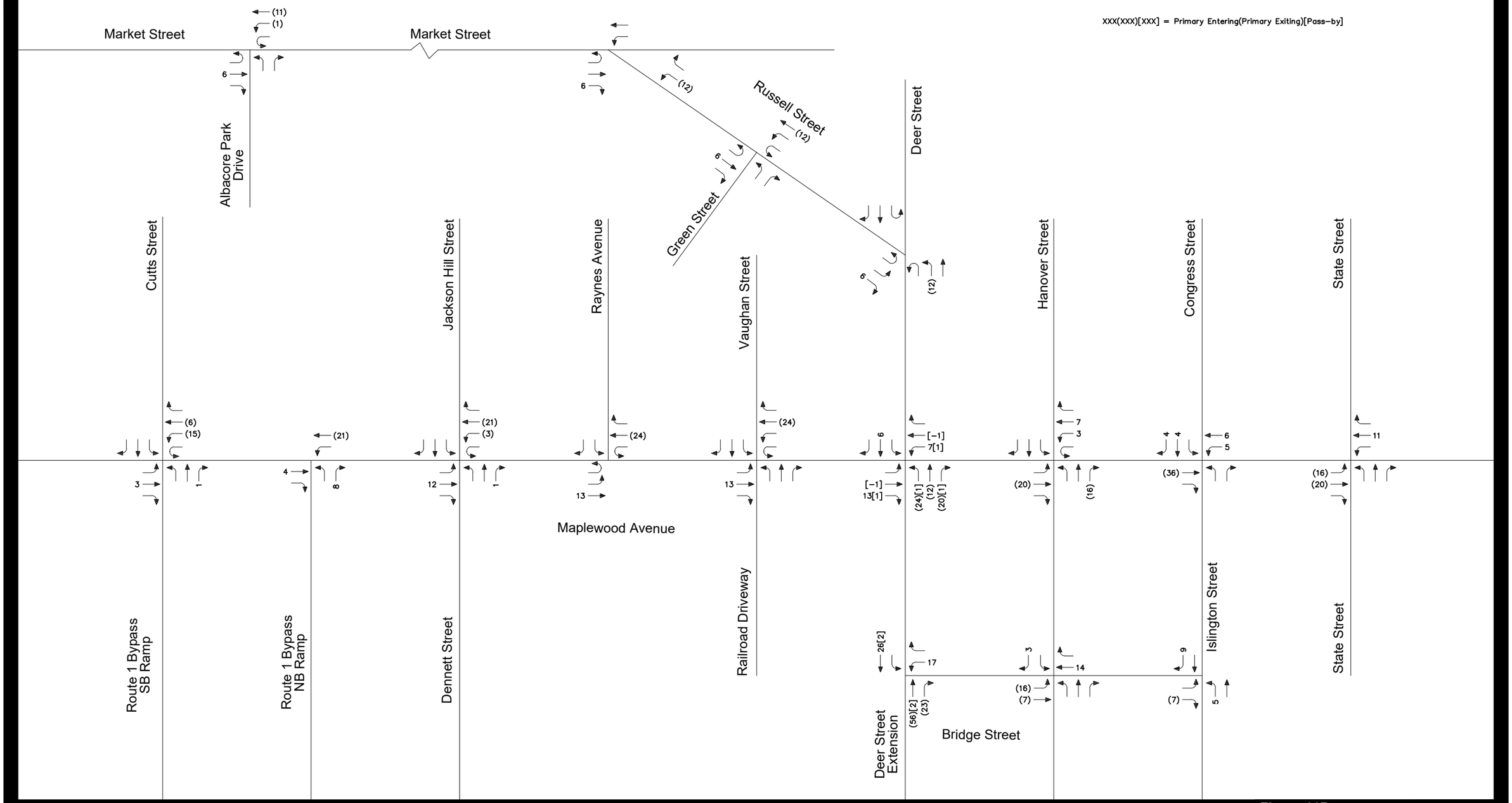


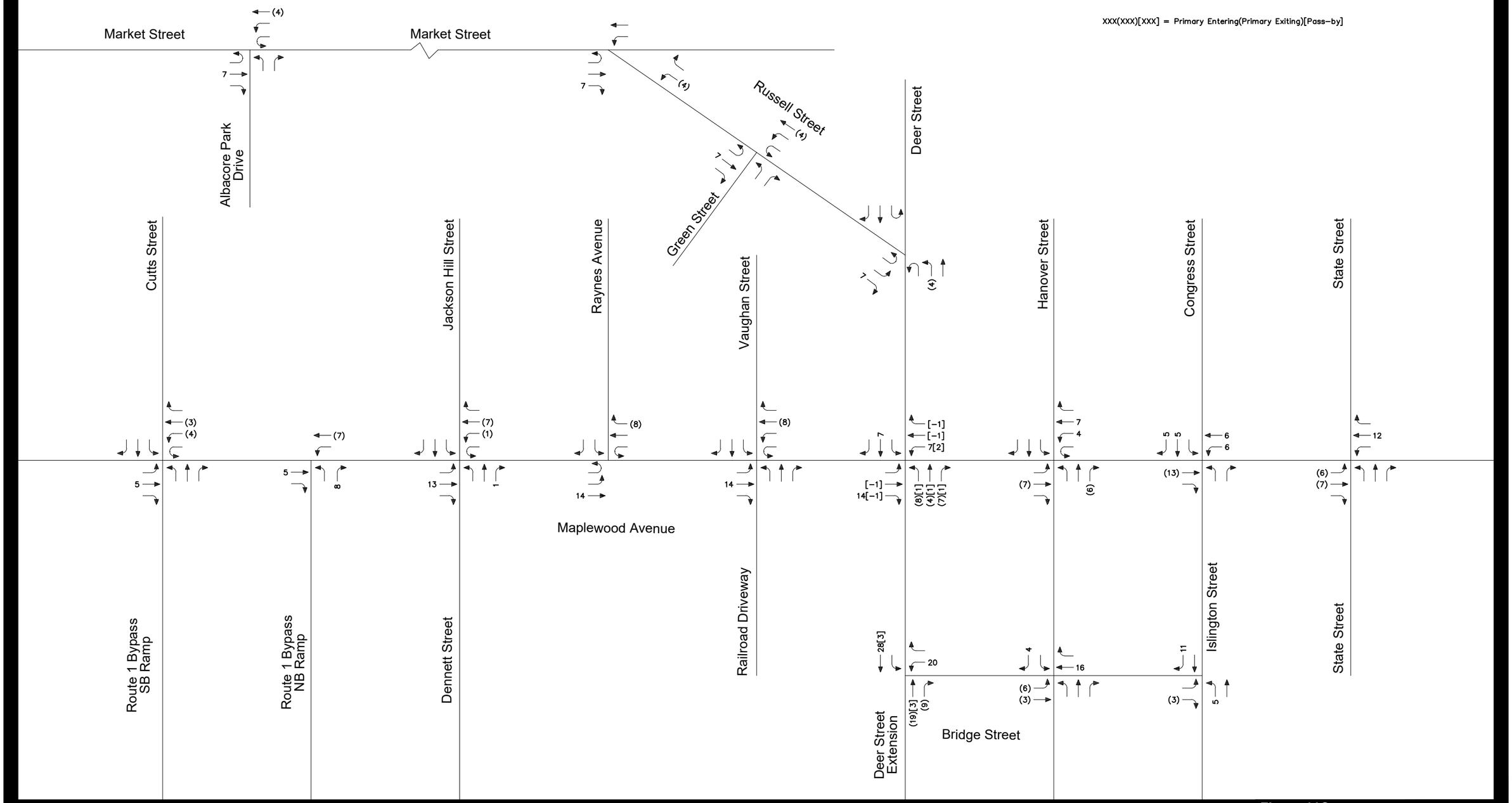
Figure 11B

Phase 1: Deer Street Parking Garage
Site Generated Trip Assignment
Weekday Evening
Peak Hour Traffic Volumes

TEC, Inc.
65 Glenn Street
Lawrence, MA 01843
(978) 794.1792
169 Ocean Blvd, Unit 101
Hampton, NH 03842
(603) 601.8154
www.TheEngineeringCorp.com

NOT TO SCALE

XXX(XXX)[XXX] = Primary Entering(Primary Exiting)[Pass-by]



TEC, Inc.
65 Glenn Street
Lawrence, MA 01843
(978) 794.1792
169 Ocean Blvd, Unit 101
Hampton, NH 03842
(603) 601.8154
www.TheEngineeringCorp.com

Figure 11C

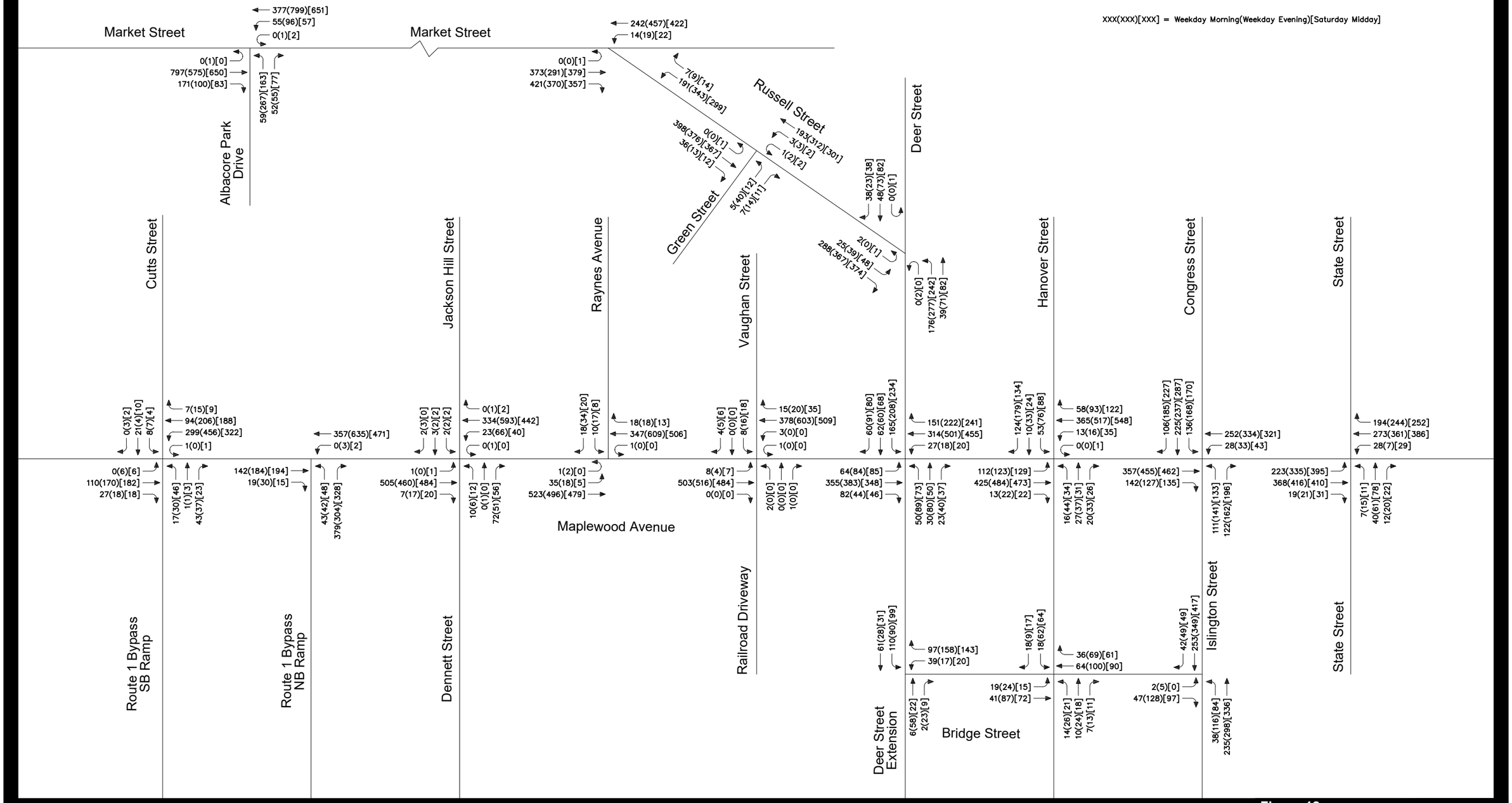
Phase 1: Deer Street Parking Garage
Site Generated Trip Assignment
Saturday Midday
Peak Hour Traffic Volumes

NOT TO SCALE

Deer Street Parking Garage & Deer Street Development - Portsmouth, New Hampshire

Traffic Impact and Access Study

XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON-STREET PARKING

Figure 12

2018 Opening Year Build Condition
Phase 1: Deer Street Parking Garage
Peak Hour Traffic Volumes

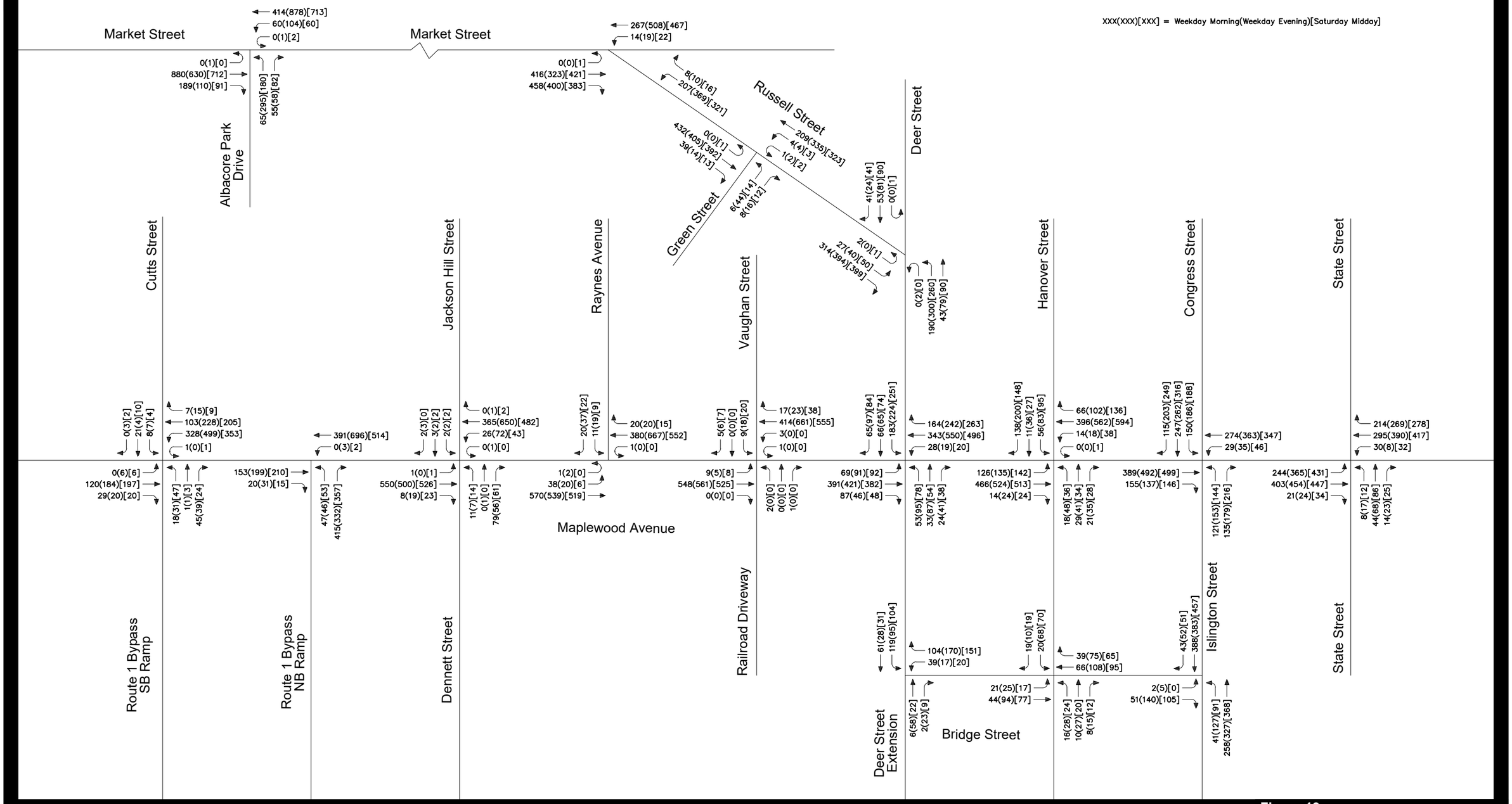
TEC, Inc.
65 Glenn Street, Lawrence, MA 01843, (978) 794.1792
169 Ocean Blvd, Unit 101, Hampton, NH 03842, (603) 601.8154
www.TheEngineeringCorp.com

NOT TO SCALE

Deer Street Parking Garage & Deer Street Development - Portsmouth, New Hampshire

Traffic Impact and Access Study

XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON-STREET PARKING

Figure 13

2028 Future Year Build Condition
Phase 1: Deer Street Parking Garage
Peak Hour Traffic Volumes

TEC, Inc.
65 Glenn Street, Lawrence, MA 01843, (978) 794.1792
169 Ocean Blvd, Unit 101, Hampton, NH 03842, (603) 601.8154
www.TheEngineeringCorp.com

Deer Street Associates Development - Phase 2 through 4

Phases 2 through 4 of the DSA private development project, which may be partially constructed concurrent with Phase 1, consists of the construction of four mixed-use buildings with 80 residential apartments, 108 hotel rooms, 41,281 SF of office, 19,969 SF of retail, 9,859 SF of restaurants, a 4,648 SF bar, and a 2,702 SF bank. A limited parking supply will be provided within parts of the development within the proposed building structures. The following summarizes the building program by phase for DSA's private development proposal:

- *Phase 2* - Lot 6 Building – 1,776 SF of retail space, 4,424 SF of general office space, 34 dwelling units, and 24,500 SF for associated in-building parking.
- *Phase 3* - Lot 3 Building – 4,379 SF of retail space, 2,334 SF of restaurant space, 4,648 SF of bar space, a 108-room hotel, 1 dwelling unit, and 11,936 SF of in-building parking; and Lot 2 - comprised of civic use space and is not anticipated to generate any trips.
- *Phase 4* - Lot 4 Building – 19,583 SF of retail space and 7,525 SF of general office space; and Lot 5 Building – 13,814 SF of retail space, 17,274 SF of general office space, a 2,702 SF bank, 45 dwelling units, and 17,906 SF of in-building parking.

For the purposes of this study, TEC has combined DSA Development phases, Phases 2 through 4, as one combined analysis condition. Additional analyses for each individual phase are provided in Appendix K. The site-generated traffic volumes for the project were estimated based on standard trip rates published in the Institute of ITE publication *Trip Generation, 9th Edition* for LUC 220 – Apartment, LUC 310 – Hotel, LUC 710 – General Office Building, LUC 820 – Shopping Center, LUC 826 – Specialty Retail Center, LUC 912 – Drive-In Bank, LUC 925 – Drinking Place, and LUC 932 High-Turnover (Sit-Down) Restaurant.

Internal Capture

It is reasonable to expect that some trips generated by the proposed development will be shared between multiple tenants on the site. For example, someone living in the apartments may choose to shop in the retail or eat at the restaurant. Therefore, a reduction in the overall trips experienced on the adjacent roadways can be anticipated as a result of mixed-use trips that include stops at more than one use on site. Based on information contained in the ITE publications *Trip Generation Handbook, 2nd / 3rd Editions*, mixed-use trips were assigned between the several residential, retail, office, hotel, and restaurant land uses and between each specific phased structure. The mixed-use trip generation worksheets are included in Appendix H.

Based on the mixed-use trip generation calculation sheet provided in Appendix H, the overall internal capture rates were calculated at 6 percent for the weekday morning peak hour, 21 percent for the weekday evening peak hour, and 10 percent for the Saturday midday peak hour. Knowing that Downtown Portsmouth is a regional destination with a myriad of other retail and restaurant uses, and recreational and cultural experiences, the shared trip credit may be higher.

Transit Trips

COAST and UNH provide convenient bus service in close proximity to the site frontage with bus stops along Maplewood Avenue and Islington Street. The availability of public transportation for access to the site will result in a reduction in the trips generated by passenger vehicles traveling to and from the site. The Proponent has committed to marketing the development to transit users and will post transit maps and schedules on-site and provide public transportation information to new tenants and residents upon move-in. Based on *2010-2014 American Community Survey 5-Year Estimates*[14] provided by the U.S. Census Bureau through the American FactFinder, 1.5 percent of Portsmouth residents utilize public transportation to commute to and from work. As such, TEC applied a 1.5 percent transit trip credit to the overall site trip generation. Although the U.S. Census is based upon Portsmouth residents, it is reasonable to assume that this development would generate a similar public transportation rate.

Walking and Bicycling Trips

The proposed Deer Street Development project is located in Downtown Portsmouth, within close proximity to multiple retail, restaurant, office, and commercial establishments. Sidewalks are provided along both sides of the majority of the streets in the surrounding area, and dedicated bicycle lanes are provided along some stretches of roadway as well. As a result, it is reasonable to expect that several of the trips to/from the site will be walking and cycling trips. Based on *2010-2014 American Community Survey 5-Year Estimates*, approximately 8 percent of Portsmouth residents walk or bicycle to/from work. As such, TEC applied an 8.0 percent walking and bicycling trip credit to the overall site trip generation. Although the U.S. Census is based upon Portsmouth residents, it is reasonable to assume that this development would generate a similar walking and cycling rate.

Pass-by Trips

Not all trips generated by the project will be new to the study area. Many of the trips generated by the proposed retail and restaurant are already present in the existing traffic flow passing by the site. For example, some vehicles which are already on the roadways may decide to visit the site on their way to another destination. These vehicle trips are known as "pass-by" trips and are subtracted from the total trips to calculate the total primary (or "new") trips that affect the volume of traffic within the study area away from the site. Based on information contained in the ITE publication *Trip Generation Handbook, 3rd Edition*, for LUC 820 – Shopping Center, approximately 26 to 34 percent of retail traffic is expected to be pass-by traffic[15]. Additionally, 43 percent of restaurant traffic is expected to be pass-by traffic, as classified under LUC 932 – High-Turnover (Sit-Down) Restaurant. Pass-by trip rates were not applied to office, hotel, or residential uses.

Table 7 provides a summary of the resulting trip generation estimate for the full build-out scenario. The detailed trip generation calculation worksheets are provided in Appendix H.

---

[14] U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates.

[15] Source: *Trip Generation Handbook, 3rd Edition*; Institute of Traffic Engineers; Washington D.C.; 2014

Table 7 – DSA Development - Full Build-Out Trip Generation Summary

Time Period / Direction	Phase 1 (Garage)	Phase 2 (DSA)	Phase 3 (DSA)	Phase 4 (DSA)	Total Trips	Transit Trips[a]	Walk / Bike Trips[b]	Mixed-Use Trips[c]	Pass-by Trips[d]	Primary Trips
Weekday Daily	1,195	352	1,680	2,674	5,901	72	394	592	696	**4,147**
Weekday Morning Peak Hour										
Enter	100	10	50	125	285	2	14	8	19	**242**
Exit	8	16	38	81	143	1	9	8	19	**106**
Total	108	26	88	206	428	3	23	16	38	**348**
Weekday Evening Peak Hour										
Enter	45	17	85	121	268	2	17	48	26	**175**
Exit	81	15	65	141	302	0	19	48	26	**209**
Total	126	32	150	262	570	2	36	96	52	**384**
Saturday Daily	1,442	302	2,040	2,384	6,168	74	394	392	782	**4,526**
Saturday Midday Peak Hour										
Enter	51	14	107	147	319	5	22	26	41	**225**
Exit	31	14	91	137	273	3	20	26	41	**183**
Total	82	28	198	284	592	8	42	52	82	**408**

[a] 1.5% transit trip credit applied to Phases 2-4.
[b] 8.0% walking / bicycling trip credit applied to Phases 2-4.
[c] 14%, 6%, 21%, 11%, and 10% multi-use trip credits applied to Phases 2-4 for weekday daily, weekday AM, weekday PM, Saturday daily, and Saturday midday peak hours.
[d] Pass-by trips represent 34 percent of retail trips during evening peak and 26 percent during all other periods; and 43 percent of restaurant trips for all periods.

Deer Street Associates Development Trip Distribution

The distribution of the retail-based site-generated traffic volumes for the Deer Street Development was based upon average traffic volumes at five (5) gateway locations into the Downtown Portsmouth roadway network: Maplewood Avenue, Market Street, Congress Street, Islington Street, and Middle Street. The resulting primary trip distribution is shown in Table 8.

Table 8 – Retail-Based Trip Distribution Summary

Direction	Entering %	Exiting %
Maplewood Ave to/from Northwest	30%	30%
Market St to/from Northwest	15%	15%
Congress St to/from Northeast	20%	20%
Islington St to/from Southwest	10%	10%
Middle St to/from South	25%	25%
Total	**100%**	**100%**

The distribution of the residential-based site-generated traffic volumes for the Deer Street Development was based upon Journey to Work data obtained from the United States Census Bureau, 2000. The resulting primary trip distribution is shown in Table 9.

Table 9 – Residential-Based Trip Distribution Summary

Direction	Entering %	Exiting %
Maplewood Ave to/from Northwest	55%	55%
Market St to/from Northwest	10%	10%
Congress St to/from Northeast	15%	15%
Islington St to/from Southwest	5%	5%
Middle St to/from South	15%	15%
Total	**100%**	**100%**

The distribution of the office-based site-generated traffic volumes for the Deer Street Development was based upon Journey to Home data obtained from the United States Census Bureau, 2000. The resulting primary trip distribution is shown in Table 10.

Table 10 – Office-Based Trip Distribution Summary

Direction	Entering %	Exiting %
Maplewood Ave to/from Northwest	60%	60%
Market St to/from Northwest	20%	20%
Congress St to/from Northeast	10%	10%
Islington St to/from Southwest	5%	5%
Middle St to/from South	5%	5%
Total	**100%**	**100%**

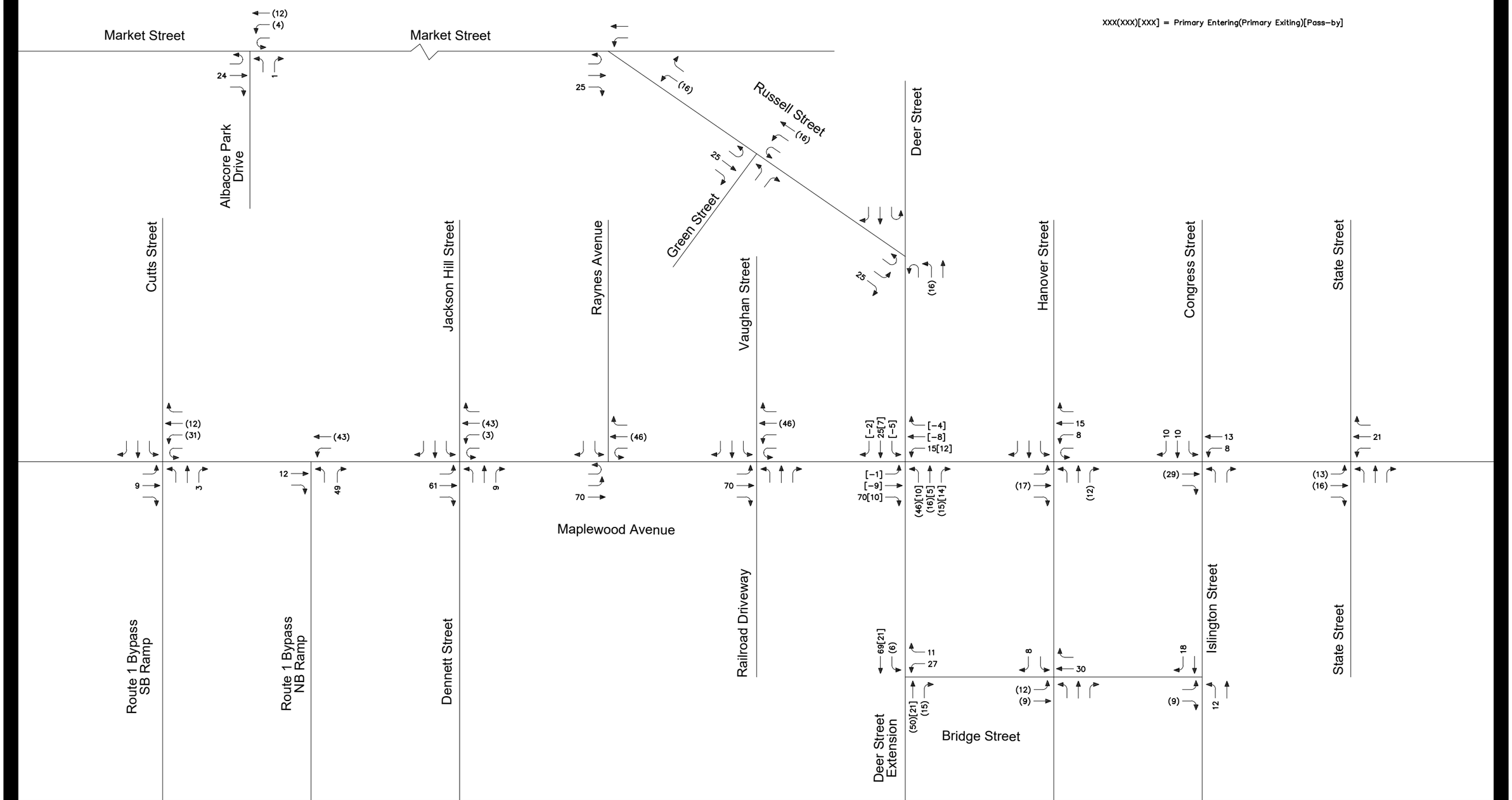
The resulting site-generated traffic-volume networks for the Deer Street Development during the weekday morning, weekday evening, and Saturday peak periods are presented in Figure 14 (A through C).

Phases 2-4 Build Traffic Volumes

The 2018 Opening Year and 2028 Future Year Build Condition - Phases 2 through 4 traffic-volume networks consist of the 2018 Opening Year and 2028 Future Year Build Phase 1 traffic volumes with the addition of the Phase 2 through 4 site-generated traffic. The resulting '2018 Opening Year- Phases 2 through 4' and '2028 Future Year Build - Phases 2 through 4' weekday morning, weekday evening, and Saturday midday peak-hour traffic-volume networks are presented in Figure 15 and Figure 16, respectively.

NOT TO SCALE

XXX(XXX)[XXX] = Primary Entering(Primary Exiting)[Pass-by]



TEC, Inc.
65 Glenn Street | 169 Ocean Blvd, Unit 101
Lawrence, MA 01843 | Hampton, NH 03842
(978) 794.1792 | (603) 601.8154
www.TheEngineeringCorp.com

Figure 14A

Phases 2-4: Total Deer Street Development
Site Generated Trip Assignment
Weekday Morning
Peak Hour Traffic Volumes

NOT TO SCALE

Deer Street Parking Garage & Deer Street Development - Portsmouth, New Hampshire

Traffic Impact and Access Study

XXX(XXX)[XXX] = Primary Entering(Primary Exiting)[Pass-by]

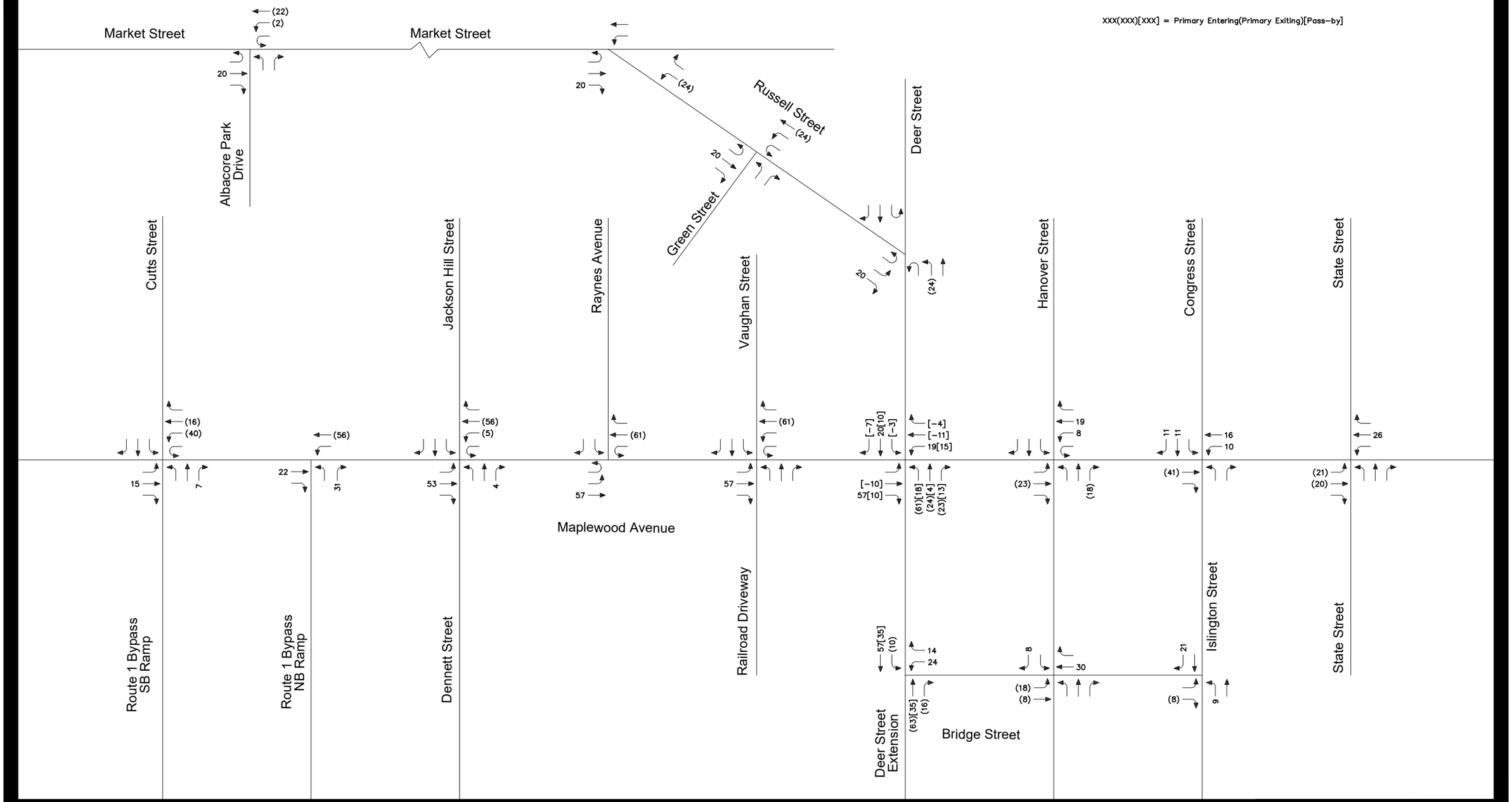


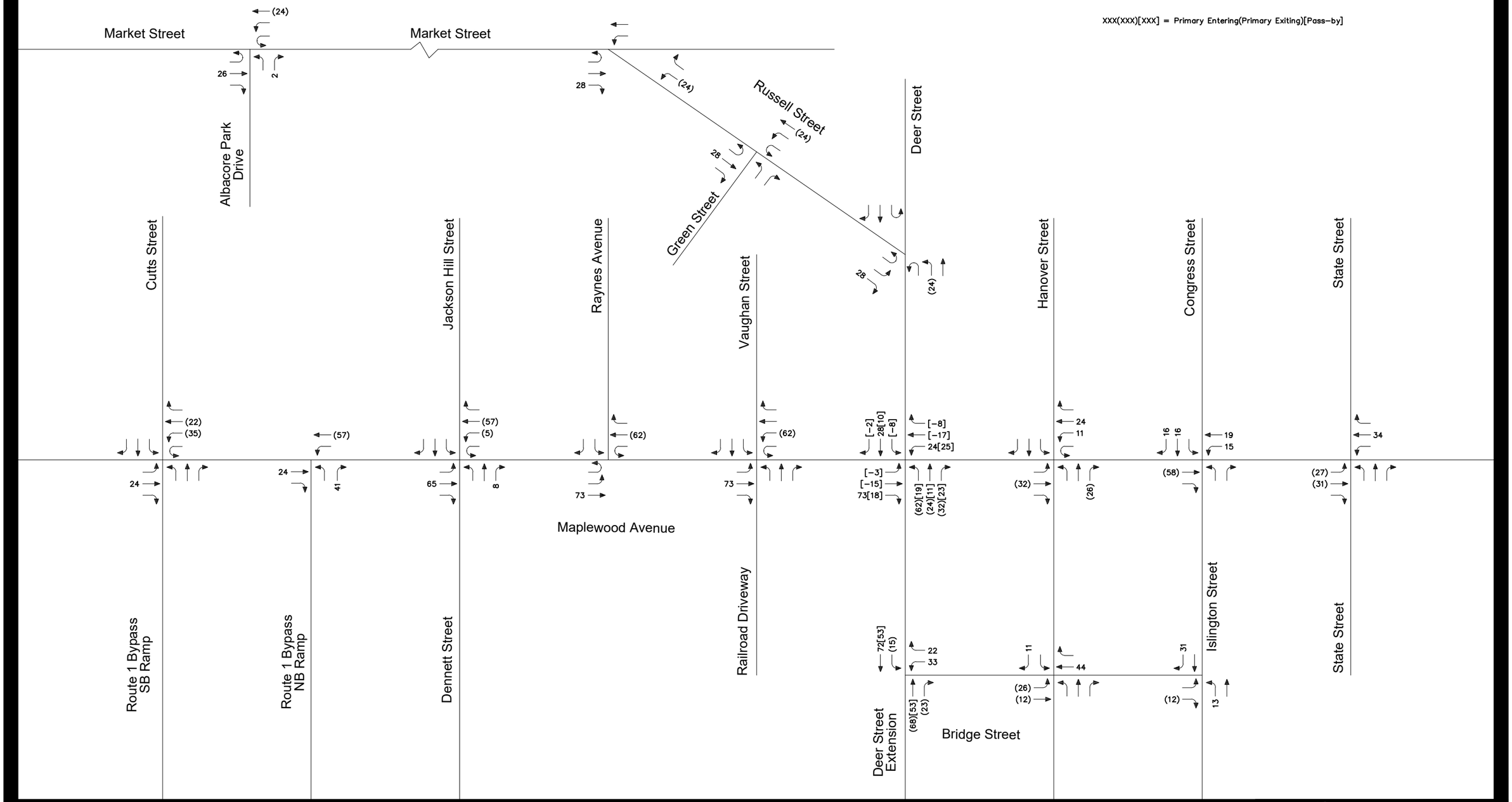
Figure 14B

Phases 2-4: Total Deer Street Development
Site Generated Trip Assignment
Weekday Evening
Peak Hour Traffic Volumes

TEC, Inc.
65 Glenn Street
Lawrence, MA 01843
(978) 794.1792
169 Ocean Blvd, Unit 101
Hampton, NH 03842
(603) 601.8154
www.TheEngineeringCorp.com

NOT TO SCALE

XXX(XXX)[XXX] = Primary Entering(Primary Exiting)[Pass-by]



TEC, Inc.
65 Glenn Street
Lawrence, MA 01843
(978) 794.1792
169 Ocean Blvd, Unit 101
Hampton, NH 03842
(603) 601.8154
www.TheEngineeringCorp.com

Figure 14C

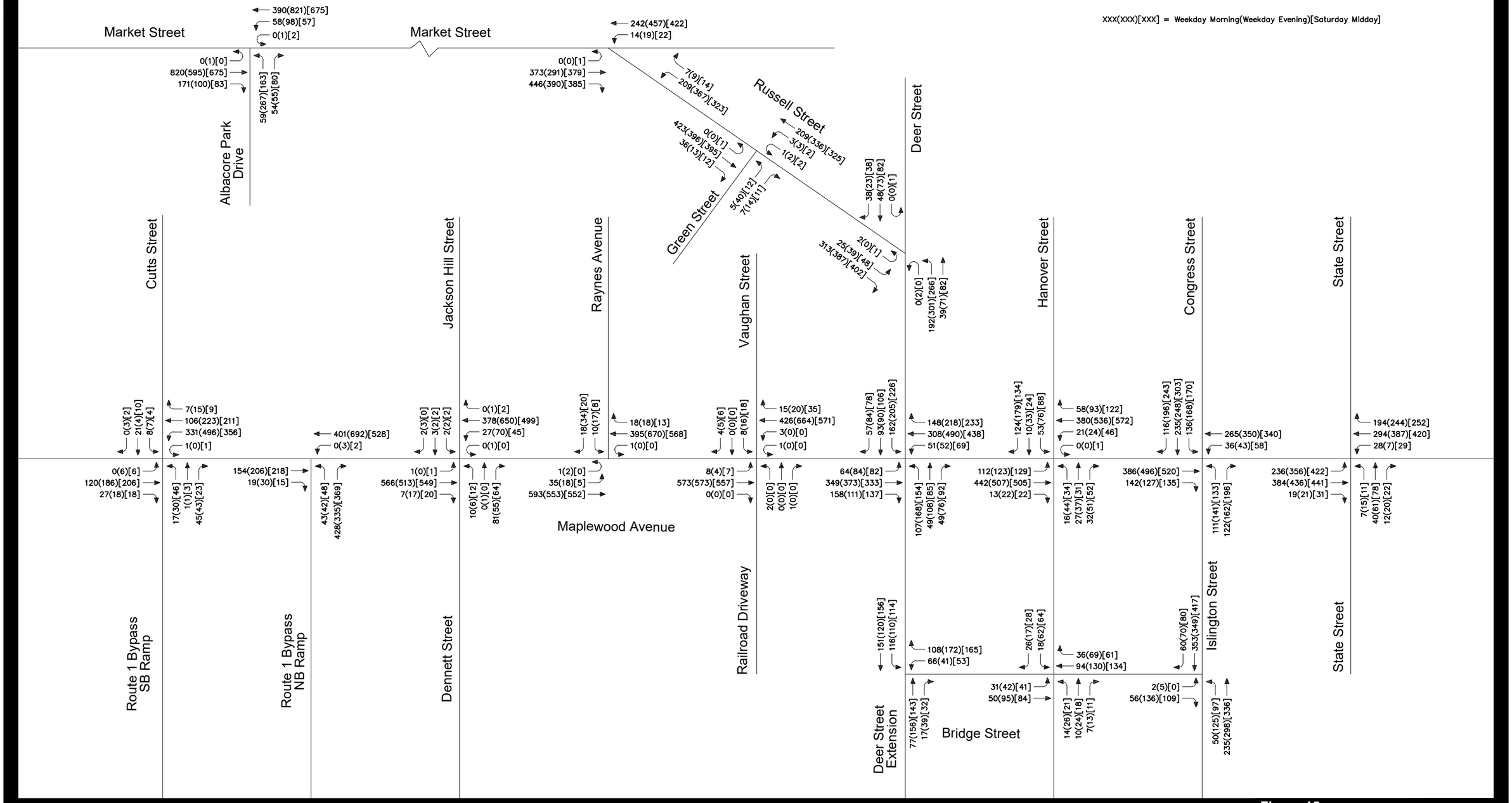
Phases 2-4: Total Deer Street Development
Site Generated Trip Assignment
Saturday Midday
Peak Hour Traffic Volumes

NOT TO SCALE

Deer Street Parking Garage & Deer Street Development - Portsmouth, New Hampshire

Traffic Impact and Access Study

XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON-STREET PARKING

Figure 15

2018 Opening Year Build Condition
Phases 1-4: Full Build-Out
Peak Hour Traffic Volumes

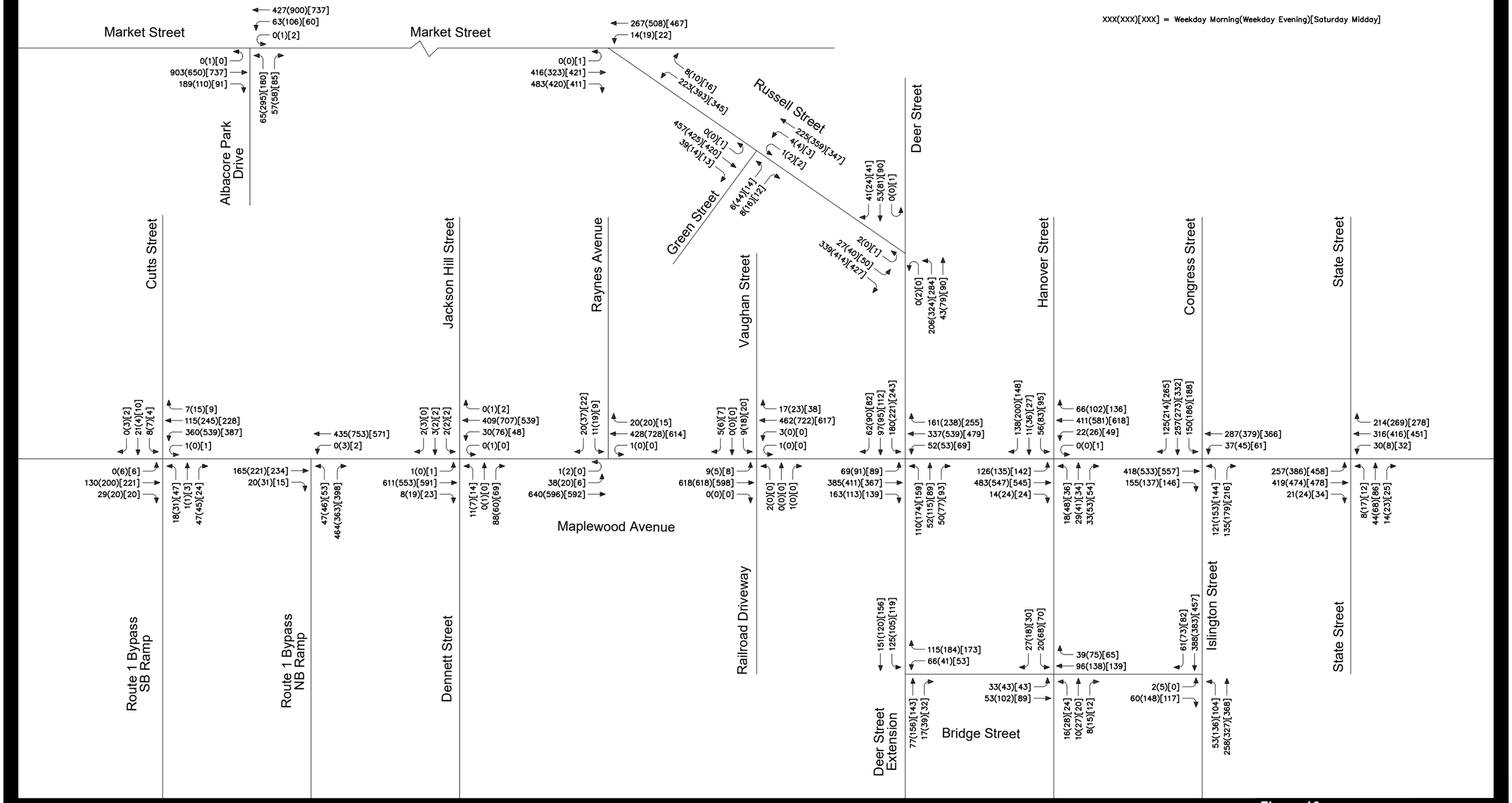
TEC, Inc.
65 Glenn Street | 169 Ocean Blvd, Unit 101
Lawrence, MA 01843 | Hampton, NH 03842
(978) 794.1792 | (603) 601.8154
www.TheEngineeringCorp.com

NOT TO SCALE

Deer Street Parking Garage & Deer Street Development - Portsmouth, New Hampshire

Traffic Impact and Access Study

XXX(XXX)[XXX] = Weekday Morning(Weekday Evening)[Saturday Midday]



NOTE THAT TRAFFIC VOLUMES AT ADJACENT INTERSECTIONS MAY NOT BALANCE DUE TO LOT DRIVEWAYS AND ON-STREET PARKING

Figure 16

2028 Future Year Build Condition
Phases 1-4: Full Build-Out
Peak Hour Traffic Volumes

TEC, Inc.
65 Glenn Street | Lawrence, MA 01843 | (978) 794.1792
169 Ocean Blvd, Unit 101 | Hampton, NH 03842 | (603) 601.8154
www.TheEngineeringCorp.com

TRAFFIC IMPACT SUMMARY

Level-of-service and queue analyses were conducted for 2016 Existing, 2018 Opening Year and 2028 Future Year No Build, 2018 Opening Year and 2028 Future Year Build, and the 2018 Opening Year and 2028 Future Year Build conditions for the unsignalized and signalized intersections within the study area. The results of the intersection capacity and queue analysis are summarized in Chapter V – "Traffic Impact Analysis Summary". The following section provides a summary of the traffic impacts for the several intersections in the study area. For those intersections within the study area that have defined improvements to mitigate the traffic impacts of the parking garage or DSA Development projects, the description of the traffic impact summary is reported in Chapter V – "Mitigation Summary."

Maplewood Avenue / Cutts Street / Route 1 Bypass Southbound Ramps

Both the Cutts Street and Route 1 Bypass Ramps approaches are anticipated to operate at degraded levels-of-service (LOS E or F) during the weekday evening and Saturday midday peak periods. Specifically, the Route 1 Bypass Ramps northbound approach is expected to experience a volume-to-capacity (V/C) ratio greater than 1.00 during those conditions. Based on field observations and anticipated improvements as part of the Maplewood Avenue Corridor Project, the elevated delays and levels-of-service on these approaches is not anticipated to be realized. Due to the constrained right-of-way at the intersection, there are currently no additional improvements at this intersection that are expected to improve operations. The side street traffic volumes will not exceed the threshold to warrant the installation of a new traffic signal at this time. Although the queues may be longer under Build conditions, the length of the Route 1 Bypass Ramps approach is adequate to accommodate the projected queue without routine queuing onto Route 1 Bypass.

Maplewood Avenue / Dennett Street / Jackson Hill Street

The Jackson Hill Street southbound approach is anticipated to experience elevated levels-of-service (LOS E) during the weekday evening and Saturday midday peak periods. It should be noted that the traffic volume along this approach is generally limited to less than 7 vehicles per hour and does not warrant a change in traffic control. All other movements at this intersection are anticipated to operate at acceptable levels-of-service (LOS D or better) during all time periods.

Maplewood Avenue / Raynes Avenue

The Raynes Street westbound approach is anticipated to experience elevated levels-of-service (LOS E or F) during the weekday evening peak periods. It should be noted that the traffic volume along this approach is generally limited to less than 1 vehicle per minute on the approach, many of which are right turns. Although the approach experiences LOS E or F, the V/C ratio along the approach is well below 1.00, indicating that the adequate capacity exists to process the current traffic. All other movements at this intersection are anticipated to operate at acceptable levels-of-service (LOS C or better) during all time periods.

Maplewood Avenue / Vaughan Street / Railroad Access Driveway

The Vaughan Street westbound approach is anticipated to experience elevated levels-of-service (LOS E or F) during the weekday evening and Saturday midday peak periods. It should be noted that the traffic volume along this approach is generally limited to less than 30 vehicles per hour on the approach. Although the approach experiences LOS E or F, the V/C ratio along the approach is well below 1.00, indicating that the adequate capacity exists to process the current traffic. All other movements at this intersection are anticipated to operate at acceptable levels-of-service (LOS D or better) during all time periods.

Upon implementation of mitigation measures at the Maplewood Avenue / Deer Street intersection, the delay and queue along the Vaughan Street westbound approach may experience a minor increase as a result of the improved progression of mainline traffic along Maplewood Avenue. It is recommended that 'Do Not Block the Intersection' signage and striping be incorporated along Maplewood Avenue southbound at the intersection, as described in Chapter IV – "Mitigation Summary," to alleviate potential concerns for queueing from the Maplewood Avenue / Deer Street intersection.

Deer Street / Russell Street

The Russell Street southbound approach is anticipated to experience an elevated level-of-service (LOS E) during the Saturday midday peak period. The elevated level-of-service is potentially tied to the narrowing of the Russell Street approach as mitigation for the North End Portsmouth Development Project. Narrowing the lane is anticipated to increase pedestrian and bicycle safety at the intersection. Although the approach experiences LOS E during the Saturday midday peak period, the V/C ratio along the approach is below 1.00, indicating that adequate capacity exists to process the projected traffic. Queues along this approach are not expected to increase by more than two vehicles as a result of the Deer Street Parking garage or DSA Development projects. All other movements at this intersection are anticipated to operate at acceptable levels-of-service (LOS C or better) during all time periods.

Market Street / Russell Street

The introduction of the roundabout at the intersection of Market Street / Russell Street, as part of a separate City project, is anticipated to significantly improve operations at the intersection. Under both 2018 and 2028 Build conditions, all movements at the roundabout are anticipated to operate at acceptable levels-of-service (LOS C or better) during each analysis period.

Other Study Area Intersections

All other intersections and movements within the study area are anticipated to operate at acceptable levels-of-service (LOS D or better) with V/C ratios well below 1.00, indicating that there will be adequate capacity to accommodate the anticipated traffic volumes.

IV. MITIGATION SUMMARY

After evaluating the operations and safety of the study area roadways and intersections, the next step is to identify measures to improve traffic operations and safety for all users based on existing and future deficiencies as a result of the Project. The following section provides a summary of improvement measures that the City of Portsmouth and the DSA Development should consider to mitigate the traffic-related impacts of the public and private elements of the project and to improve the safety and accessibility characteristics for vehicles, pedestrians, bicyclists, and transit users.

OFF-SITE IMPROVEMENTS

Off-site improvements within the study area were identified separately for the proposed Deer Street Parking Garage and the proposed DSA Development. The following section describes the improvements necessary to mitigate the impacts of the two projects.

Deer Street Parking Garage Mitigation - City of Portsmouth

Deer Street, Deer Street Extension, and Bridge Street

As the primary access/egress point for the Deer Street Parking Garage, it is recommended that the City of Portsmouth construct roadway improvements along Deer Street and at the intersection of Maplewood Avenue / Deer Street with a cost-sharing allocation with DSA. The following improvements are necessary to improve traffic operations and safety at the parking garage's front door:

- Construct the Deer Street Extension near the existing apex of Deer Street / Bridge Street to provide access and egress for the proposed parking garage;
- Coordinate with the adjacent property and business operator, Redlon & Johnson, to investigate an opportunity to provide a new sidewalk (possibly with a landscape strip) and defined curb cuts and driveway aprons to create a more inviting walking environment on the west side of Bridge Street near the proposed parking garage;

- Restripe the Deer Street eastbound approach between the Deer Street Extension and Maplewood Avenue, within the existing curb lines, to include an 11.5-foot wide westbound receiving lane, a 10-foot wide eastbound left-turn lane, an 11.5-foot wide eastbound shared through / right-turn lane, and 1-foot shoulders on each roadway edge. The proposed lane configurations will require eradication of existing pavement markings, new pavement markings, and the removal of on-street parking along both sides of Deer Street between Maplewood Avenue and the existing Eastern Bank Driveway (proposed Lot 3 Driveway).

  The restriping of Deer Street to include an eastbound left-turn lane will reduce the length of queue expected following the opening of the parking garage. In addition, the striping of the left-turn lane will shift the westbound receiving lane along Deer Street to better align with the westbound approach on the opposing side of the Maplewood Avenue intersection. Although vehicle will still require a slight track across the intersection, the offset will be significantly reduced over existing conditions. The modifications of the Deer Street eastbound approach are illustrated conceptually in Figure 17;
- Stripe dashed "tracking" pavement markings along Deer Street through the intersection to provide positive guidance for westbound motorists on Deer Street as they cross Maplewood Avenue; and
- Replace the existing 'No Left Turn' signs for the Bridge Street southbound approach to Islington Street and apply new right turn arrow and 'ONLY' pavement markings.

Maplewood Avenue / Middle Street Corridor

Maplewood Avenue / Middle Street serves as the primary access/egress point for Downtown Portsmouth to/from the south and west for those vehicles expected to utilize the Deer Street Parking Garage. It is recommended that the City of Portsmouth complete the following improvements along Maplewood Avenue / Middle Street to improve traffic operations and safety on the major adjacent corridor:

- Modify existing traffic signal timing and coordination parameters along the Maplewood Avenue / Middle Street corridor, between Deer Street and State Street, to optimize operations and efficiency; and
- Reestablish traffic signal coordination at the intersection of Middle Street / State Street to allow for improved vehicle progression along the Maplewood Avenue / Middle Street corridor.

Dynamic Parking Message Signs

To enhance the wayfinding and parking opportunities for patrons and visitors entering Downtown Portsmouth, which will result in a more efficient route choice and may limit downtown traffic circulation, the City should consider additional dynamic parking garage message signs at key gateway locations within Downtown Portsmouth. Currently, an existing dynamic parking sign is installed along Market Street southbound, north of Russell Street. New dynamic parking signs should be designed to incorporate the available parking supply ("Open"

or "Full") at both the existing High-Hanover Parking Garage and the proposed Deer Street Parking Garage. It may also include a separate dynamic message board with other instructions or notices. Upon initial review, TEC recommends dynamic signs be considered along the following Downtown gateway approaches:

- Market Street southbound, north of Russell Street (enhance existing sign location);
- Maplewood Avenue southbound, north of Raynes Avenue;
- Middle Street northbound, south of Court Street; and
- Memorial Bridge southbound, north of Bow Street

Multi-modal Accommodations

The City of Portsmouth's walkability and bike-ability has increased the potential for reducing single-occupancy vehicles within Downtown. However, it is important to provide opportunities for visitors, patrons, and employees in the area to utilize these available multi-modal resources by increasing opportunities to/from major parking facilities. TEC recommends that the City should incorporate the following multi-modal accommodations as part of the Deer Street Parking Garage:

- Construct a sidewalk connecting the proposed Deer Street Parking Garage to the sidewalk network along Deer Street and Bridge Street. The sidewalk should provide curbing to vertically separate vehicular and pedestrian traffic flows;
- Construct or reconstruct accessible ramps and driveway aprons along Deer Street between the proposed Deer Street Parking Garage and Maplewood Avenue to comply with Americans with Disabilities Act (ADA) standards;
- Stripe shared-use lane markings "sharrows" along Deer Street and Bridge Street between Maplewood Avenue and Hanover Street. Although the roadways were not specifically identified in the City's Bicycle Pedestrian Plan 2014, linking the parking garage to identified pedestrian / bicycle corridors such as Maplewood Avenue could reduce vehicular traffic;
- Provide opportunities for bicycle sharing at the parking garage. Bicycle sharing will allow Downtown visitors to park at the parking garage and travel the City via bicycle;
- The City should provide bicycle racks to encourage bicycling, particularly for residents that may use the facility. Bicycle racks encourage residents/employees to ride bicycles to and from Downtown by allowing them to store their bicycles in a secure, weather-protected space; and
- Post COAST and Wildcat Transit maps and schedules within the parking garage to identify opportunities for visitors to utilize public transportation to/from Downtown.

Deer Street Associates (DSA) Development Mitigation (Private)

Deer Street, Deer Street Extension, and Bridge Street

As the primary access/egress point for the DSA Development, it is recommended that the Deer Street Associates contribute to construct roadway improvements along Deer Street and at the intersection of Maplewood Avenue / Deer Street with a cost-sharing allocation with the City. The following improvements are necessary to improve traffic operations and safety at the project's front door:

- Upon reconstruction of the sidewalk and other utility improvements along the northerly side of Deer Street specific to the new development, remove and reset the northerly curb line to provide a consistent cross-section along Deer Street, as restriped by the City's parking garage project, while providing a standardized curb reveal for the reconstructed sidewalk along the site frontage;
- Provide updated ADA accessible ramps on the northwest and southwest corners of the Maplewood Avenue / Deer Street intersection that would be affected by the proposed sidewalk or roadway construction; and
- In conjunction with the utility work for the DSA Development, the Applicant should provide a mill and overlay for the entire length of Deer Street and Bridge Street between Maplewood Avenue and Hanover Street.

Maplewood Avenue / Middle Street Corridor

Maplewood Avenue / Middle Street serves as the primary access/egress point for Downtown Portsmouth to/from the south and west for those vehicles expected to utilize the DSA Development. It is recommended that DSA should complete, or provide mitigation funding to the City of Portsmouth for, the following improvements along Maplewood Avenue / Middle Street to improve traffic operations and safety on the major adjacent corridor:

- Install 'Do Not Block the Intersection' pavement markings and signage (R10-7) along the Maplewood Avenue / Middle Street corridor at the intersections with Deer Street, Hanover Street, Islington Street, and State Street. This should be coordinated with the State's project to reconstruct the at-grade railroad crossing;
- Introduce concurrent pedestrian phasing at intersections along the Maplewood Avenue / Middle Street corridor, between Deer Street and State Street. Based on an existing traffic count conducted during the Saturday midday peak period on Saturday, December 10, 2016, more than 20 percent of pedestrians cross the intersection of Maplewood Avenue / Middle Street / Islington Street / Congress Street on the solid 'Don't Walk'. The diagonal crosswalk will need to be eradicated, and two push buttons per corner are required, as well as internal changes to the cabinet, to implement concurrent phasing. Concurrent pedestrian phasing is routinely employed in downtown locations in other cities, and the changes will significantly increase the available green times along the corridor while providing opportunities for pedestrians to travel along the corridors more efficiently;

- Replace existing pedestrian signal heads at Middle Street / State Street with new countdown pedestrian signal heads;
- Install video detection infrastructure along the Maplewood Avenue / Middle Street corridor, between Deer Street and State Street to improve detection capabilities along the coordinated corridor. The video detection will include an added benefit of providing real-time traffic volume counting capabilities that can be utilized as traffic monitoring for the DSA Development project;
- Modify the vehicle signal phasing on the Middle Street northbound approach to Congress/Islington to provide a protected left-turn advance phase (with green arrow) to improve the northbound flow. This will require the replacement of one or more vehicle signal heads; and
- Modify existing traffic signal timing, coordination parameters, and cycle lengths along the Maplewood Avenue / Middle Street corridor, between Deer Street and State Street, to optimize operations and efficiency in conjunction with the proposed concurrent pedestrian phasing.

Multi-modal Accommodations

To enhance the walkability and bike-ability for the proposed development, TEC recommends that DSA should incorporate the following multi-modal accommodations as part of the DSA Development:

- Reconstruct the sidewalk along the northerly side of Deer Street between the Deer Street Extension and Maplewood Avenue. Provide streetscape opportunities where applicable to enhance the plaza-style sidewalk along the site frontage. The sidewalk should provide curbing to vertically separate vehicular and pedestrian traffic flows;
- Construct or reconstruct accessible ramps along the building frontage, or other intersection corners, to comply with ADA standards if impacted by building construction or the intersection modifications noted above;
- Provide secure interior bicycle racks for residents or employees to encourage bicycling; and
- Post COAST and Wildcat Transit maps and schedules within the several buildings as part of the development to identify opportunities for residents, patrons, and employees to utilize public transportation to and from Downtown.

Market Street Roundabout Contribution

The project is expected to contribute new trips along the Market Street corridor between the project site and Route 1 Bypass and Interstate 95. The City has identified the need for a gateway traffic calming and traffic control improvement by reconstructing the intersection of Market Street / Russell Street to provide a single-lane roundabout. As part of the permitting approvals for the adjacent North End Portsmouth ("HarborCorp") project, the City required an applicant contribution of $50,000 toward the future construction costs. TEC recommends a similar assessment for the proposed DSA project.

Downtown Traffic Modeling Study Contribution

The project is expected to contribute a minor or unquantifiable amount of new traffic along many of the roadways within Downtown Portsmouth. The City has identified the need for a full Downtown Portsmouth traffic model to assess long-range planning within Downtown as economic growth is expanded. TEC recommends that DSA provide a financial contribution to the City towards the study and modeling effort. The modeling effort will reevaluate the Maplewood Avenue corridor as well with the potential to further improve the traffic related impacts along the DSA site frontage.

An illustration of the improvements associated to both the Deer Street Parking Garage and the DSA Development is present in Figure 18.

TRAFFIC IMPACT SUMMARY – MITIGATION RESULTS

Level-of-service and queue analyses were conducted for the 2018 Opening Year and 2028 Future Year Build with Mitigation conditions for the mitigation-impacted intersections within the study area. The results of the intersection capacity and queue analysis are summarized in Tables 14 and 15 for the 2018 and 2028 conditions, respectively. Using the Synchro v9.0 intersection capacity analysis software, Sim Traffic simulations were conducted for the 2018 Opening Year and 2028 Future Year Build with Mitigation analysis scenarios to further evaluate the effect of the proposed improvements on the traffic flow within the study area based on standard practice for projects within NHDOT coordinated signal systems. The results of the intersection capacity and queue analysis are summarized in Chapter V – "Traffic Impact Analysis Summary".

Maplewood Avenue / Deer Street

With the construction of the left-turn lane along Deer Street eastbound as part of the mitigation for the Deer Street Parking Garage and DSA trips, the left-turn movement from Deer Street westbound is anticipated to operate an elevated level-of-service (LOS E) during the Saturday midday peak period. This elevated level-of-service is not expected to occur during any other time periods. All other movements under this scenario are expected to operate at acceptable levels-of-service (LOS D or better) during all time periods. The implementation of concurrent pedestrian phasing as mitigation for the DSA Development will significantly improve operations along the corridor, mitigating the impacts of the private development. Although the 95th percentile queue may extend back to the upstream and downstream intersections along the corridor during a short portion of the peak periods, similar to the existing conditions, the queues as depicted in the associated Sim Traffic simulation analysis indicate that these vehicles in these short-lived queues generally progress through the signalized intersection within the next available green period. It is recommended that 'Do Not Block the Intersection' signage and striping be incorporated at the intersection as described in Chapter IV – "Proposed Mitigation."

Maplewood Avenue / Hanover Street

Traffic signal timing and coordination optimization is expected to be implemented along the Maplewood Avenue corridor as mitigation for the Deer Street Parking Garage. The optimization

of signal timings is not expected to significantly alter the traffic impacts at the intersection of Maplewood Avenue / Hanover Street, but is anticipated to improve the overall progression through the corridor. Under both No-Build and Build with Mitigation conditions, the Hanover Street westbound left-turn / through movement is anticipated to operate at elevated levels-of-service (LOS E) during the weekday evening and Saturday midday peak period. The additional traffic from the Deer Street Parking Garage is not anticipated to contribute any substantial delay to the movement. The implementation of concurrent pedestrian phasing as mitigation for the DSA Development will significantly improve operations along the Hanover Street approach. Upon the implementation of these improvements, all movements at the intersection are anticipated to operate at acceptable levels-of-service (LOS D or better). Although the 95th percentile queue is not expected to extend back to the adjacent signalized intersections, it is recommended that 'Do Not Block the Intersection' signage and striping be incorporated at the intersection to provide consistency throughout the corridor as described in Chapter IV – "Proposed Mitigation."

Maplewood Avenue / Middle Street / Islington Street / Congress Street

Several movements at the intersection of Maplewood Avenue / Middle Street / Islington Street / Congress Street are anticipated to operate at elevated levels-of-service (LOS E) during all time periods for the No-Build and Build conditions. Traffic signal timing and coordination optimization is expected to be implemented along the Maplewood Avenue corridor as mitigation for the Deer Street Parking Garage. The optimization of signal timings is not expected to significantly alter the traffic impacts at the intersection of Maplewood Avenue / Middle Street / Islington Street / Congress Street, but is anticipated to improve the overall progression through the corridor. The implementation of concurrent pedestrian phasing as mitigation for the DSA Development will significantly improve operations along the corridor, mitigating the impacts of the private development. Although the Islington Street eastbound left-turn is still anticipated to operate at LOS E, the delay will be significantly reduced at the intersection when compared to No-Build conditions. All other movements at the intersection are anticipated to operate at acceptable levels-of-service (LOS D or better) during all time periods.

Middle Street / State Street

Traffic signal timing and coordination optimization is expected to be implemented along the Maplewood Avenue corridor as mitigation for the Deer Street Parking Garage. The optimization of signal timings is not expected to significantly alter the traffic impacts at the intersection of Middle Street / State Street, but is anticipated to improve the overall progression through the Maplewood Avenue / Middle Street corridor. The additional traffic from the Deer Street Parking Garage is not anticipated to contribute any substantial delay to the movement. The implementation of concurrent pedestrian phasing as mitigation for the DSA Development will significantly improve operations at the intersection. Upon the implementation of these improvements, all movements at the intersection are anticipated to operate at acceptable levels-of-service (LOS D or better). Although the 95th percentile queue is not expected to extend back to the adjacent signalized intersections, it is recommended that 'Do Not Block the Intersection' signage and striping be considered in the future on the northbound Middle Street approach if extended queuing persists.

Scale: 1" = 40'

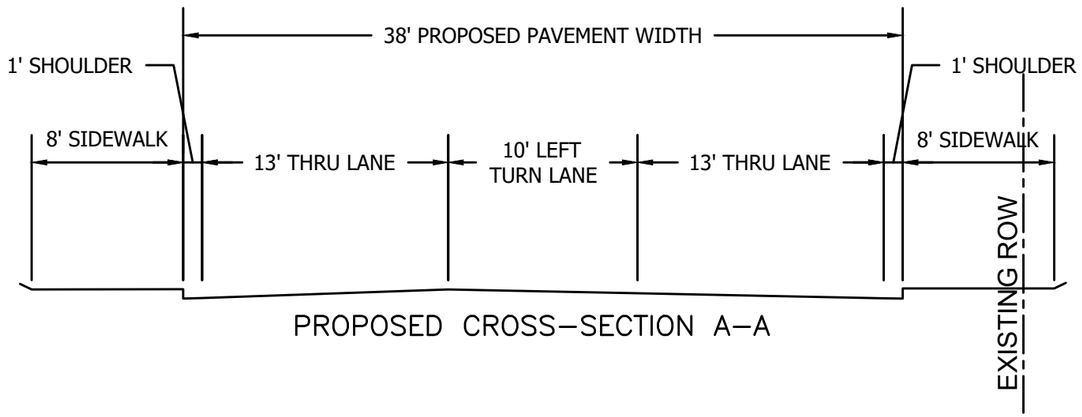
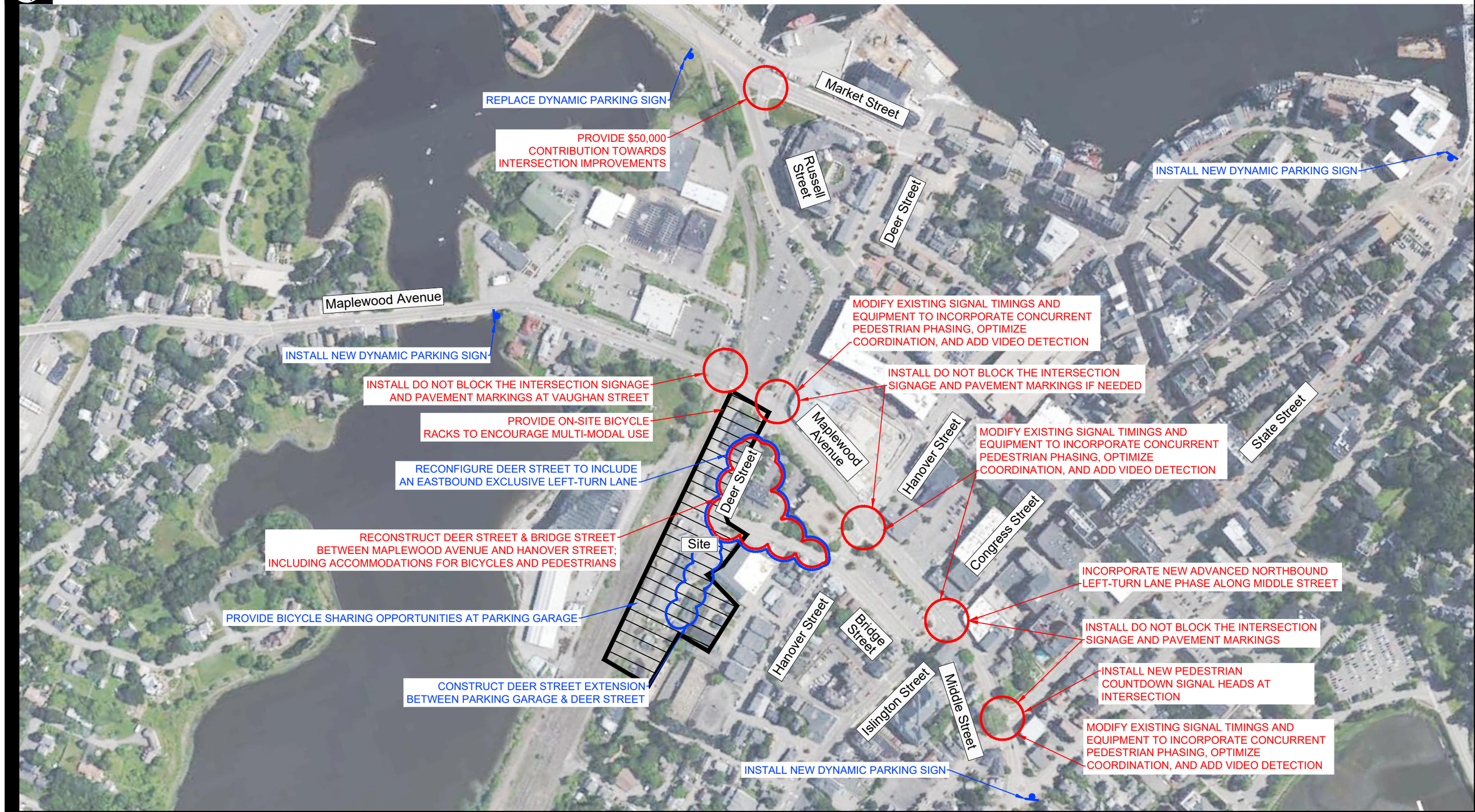


Figure 17

Deer Street Left-Turn Lane
Conceptual Improvement Graphic

TEC, Inc.
65 Glenn Street
Lawrence, MA 01843
(978) 794.1792
169 Ocean Blvd, Unit 101
Hampton, NH 03842
(603) 601.8154
www.TheEngineeringCorp.com

NOT TO SCALE



City Parking Garage Improvements

Deer Street Associates Improvements

Figure 18

Locus of Recommended Mitigation Improvements

TEC, Inc.
65 Glenn Street, Lawrence, MA 01843, (978) 794.1792
169 Ocean Blvd, Unit 101, Hampton, NH 03842, (603) 601.8154
www.TheEngineeringCorp.com

V. TRAFFIC IMPACT ANALYSIS SUMMARY

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build, Build, and Build with Mitigation conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

METHODOLOGY

The unsignalized and signalized intersection capacity and queue analysis was conducted using the industry standard Synchro 9.0 traffic analysis software program, which generally uses the methodology of the *Highway Capacity Manual (HCM)* publication series. For the purposes of this study, the methodology from the past *HCM 2000* was utilized for overall capacity analyses due to the restrictions posed on intersection analysis using Synchro 9.0 or Highway Capacity Software 2010 (HCS 2010) by the more recently published *HCM 2010*. This includes the inability of *HCM 2010* to correctly analyze exclusive pedestrian phases, to analyze custom turn-types associated with one-way approaches for signalized intersections.

NHDOT and the traffic engineering industry have recognized the deficiencies in the *HCM 2010* methodology and traffic impact software such as Synchro 9.0 or HCS 2010 when attempting to analyze traffic signals. Therefore, TEC has used *HCM 2000* methodology over "Synchro 9 Percentile Delay" methodology, as *HCM 2000* represents the most recent previous state and federally accepted methodology for analyzing capacity, delay, and queues.

To remain consistent throughout the study, all signalized and unsignalized intersection capacity and queue analyses were therefore conducted using *HCM 2000* methodology with the exception of the intersection of Bridge Street / Hanover Street. As *HCM 2000* does not provide a complete analysis condition for all-way STOP intersections, the intersection of Bridge Street / Hanover Street was conducted with the more recent *HCM 2010* publication.

Levels of Service

A primary result of capacity analyses is the assignment of levels-of-service to traffic facilities under various traffic-flow conditions.[16] The concept of level-of-service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels-of-service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best operating conditions and subsequent letters representing decreasing operation conditions. Since the level-of-service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels-of-service, depending on the time of day, day of week, or period of year.

Intersection Queue Length Analysis

Vehicle queue analyses are a direct measurement of an intersection's ability to process vehicles under various traffic control and volume scenarios and lane use arrangements.

The vehicle queue analysis was performed using the Synchro 9.0 intersection capacity analysis software's "Percentile Queue" methodology which is also based upon the methodology and procedures presented in the *HCM*. Synchro reports the 95th percentile queues for unsignalized intersections and both the 50th (average) and 95th percentile vehicle queues for signalized intersections, which are based on the number of vehicles that experience a delay of six seconds or more at an intersection and is a function of the traffic signal timing; vehicle arrival patterns during the analysis period; and the saturation flow rate. The 50th percentile or average vehicle queue is the average number of vehicles that are projected to be delayed by six seconds or more at the intersection under study during the analysis period. The 95th percentile vehicle queue is the vehicle queue length that will be exceeded only 5 percent of the time; or approximately three minutes out of sixty minutes during the peak one hour of the day. During the remaining fifty-seven minutes, the vehicle queue length will be less than the 95th percentile queue length.

PARAMETERS FOR TRAFFIC IMPACT ANALYSIS

Unsignalized Intersections

The levels-of-service of unsignalized intersections are determined by application of a procedure described in the *HCM 2000*. Level-of-service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects

[16]The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual 2000*; Transportation Research Board; Washington, DC; 2000.

of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level-of-service at unsignalized intersections are also given in the *HCM 2000*. Table 11 summarizes the relationship between level-of-service and average control delay.

Table 11 – Level-of-Service Criteria for Unsignalized Intersections[a]

Level-of-Service	Average Control Delay (seconds per vehicle)	Description
A	≤10.0	LOS A represents a condition with little or no control delay to minor street traffic.
B	10.1 to 15.0	LOS B represents a condition with short control delays to minor street traffic.
C	15.1 to 25.0	LOS C represents a condition with average control delays to minor street traffic.
D	25.1 to 35.0	LOS D represents a condition with long control delays to minor street traffic.
E	35.1 to 50.0	LOS E represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
F	>50.0	LOS F represents a condition where minor street demand volume exceeds capacity of an approach lane, with excessive control delays resulting.

[a] Source: *Highway Capacity Manual 2000*; Transportation Research Board; Washington D.C.; 2000

Although the capacity analysis for the all-way STOP intersection of Bridge Street / Hanover Street was conducted using methodologies from the more recent *HCM 2010*, the general parameters for average control delay per vehicle are consistent with Table 11 above. As none of the intersection approaches were analyzed to operate with a volume-to-capacity (V/C) ratio greater than 1.00, the level-of-service parameters between the two methodologies are consistent for the intersection.

Signalized Intersections

Level-of-service for signalized intersections is calculated using the operational analysis methodology of the *HCM 2000*. This method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on delay. Level-of-service designations are based on the criterion of control or signal delay per vehicle. Control or signal delay can be related to driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay. Table 12 summarizes the relationship between level-of-service and control delay. The tabulated control delay criterion may be applied in assigning level-of-service designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table 12 – Level-of-Service Criteria for Signalized Intersections[a]

Level-of-Service	Average Control Delay (seconds per vehicle)	Description
A	≤10.0	*LOS A* describes operations with very low control delay; most vehicles do not stop at all.
B	10.1 to 20.0	*LOS B* describes operations with relatively low control delay. However, more vehicles stop than LOS A.
C	20.1 to 35.0	*LOS C* describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	35.1 to 55.0	*LOS D* describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable, whereby motorists are not able to get through the signal on one cycle.
E	55.1 to 80.0	*LOS E* describes operations with high control delay values. Individual cycle failures are frequent occurrences.
F	>80.0	*LOS F* describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

[a] Source: *Highway Capacity Manual 2000*; Transportation Research Board; Washington D.C.; 2000

Roundabout Intersections

The levels-of-service of roundabout intersections are determined by application of a procedure described in the *HCM 2000*. Level-of-service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as roundabouts. Control delay includes the effects of initial deceleration delay approaching a STOP or YIELD sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level-of-service at roundabouts are also given in the *HCM 2000*. Table 13 summarizes the relationship between level-of-service and average control delay.

Table 13 – Level-of-Service Criteria for Roundabouts[a]

Level-of-Service	Average Control Delay (seconds per vehicle)	Description
A	≤10.0	LOS A represents a condition with little or no control delay to minor street traffic.
B	10.1 to 15.0	LOS B represents a condition with short control delays to minor street traffic.
C	15.1 to 25.0	LOS C represents a condition with average control delays to minor street traffic.
D	25.1 to 35.0	LOS D represents a condition with long control delays to minor street traffic.
E	35.1 to 50.0	LOS E represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
F	>50.0	LOS F represents a condition where minor street demand volume exceeds capacity of an approach lane, with excessive control delays resulting.

[a] Source: *Highway Capacity Manual 2010*; Transportation Research Board; Washington D.C.; 2010

TRAFFIC IMPACT ANALYSIS RESULTS

Level-of-service and queue analyses were conducted for 2016 Existing, 2018 Opening Year and 2028 Future Year No Build, 2018 Opening Year and 2028 Future Year Build, and the 2018 Opening Year and 2028 Future Year Build with Mitigation conditions for the unsignalized and signalized intersections within the study area. The results of the intersection capacity and queue analysis are summarized in Tables 14 and 15 for the 2018 and 2028 conditions, respectively. The intersection capacity and queue analysis worksheets are provided in Appendix M.

Table 14 – 2018 Opening Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2018 Opening Year No-Build				2018 Opening Year Build Phase 1				2018 Opening Year Build w/ Mitigation Phase 1				2018 Opening Year Build Phases 2-4				2018 Opening Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Maplewood Avenue / Cutts Street / Route 1 Bypass SB Ramps																								
Weekday Morning Peak Period																								
Maplewood Avenue EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25					0.00	0.0	A	<25				
Maplewood Avenue WB Approach	0.23	6.7	A	<25	0.26	7.0	A	26	0.26	6.9	A	26					0.29	7.2	A	30				
Route 1 Bypass NB Approach	0.10	16.9	C	<25	0.24	19.0	C	<25	0.24	19.0	C	<25					0.29	22.4	C	29				
Cutts Street SB Approach	0.21	26.2	D	<25	0.26	33.3	D	25	0.26	33.2	D	<25					0.31	41.8	E	31				
Weekday Evening Peak Period																								
Maplewood Avenue EB Approach	0.01	0.4	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25					0.01	0.3	A	<25				
Maplewood Avenue WB Approach	0.35	7.3	A	41	0.41	8.0	A	52	0.41	8.1	A	52	Same as Build Condition				0.46	8.7	A	62	Same as Build Condition			
Route 1 Bypass NB Approach	0.14	23.1	C	<25	1.03	171.4	F	166	1.03	169.6	F	167					1.37	310.0	F	228				
Cutts Street SB Approach	0.20	50.7	F	<25	0.31	85.5	F	28	0.31	85.6	F	28					0.42	127.9	F	38				
Saturday Midday Peak Period																								
Maplewood Avenue EB Approach	0.01	0.3	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25					0.01	0.2	A	<25				
Maplewood Avenue WB Approach	0.22	6.0	A	<25	0.27	6.4	A	28	0.27	6.4	A	28					0.31	6.8	A	33				
Route 1 Bypass NB Approach	0.09	18.6	C	<25	0.57	53.2	F	75	0.58	52.5	F	76					0.74	86.6	F	106				
Cutts Street SB Approach	0.12	25.2	D	<25	0.16	34.2	D	<25	0.16	34.2	D	<25					0.21	43.7	E	<25				
Maplewood Avenue / Route 1 Bypass NB Ramps																								
Weekday Morning Peak Period																								
Maplewood Avenue EB Approach	0.08	0.0	A	<25	0.12	0.0	A	<25	0.12	0.0	A	<25					0.12	0.0	A	<25				
Maplewood Avenue WB Approach	0.23	0.0	A	<25	0.26	0.0	A	<25	0.26	0.0	A	<25					0.29	0.0	A	<25				
Route 1 Bypass NBL	0.10	13.5	B	<25	0.12	15.0	B	<25	0.12	15.0	B	<25					0.13	16.1	C	<25				
Route 1 Bypass NBR	0.42	11.7	B	52	0.50	13.3	B	70	0.50	13.3	B	70					0.57	14.8	B	93				
Weekday Evening Peak Period																								
Maplewood Avenue EB Approach	0.12	0.0	A	<25	0.17	0.0	A	<25	0.18	0.0	A	<25					0.19	0.0	A	<25				
Maplewood Avenue WB Approach	0.42	0.0	A	<25	0.47	0.0	A	<25	0.47	0.0	A	<25	Same as Build Condition				0.51	0.0	A	<25	Same as Build Condition			
Route 1 Bypass NBL	0.15	19.3	C	<25	0.19	23.5	C	<25	0.20	23.5	C	<25					0.22	27.1	D	<25				
Route 1 Bypass NBR	0.34	11.4	B	38	0.44	13.3	B	57	0.45	13.4	B	58					0.51	14.8	B	73				
Saturday Midday Peak Period																								
Maplewood Avenue EB Approach	0.10	0.0	A	<25	0.13	0.0	A	<25	0.13	0.0	A	<25					0.15	0.0	A	<25				
Maplewood Avenue WB Approach	0.27	0.0	A	<25	0.32	0.0	A	<25	0.32	0.0	A	<25					0.36	0.0	A	<25				
Route 1 Bypass NBL	0.13	14.4	B	<25	0.16	16.5	C	<25	0.16	16.6	C	<25					0.18	18.5	C	<25				
Route 1 Bypass NBR	0.38	11.6	B	45	0.48	13.2	B	65	0.48	13.3	B	66					0.56	15.0	C	88				
Maplewood Avenue / Dennett Street / Jackson Hill Street																								
Weekday Morning Peak Period																								
Maplewood Avenue EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25					0.00	0.0	A	<25				
Maplewood Avenue WB Approach	0.03	0.9	A	<25	0.03	0.9	A	<25	0.03	0.9	A	<25					0.04	1.0	A	<25				
Dennett Street NB Approach	0.22	15.2	C	<25	0.27	17.4	C	26	0.27	17.4	C	26					0.33	20.2	C	36				
Jackson Hill Street SB Approach	0.04	19.7	C	<25	0.05	23.4	C	<25	0.05	23.4	C	<25					0.07	28.6	D	<25				
Weekday Evening Peak Period													Same as Build Condition								Same as Build Condition			
Maplewood Avenue EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25					0.00	0.0	A	<25				
Maplewood Avenue WB Approach	0.06	1.6	A	<25	0.07	1.8	A	<25	0.08	1.9	A	<25					0.09	2.2	A	<25				
Dennett Street NB Approach	0.16	14.5	B	<25	0.20	16.7	C	<25	0.21	16.7	C	<25					0.25	19.0	C	<25				
Jackson Hill Street SB Approach	0.08	24.4	C	<25	0.11	31.2	D	<25	0.11	31.5	D	<25					0.14	39.2	E	<25				

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 14 – 2018 Opening Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2018 Opening Year No-Build				2018 Opening Year Build Phase 1				2018 Opening Year Build w/ Mitigation Phase 1				2018 Opening Year Build Phases 2-4				2018 Opening Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Maplewood Avenue / Dennett Street / Jackson Hill Street																								
Saturday Midday Peak Period																								
Maplewood Avenue EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	00	A	<25					0.00	0.0	A	<25				
Maplewood Avenue WB Approach	0.03	1.1	A	<25	0.05	1.3	A	<25	0.05	1.2	A	<25	Same as Build Condition				0.05	1.4	A	<25	Same as Build Condition			
Dennett Street NB Approach	0.16	14.8	B	<25	0.22	17.4	C	<25	0.22	17.5	C	<25					0.27	20.3	C	27				
Jackson Hill Street SB Approach	0.04	23.0	C	<25	0.05	30.3	D	<25	0.05	30.3	D	<25					0.07	38.6	E	<25				
Maplewood Avenue / Raynes Avenue																								
Weekday Morning Peak Period																								
Raynes Avenue WB Approach	0.12	14.7	B	<25	0.14	16.5	C	<25	0.14	16.5	C	<25					0.17	19.3	C	<25				
Maplewood Avenue NB Approach	0.22	0.0	A	<25	0.25	0.0	A	<25	0.25	0.0	A	<25					0.28	0.0	A	<25				
Maplewood Avenue SBL Approach	0.04	1.0	A	<25	0.04	1.0	A	<25	0.04	1.0	A	<25					0.04	1.1	A	<25				
Weekday Evening Peak Period																								
Raynes Avenue WB Approach	0.27	20.3	C	27	0.36	26.9	D	40	0.36	26.9	D	40					0.44	35.0	E	52				
Maplewood Avenue NB Approach	0.39	0.0	A	<25	0.43	0.0	A	<25	0.43	0.0	A	<25	Same as Build Condition				0.48	0.0	A	<25	Same as Build Condition			
Maplewood Avenue SBL Approach	0.02	0.7	A	<25	0.03	0.7	A	<25	0.03	0.7	A	<25					0.03	0.8	A	<25				
Saturday Midday Peak Period																								
Raynes Avenue WB Approach	0.11	13.9	B	<25	0.14	16.3	C	<25	0.14	16.4	C	<25					0.17	19.3	C	<25				
Maplewood Avenue NB Approach	0.30	0.0	A	<25	0.35	0.0	A	<25	0.35	0.0	A	<25					0.39	0.0	A	<25				
Maplewood Avenue SBL Approach	0.00	0.1	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25					0.01	0.2	A	<25				
Maplewood Avenue / Vaughan Street / Railroad Driveway																								
Weekday Morning Peak Period																								
Railroad Driveway EB Approach	0.02	18.3	C	<25	0.03	21.9	C	<25	0.03	21.8	C	<25	0.03	21.9	C	<25	0.04	26.8	D	<25	0.04	27.1	D	<25
Vaughan Street WB Approach	0.07	18.4	C	<25	0.09	22.1	C	<25	0.09	22.0	C	<25	0.09	22.0	C	<25	0.11	27.4	D	<25	0.11	27.6	D	<25
Maplewood Avenue NB Approach	0.00	0.1	A	<25	0.01	0.1	A	<25	0.01	0.1	A	<25	0.01	0.1	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25
Maplewood Avenue SB Approach	0.01	0.2	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25
Weekday Evening Peak Period																								
Railroad Driveway EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25
Vaughan Street WB Approach	0.17	25.9	D	<25	0.24	38.0	E	<25	0.24	38.5	E	<25	0.24	38.4	E	<25	0.31	52.3	F	30	0.34	59.4	F	34
Maplewood Avenue NB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25
Maplewood Avenue SB Approach	0.00	0.1	A	<25	0.00	0.1	A	<25	0.00	0.1	A	<25	0.00	0.1	A	<25	0.01	0.1	A	<25	0.01	0.1	A	<25
Saturday Midday Peak Period																								
Railroad Driveway EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25
Vaughan Street WB Approach	0.14	21.3	C	<25	0.21	30.5	D	<25	0.21	30.7	D	<25	0.21	30.7	D	<25	0.28	43.2	E	27	0.30	45.7	E	29
Maplewood Avenue NB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25
Maplewood Avenue SB Approach	0.01	0.2	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 14 – 2018 Opening Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2018 Opening Year No-Build				2018 Opening Year Build Phase 1				2018 Opening Year Build w/ Mitigation Phase 1				2018 Opening Year Build Phases 2-4				2018 Opening Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Maplewood Avenue / Deer Street																								
Weekday Morning Peak Period																								
Deer Street EB Approach	0.38	37.9	D	41/79	0.50	37.4	D	60/111	0.52	37.9	D	62/115	-	-	-	-	0.59	26.7	C	119/303	-	-	-	-
Deer Street EB LT	-	-	-	-	-	-	-	-	-	-	-	-	0.33	36.1	D	33/67	-	-	-	-	0.55	32.4	C	60/83
Deer Street EB TH/RT	-	-	-	-	-	-	-	-	-	-	-	-	0.16	34.3	C	<25/51	-	-	-	-	0.34	34.0	C	35/66
Deer Street WB LT	0.76	53.8	D	103/204	0.75	50.5	D	103/225	0.74	50.1	D	102/227	0.75	51.1	D	104/217	0.43	23.8	C	80/235	0.57	32.3	C	81/115
Deer Street WB TH/RT	0.21	36.0	D	25/71	0.23	34.2	C	32/86	0.29	34.6	C	45/105	0.31	35.8	D	47/105	0.23	21.1	C	56/142	0.49	35.4	D	69/115
Maplewood Avenue NB LT	0.03	13.7	B	<25/<25	0.04	19.1	B	<25/<25	0.08	19.2	B	<25/42	0.08	13.2	B	<25/32	0.46	45.3	D	<25/84	0.24	9.5	A	<25/<25
Maplewood Avenue NB TH	0.34	14.8	B	47/297	0.41	20.2	C	52/330	0.41	20.2	C	50/327	0.40	15.0	B	95/328	0.65	39.3	D	145/320	0.42	12.6	B	152/152
Maplewood Avenue NB RT	0.09	18.3	B	<25/29	0.10	34.0	C	<25/83	0.10	34.2	C	<25/85	0.10	16.1	B	<25/44	0.10	66.2	E	26/88	0.11	8.6	A	<25/<25
Maplewood Avenue SB LT	0.10	7.6	A	<25/45	0.15	9.2	A	<25/57	0.15	9.3	A	<25/57	0.15	8.7	A	<25/57	0.26	19.6	B	25/57	0.16	11.9	B	<25/42
Maplewood Avenue SB TH/RT	0.39	10.0	A	103/299	0.50	12.9	B	146/365	0.50	13.2	B	148/366	0.49	12.3	B	138/366	0.85	38.6	D	280/490	0.81	30.3	C	271/484
Overall Intersection	**0.47**	**21.2**	**C**	**-**	**0.56**	**24.5**	**C**	**-**	**0.57**	**24.7**	**C**	**-**	**0.55**	**21.3**	**C**	**-**	**0.73**	**35.9**	**D**	**-**	**0.69**	**24.8**	**C**	**-**
Weekday Evening Peak Period																								
Deer Street EB Approach	0.61	45.0	D	97/147	0.49	29.4	C	110/217	0.56	28.6	C	136/301	-	-	-	-	0.92	53.6	D	252/583	-	-	-	-
Deer Street EB LT	-	-	-	-	-	-	-	-	-	-	-	-	0.40	31.0	C	60/117	-	-	-	-	0.72	35.9	D	91/118
Deer Street EB TH/RT	-	-	-	-	-	-	-	-	-	-	-	-	0.27	29.1	C	67/125	-	-	-	-	0.67	39.3	D	104/142
Deer Street WB LT	0.79	60.1	E	112/207	0.64	34.3	C	140/327	0.61	30.8	C	134/338	0.67	38.5	D	145/319	0.61	27.8	C	114/350	0.73	35.4	D	103/140
Deer Street WB TH/RT	0.26	38.2	D	39/87	0.24	26.2	C	55/128	0.23	23.4	C	52/131	0.27	29.2	C	58/131	0.26	20.7	C	65/172	0.55	35.0	C	80/130
Maplewood Avenue NB LT	0.01	7.1	A	<25/<25	0.04	15.5	B	<25/<25	0.07	18.3	B	<25/<25	0.05	24.8	C	<25/30	0.32	27.8	C	29/36	0.21	18.0	B	<25/51
Maplewood Avenue NB TH	0.54	13.0	B	121/568	0.87	39.3	D	279/677	0.94	53.2	D	283/646	0.75	35.6	D	262/595	1.08	96.6	F	434/624	0.76	27.6	C	276/452
Maplewood Avenue NB RT	0.13	6.3	A	<25/<25	0.19	14.5	B	<25/<25	0.19	19.3	B	<25/<25	0.16	42.7	D	<25/103	0.18	27.1	C	<25/<25	0.16	31.3	C	<25/75
Maplewood Avenue SB LT	0.15	10.3	B	<25/58	0.43	22.7	C	29/72	0.50	25.8	C	32/72	0.34	18.8	B	27/72	0.49	28.2	C	38/72	0.34	17.1	B	<25/56
Maplewood Avenue SB TH/RT	0.33	10.4	B	101/294	0.52	22.3	C	183/350	0.57	26.0	C	203/357	0.49	19.4	B	173/357	0.73	35.1	D	289/419	0.75	30.9	C	243/454
Overall Intersection	**0.56**	**21.2**	**C**	**-**	**0.71**	**28.7**	**C**	**-**	**0.72**	**33.1**	**C**	**-**	**0.67**	**31.1**	**C**	**-**	**0.93**	**49.6**	**D**	**-**	**0.72**	**31.4**	**C**	**-**
Saturday Midday Peak Period																								
Deer Street EB Approach	0.47	41.9	D	65/108	0.59	38.3	D	97/178	0.58	37.0	D	100/188	-	-	-	-	0.88	48.7	D	192/525	-	-	-	-
Deer Street EB LT	-	-	-	-	-	-	-	-	-	-	-	-	0.41	37.4	D	50/94	-	-	-	-	0.64	35.5	D	83/127
Deer Street EB TH/RT	-	-	-	-	-	-	-	-	-	-	-	-	0.22	34.8	C	39/81	-	-	-	-	0.66	45.0	D	97/150
Deer Street WB LT	0.74	54.9	D	115/183	0.83	55.7	E	157/340	0.81	52.6	D	156/345	0.86	62.4	E	166/302	0.64	31.0	C	110/361	0.72	36.8	D	115/185
Deer Street WB TH/RT	0.27	39.5	D	41/87	0.29	32.8	C	58/129	0.28	31.9	C	57/129	0.33	36.2	D	62/125	0.28	22.8	C	63/179	0.60	41.1	D	99/161
Maplewood Avenue NB LT	0.00	13.2	B	<25/<25	0.04	21.9	C	<25/<25	0.07	23.1	C	<25/<25	0.06	9.0	A	<25/<25	0.60	50.1	D	31/108	0.27	10.8	B	25/25
Maplewood Avenue NB TH	0.51	15.4	B	79/462	0.76	31.8	C	158/597	0.78	33.9	C	161/592	0.69	21.3	C	67/658	1.08	100.3	F	381/562	0.64	23.7	C	312/397
Maplewood Avenue NB RT	0.15	10.2	B	<25/26	0.20	26.5	C	<25/77	0.20	28.4	C	<25/73	0.20	12.9	B	<25/85	0.19	49.4	D	28/77	0.17	39.4	D	55/62
Maplewood Avenue SB LT	0.16	11.7	B	<25/61	0.36	19.2	B	29/79	0.37	20.1	C	30/79	0.31	16.5	B	25/82	0.53	30.3	C	43/76	0.29	16.2	B	29/56
Maplewood Avenue SB TH/RT	0.34	12.6	B	90/292	0.50	20.0	B	165/352	0.51	21.0	C	171/354	0.47	17.2	B	142/365	0.81	42.0	D	322/441	0.72	29.7	C	291/407
Overall Intersection	**0.49**	**21.6**	**C**	**-**	**0.68**	**31.4**	**C**	**-**	**0.68**	**31.9**	**C**	**-**	**0.64**	**26.7**	**C**	**-**	**0.85**	**53.6**	**D**	**-**	**0.71**	**31.9**	**C**	**-**

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 14 – 2018 Opening Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2018 Opening Year No-Build				2018 Opening Year Build Phase 1				2018 Opening Year Build w/ Mitigation Phase 1				2018 Opening Year Build Phases 2-4				2018 Opening Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Maplewood Avenue / Hanover Street																								
Weekday Morning Peak Period																								
Hanover Street EB LT	0.17	44.8	D	<25/28	0.13	41.0	D	<25/29	0.13	41.0	D	<25/29	0.13	40.9	D	<25/29	0.13	41.0	D	<25/29	0.10	33.8	C	<25/25
Hanover Street EB TH/TR	0.27	45.5	D	<25/48	0.20	41.4	D	<25/50	0.20	41.4	D	<25/49	0.19	41.3	D	<25/49	0.21	41.5	D	<25/54	0.17	34.2	C	<25/45
Hanover Street WB LT/TH	0.59	56.7	E	29/60	0.62	52.1	D	45/80	0.63	52.8	D	45/82	0.62	52.4	D	45/82	0.64	53.8	D	45/82	0.47	37.8	D	40/68
Hanover Street WB RT	0.08	36.9	D	<25/36	0.08	33.8	C	<25/35	0.08	34.1	C	<25/35	0.08	34.0	C	<25/35	0.08	34.2	C	<25/35	0.09	27.5	C	<25/29
Maplewood Avenue NB Approach	0.19	4.3	A	44/83	0.24	6.0	A	52/97	0.25	6.0	A	51/100	0.25	7.1	A	48/103	0.26	6.2	A	52/104	0.26	12.5	B	75/139
Maplewood Avenue SB LT	0.18	1.3	A	<25/<25	0.22	2.3	A	<25/52	0.18	2.2	A	<25/45	0.18	3.1	A	<25/47	0.19	2.1	A	<25/41	0.18	5.7	A	<25/43
Maplewood Avenue SB TH/RT	0.29	1.9	A	26/88	0.34	3.1	A	47/154	0.34	3.2	A	51/161	0.34	3.9	A	41/204	0.35	3.0	A	34/183	0.34	7.1	A	89/242
Overall Intersection	**0.32**	**11.2**	**B**	**-**	**0.38**	**12.0**	**B**	**-**	**0.38**	**12.2**	**B**	**-**	**0.38**	**12.9**	**B**	**-**	**0.39**	**12.3**	**B**	**-**	**0.39**	**14.2**	**B**	**-**
Weekday Evening Peak Period																								
Hanover Street EB LT	0.38	44.6	D	40/51	0.42	43.7	D	46/57	0.42	44.1	D	47/57	0.41	43.6	D	47/56	0.40	43.1	D	46/57	0.36	34.3	C	37/46
Hanover Street EB TH/RT	0.30	43.5	D	42/52	0.30	41.8	D	46/55	0.34	42.6	D	50/57	0.33	42.2	D	50/56	0.37	42.3	D	56/60	0.32	33.6	C	36/42
Hanover Street WB LT/TH	0.65	54.0	D	73/122	0.72	57.0	E	89/144	0.73	58.7	E	84/138	0.71	56.5	E	84/136	0.79	67.2	E	85/143	0.68	44.7	D	67/113
Hanover Street WB RT	0.13	35.5	D	<25/47	0.13	33.9	C	<25/47	0.12	34.3	C	<25/46	0.12	33.7	C	<25/44	0.12	33.6	C	<25/46	0.24	26.8	C	28/64
Maplewood Avenue NB Approach	0.31	6.1	A	<25/141	0.38	6.3	A	<25/182	0.38	6.5	A	28/182	0.39	7.0	A	<25/182	0.41	7.7	A	35/207	0.41	11.9	B	92/201
Maplewood Avenue SB LT	0.22	2.9	A	<25/<25	0.29	4.3	A	<25/46	0.28	4.3	A	<25/46	0.28	3.8	A	<25/73	0.29	6.4	A	<25/48	0.27	5.7	A	<25/49
Maplewood Avenue SB TH/RT	0.31	3.3	A	51/98	0.39	4.9	A	64/292	0.41	5.1	A	62/315	0.41	5.6	A	139/362	0.43	7.7	A	109/363	0.41	6.5	A	142/211
Overall Intersection	**0.37**	**15.6**	**B**	**-**	**0.46**	**15.7**	**B**	**-**	**0.47**	**15.8**	**B**	**-**	**0.47**	**15.8**	**B**	**-**	**0.50**	**17.7**	**B**	**-**	**0.50**	**15.8**	**B**	**-**
Saturday Midday Peak Period																								
Hanover Street EB LT	0.20	43.3	D	<25/45	0.25	42.1	D	<25/56	0.25	41.5	D	25/56	0.23	41.5	D	25/53	0.25	42.2	D	<25/56	0.18	34.8	C	<25/45
Hanover Street EB TH/TR	0.16	42.8	D	<25/53	0.16	41.0	D	<25/59	0.16	40.9	D	<25/58	0.15	40.5	D	<25/55	0.18	41.3	D	<25/65	0.16	34.5	C	<25/53
Hanover Street WB LT/TH	0.65	54.4	D	69/109	0.80	67.2	E	92/168	0.79	45.3	E	91/165	0.76	60.9	E	91/141	0.81	69.5	E	91/168	0.65	44.4	D	77/121
Hanover Street WB RT	0.09	35.3	D	<25/34	0.10	33.5	C	<25/36	0.09	33.6	C	<25/36	0.09	33.1	C	<25/34	0.09	33.7	C	<25/36	0.12	27.8	C	<25/33
Maplewood Avenue NB Approach	0.40	7.6	A	50/158	0.51	9.4	A	151/190	0.51	21.6	A	152/192	0.52	9.3	A	148/227	0.55	9.9	A	162/218	0.45	13.2	B	141/146
Maplewood Avenue SB LT	0.27	5.0	A	49/37	0.37	6.0	A	56/39	0.36	12.0	A	52/38	0.36	13.3	B	55/71	0.37	6.8	A	51/45	0.29	8.8	A	45/58
Maplewood Avenue SB TH/RT	0.33	6.0	A	136/132	0.44	7.6	A	329/221	0.45	12.9	A	338/338	0.45	13.5	B	244/315	0.48	8.3	A	228/291	0.40	9.7	A	202/288
Overall Intersection	**0.38**	**15.0**	**B**	**-**	**0.48**	**17.0**	**B**	**-**	**0.48**	**16.8**	**B**	**-**	**0.48**	**18.6**	**B**	**-**	**0.51**	**17.6**	**B**	**-**	**0.51**	**16.8**	**B**	**-**
Maplewood Avenue / Middle Street / Congress Street / Islington Street																								
Weekday Morning Peak Period																								
Islington Street EB LT	0.71	55.6	E	73/133	0.73	54.8	D	87/172	0.73	55.0	D	84/165	0.74	56.9	E	86/144	0.73	55.0	D	84/165	0.65	43.0	D	77/114
Islington Street EB RT	0.09	37.7	D	<25/<25	0.09	35.9	D	<25/<25	0.09	35.9	D	<25/<25	0.09	36.2	D	<25/<25	0.09	35.5	D	<25/<25	0.10	29.8	C	<25/<25
Congress Street WB LT	0.66	48.2	D	87/146	0.67	48.7	D	89/149	0.67	48.7	D	89/149	0.65	46.6	D	89/145	0.67	48.7	D	89/149	0.65	43.1	D	79/138
Congress Street WB TH	0.77	51.6	D	134/212	0.79	52.4	D	140/227	0.80	53.5	D	146/250	0.79	51.6	D	146/230	0.82	54.3	D	152/267	0.75	42.4	D	135/208
Congress Street WB RT	0.38	37.7	D	51/97	0.42	37.9	D	58/108	0.45	38.0	D	64/118	0.45	37.7	D	64/116	0.48	38.0	D	70/128	0.46	32.9	C	63/111
Middle Street NB Approach	0.19	20.0	C	42/107	0.26	22.2	C	58/132	0.28	22.6	C	62/139	0.28	10.4	B	<25/70	0.34	23.6	C	69/152	0.25	7.8	A	68/68
Maplewood Avenue SB TH	0.47	23.9	C	155/370	0.59	27.4	C	168/458	0.60	27.4	C	171/454	0.60	27.4	C	152/498	0.65	30.5	C	174/503	0.52	20.9	C	150/289
Maplewood Avenue SB RT	0.17	14.4	B	33/58	0.20	12.5	B	36/58	0.20	12.4	B	38/57	0.20	13.1	B	39/52	0.20	12.8	B	37/62	0.15	12.6	B	<25/87
Overall Intersection	**0.51**	**34.2**	**C**	**-**	**0.57**	**34.5**	**C**	**-**	**0.58**	**34.7**	**C**	**-**	**0.58**	**32.2**	**C**	**-**	**0.61**	**35.6**	**D**	**-**	**0.66**	**26.1**	**C**	**-**
Weekday Evening Peak Period																								
Islington Street EB LT	0.72	61.5	E	88/156	0.83	71.6	E	116/221	0.83	71.6	E	116/221	0.83	71.6	E	116/221	0.83	71.6	E	116/221	0.65	41.9	D	88/141
Islington Street EB RT	0.11	42.7	D	<25/55	0.11	41.4	D	<25/56	0.11	41.4	D	<25/56	0.11	41.4	D	<25/56	0.11	41.0	D	<25/56	0.12	30.0	C	<25/45
Congress Street WB LT	0.75	57.4	E	120/194	0.75	57.9	E	123/199	0.75	57.9	E	123/199	0.75	57.9	E	123/199	0.75	57.9	E	123/199	0.66	41.3	D	97/157
Congress Street WB TH	0.82	60.1	E	161/273	0.85	63.5	E	172/291	0.86	65.0	E	174/302	0.86	65.0	E	174/302	0.87	67.0	E	184/323	0.72	39.4	D	141/208
Congress Street WB RT	0.71	52.7	D	117/194	0.77	56.6	E	131/231	0.78	58.3	E	134/240	0.78	58.3	E	134/240	0.81	60.2	E	143/261	0.71	40.3	D	11/174
Middle Street NB Approach	0.27	24.0	C	105/140	0.42	27.4	C	141/182	0.45	28.1	C	145/188	0.45	17.5	B	147/147	0.56	31.0	C	163/213	0.39	13.7	B	25/129
Maplewood Avenue SB TH	0.58	29.4	C	284/418	0.75	33.6	C	404/574	0.80	39.4	D	432/611	0.80	38.5	D	451/611	0.88	51.5	D	508/687	0.72	25.5	C	250/472
Maplewood Avenue SB RT	0.14	16.6	B	<25/51	0.18	14.9	B	26/49	0.18	16.2	B	29/47	0.18	17.2	B	27/57	0.18	20.1	C	39/51	0.14	8.5	A	29/51
Overall Intersection	**0.56**	**40.7**	**D**	**-**	**0.64**	**42.8**	**D**	**-**	**0.67**	**44.7**	**D**	**-**	**0.67**	**42.4**	**D**	**-**	**0.71**	**48.9**	**D**	**-**	**0.79**	**28.0**	**C**	**-**

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 14 – 2018 Opening Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2018 Opening Year No-Build				2018 Opening Year Build Phase 1				2018 Opening Year Build w/ Mitigation Phase 1				2018 Opening Year Build Phases 2-4				2018 Opening Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Maplewood Avenue / Middle Street / Congress Street / Islington Street																								
Saturday Midday Peak Period																								
Islington Street EB LT	0.71	62.5	E	78/168	0.82	72.3	E	105/229	0.81	71.7	E	103/225	0.78	67.1	E	101/202	0.81	71.7	E	103/225	0.74	56.2	E	90/178
Islington Street EB RT	0.12	42.2	D	<25/69	0.12	39.7	D	<25/69	0.12	39.6	D	<25/69	0.12	40.8	D	<25/72	0.12	38.2	D	<25/69	0.15	32.6	C	<25/50
Congress Street WB LT	0.79	61.9	E	125/232	0.81	65.0	E	129/237	0.81	65.0	E	129/237	0.73	53.6	D	128/195	0.81	65.0	E	129/237	0.72	49.2	D	115/184
Congress Street WB TH	0.90	69.0	E	209/372	0.89	65.1	E	224/403	0.89	65.0	E	227/408	0.88	64.2	E	227/408	0.87	60.6	E	259/439	0.74	40.5	D	189/286
Congress Street WB RT	0.78	55.6	E	153/280	0.80	56.0	E	172/319	0.81	56.8	E	176/327	0.81	56.5	E	176/327	0.81	54.2	D	191/359	0.84	52.9	D	157/277
Middle Street NB Approach	0.29	25.0	C	106/127	0.52	31.1	C	152/178	0.56	32.0	C	155/183	0.57	16.4	B	182/210	0.88	42.4	D	185/235	0.45	19.3	B	33/140
Maplewood Avenue SB TH	0.54	21.9	C	257/318	0.77	31.5	C	352/549	0.78	32.3	C	370/563	0.79	29.9	C	389/569	0.92	48.6	D	449/660	0.67	16.5	B	317/317
Maplewood Avenue SB RT	0.14	16.3	B	55/33	0.19	16.5	B	27/43	0.19	16.4	B	27/42	0.19	14.5	B	<25/41	0.20	17.4	B	<25/37	0.15	7.0	A	<25/43
Overall Intersection	**0.57**	**42.7**	**D**	**-**	**0.68**	**44.6**	**D**	**-**	**0.68**	**44.9**	**D**	**-**	**0.67**	**39.6**	**D**	**-**	**0.74**	**49.6**	**D**	**-**	**0.82**	**30.7**	**C**	**-**
Middle Street / State Street																								
Weekday Morning Peak Period																								
State Street EB Approach	0.42	29.5	C	<25/70	0.44	30.8	C	25/72	0.44	31.1	C	26/72	0.59	50.3	D	45/71	0.45	31.8	C	27/72	0.40	38.6	D	38/52
Middle Street NB LT/TH	0.46	19.4	B	69/222	0.54	20.6	C	91/281	0.56	20.9	C	96/294	0.39	19.2	B	167/253	0.58	21.4	C	106/317	0.33	11.0	B	91/232
Middle Street NB RT	0.42	19.0	B	55/185	0.41	19.1	B	58/192	0.41	19.1	B	58/192	0.29	17.8	B	102/166	0.40	19.0	B	59/192	0.26	10.4	B	52/146
Middle Street SB LT	0.34	7.4	A	<25/120	0.40	7.9	A	28/136	0.40	8.0	A	28/136	0.40	12.9	B	65/143	0.43	8.2	A	30/144	0.35	4.0	A	26/79
Middle Street SB TH/RT	0.32	7.1	A	45/207	0.34	7.1	A	52/231	0.34	7.1	A	52/233	0.33	10.4	B	114/184	0.36	7.0	A	56/245	0.29	3.7	A	49/125
Overall Intersection	**0.37**	**13.8**	**B**	**-**	**0.43**	**14.2**	**B**	**-**	**0.44**	**14.4**	**B**	**-**	**0.36**	**17.0**	**B**	**-**	**0.46**	**14.6**	**B**	**-**	**0.38**	**9.0**	**A**	**-**
Weekday Evening Peak Period																								
State Street EB Approach	0.59	34.1	C	38/110	0.53	34.8	C	52/111	0.55	36.3	D	52/111	0.66	54.5	D	83/112	0.57	37.8	D	55/111	0.53	37.7	D	64/82
Middle Street NB LT/TH	0.56	22.2	C	97/291	0.73	30.6	C	163/383	0.76	32.9	C	166/407	0.52	25.7	C	193/369	0.78	33.5	C	182/453	0.48	17.0	B	171/292
Middle Street NB RT	0.56	22.4	C	81/253	0.58	26.3	C	104/258	0.60	27.6	C	104/258	0.41	23.8	C	121/248	0.57	26.8	C	104/258	0.38	15.8	B	99/185
Middle Street SB LT	0.54	9.8	A	42/199	0.67	15.2	B	51/309	0.68	17.0	B	64/351	0.62	21.6	C	140/266	0.74	22.4	C	85/403	0.63	18.3	B	99/189
Middle Street SB TH/RT	0.34	7.6	A	57/255	0.38	8.7	A	69/297	0.39	8.5	A	72/308	0.35	7.4	A	135/207	0.40	8.6	A	76/325	0.34	3.5	A	64/127
Overall Intersection	**0.52**	**16.6**	**B**	**-**	**0.60**	**20.8**	**C**	**-**	**0.62**	**22.0**	**C**	**-**	**0.59**	**21.6**	**C**	**-**	**0.66**	**23.3**	**C**	**-**	**0.65**	**14.8**	**B**	**-**
Saturday Midday Peak Period																								
State Street EB Approach	0.62	40.8	D	68/130	0.56	40.3	D	72/132	0.55	40.4	D	72/132	0.66	55.9	E	77/138	0.58	42.8	D	72/132	0.48	40.6	D	67/112
Middle Street NB LT/TH	0.63	27.4	C	209/333	0.82	39.5	D	288/501	0.82	39.6	D	293/508	0.66	34.5	C	296/452	0.82	38.7	D	325/571	0.56	21.9	C	211/384
Middle Street NB RT	0.56	26.0	C	157/263	0.58	29.5	C	162/269	0.58	29.3	C	162/269	0.47	29.6	C	165/254	0.54	27.7	C	162/269	0.43	20.1	C	110/221
Middle Street SB LT	0.64	13.6	B	139/241	0.84	31.9	C	206/444	0.85	34.1	C	212/454	0.77	31.7	C	219/378	0.95	52.7	D	274/512	0.71	25.6	C	160/231
Middle Street SB TH/RT	0.34	9.0	A	149/245	0.40	10.3	B	184/295	0.40	10.4	B	186/299	0.37	16.1	B	242/297	0.42	10.5	B	204/325	0.35	4.5	A	95/145
Overall Intersection	**0.56**	**20.0**	**C**	**-**	**0.68**	**28.3**	**C**	**-**	**0.69**	**28.8**	**C**	**-**	**0.66**	**29.6**	**C**	**-**	**0.77**	**33.0**	**C**	**-**	**0.70**	**19.0**	**B**	**-**
Deer Street / Russell Street																								
Weekday Morning Peak Period																								
Deer Street EB Approach	0.12	6.4	A	<25	0.16	6.8	A	<25	0.16	6.8	A	<25					0.17	6.9	A	<25				
Deer Street WB Approach	0.06	0.0	A	<25	0.07	0.0	A	<25	0.07	0.0	A	<25					0.07	0.0	A	<25				
Russell Street SB LT	0.03	12.7	B	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street SB RT	0.28	10.4	B	29	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street SB Approach	-	-	-	-	0.39	12.1	B	47	0.41	12.3	B	50					0.44	12.7	B	57				
Weekday Evening Peak Period													Same as Build Condition								Same as Build Condition			
Deer Street EB Approach	0.17	6.4	A	<25	0.22	6.9	A	<25	0.22	6.9	A	<25					0.24	7.1	A	<25				
Deer Street WB Approach	0.06	0.0	A	<25	0.07	0.0	A	<25	0.07	0.0	A	<25					0.07	0.0	A	<25				
Russell Street SBL	0.02	15.8	C	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street SBR	0.31	10.6	B	33	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street SB Approach	-	-	-	-	0.64	17.8	C	115	0.64	18.2	C	119					0.69	20.1	C	138				

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 14 – 2018 Opening Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2018 Opening Year No-Build				2018 Opening Year Build Phase 1				2018 Opening Year Build w/ Mitigation Phase 1				2018 Opening Year Build Phases 2-4				2018 Opening Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Deer Street / Russell Street																								
Saturday Midday Peak Period																								
Deer Street EB Approach	0.16	6.1	A	<25	0.22	6.9	A	<25	0.22	6.9	A	<25					0.24	7.1	A	<25				
Deer Street WB Approach	0.09	0.0	A	<25	0.11	0.0	A	<25	0.11	0.0	A	<25					0.11	0.0	A	<25				
Russell Street SB LT	0.05	16.2	C	<25	-	-	-	-	-	-	-	-	Same as Build Condition				-	-	-	-	Same as Build Condition			
Russell Street SB RT	0.32	11.4	B	34	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street SB Approach	-	-	-	-	0.74	24.6	C	161	0.74	24.4	C	160					0.80	29.3	D	199				
Russell Street / Green Street																								
Weekday Morning Peak Period																								
Green Street EB Approach	0.04	11.9	B	<25	0.04	12.7	B	<25	0.05	12.8	B	<25					0.05	13.2	B	<25				
Russell Street NB Approach	0.01	0.4	A	<25	0.00	0.2	A	<25	0.00	0.8	A	<25					0.00	0.2	A	<25				
Russell Street SB Approach	0.23	0.0	A	<25	0.28	0.0	A	<25	0.28	0.0	A	<25					0.30	0.0	A	<25				
Weekday Evening Peak Period																								
Green Street EB Approach	0.16	13.4	B	<25	0.22	16.8	C	<25	0.22	17.0	C	<25					0.23	18.1	C	<25				
Russell Street NB Approach	0.01	0.3	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25	Same as Build Condition				0.01	0.2	A	<25	Same as Build Condition			
Russell Street SB Approach	0.19	0.0	A	<25	0.25	0.0	A	<25	0.25	0.0	A	<25					0.27	0.0	A	<25				
Saturday Midday Peak Period																								
Green Street EB Approach	0.05	11.8	B	<25	0.07	14.5	B	<25	0.07	14.5	B	<25					0.07	15.3	C	<25				
Russell Street NB Approach	0.01	0.3	A	<25	0.00	0.2	A	<25	0.00	0.2	A	<25					0.00	0.2	A	<25				
Russell Street SB Approach	0.18	0.0	A	<25	0.28	0.0	A	<25	0.28	0.0	A	<25					0.30	0.0	A	<25				
Market Street / Russell Street																								
Weekday Morning Peak Period																								
Russell Street EB LT	0.41	20.0	C	49	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB RT	0.01	10.7	B	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB Approach	-	-	-	-	0.27	7.4	A	31	0.26	7.0	A	30					0.28	7.3	A	33				
Market Street NB Approach	0.15	0.0	A	<25	0.26	5.9	A	33	0.26	5.9	A	32					0.26	6.0	A	33				
Market Street SBT	0.26	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SBR	0.23	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SB Approach	-	-	-	-	0.68	11.7	B	197	0.66	11.3	B	183					0.68	11.8	B	200				
Weekday Evening Peak Period																								
Russell Street EB LT	0.94	73.4	F	238	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB RT	0.01	9.9	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB Approach	-	-	-	-	0.45	9.1	A	66	0.46	9.2	A	68					0.49	9.7	A	78				
Market Street NB Approach	0.31	0.0	A	<25	0.61	13.1	B	122	0.58	12.5	B	111	Same as Build Condition				0.60	13.3	B	117	Same as Build Condition			
Market Street SBT	0.21	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SBR	0.20	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SB Approach	-	-	-	-	0.59	9.4	A	144	0.59	9.4	A	143					0.61	9.8	A	154				
Saturday Midday Peak Period																								
Russell Street EB LT	0.74	43.0	E	137	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB RT	0.02	10.3	B	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB Approach	-	-	-	-	0.39	8.4	A	52	0.39	8.3	A	52					0.42	8.8	A	57				
Market Street NB Approach	0.29	0.0	A	<25	0.53	10.6	B	94	0.53	10.5	B	91					0.54	11.0	B	97				
Market Street SBT	0.24	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SBR	0.15	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SB Approach	-	-	-	-	0.58	9.3	A	137	0.58	9.2	A	135					0.60	9.6	A	147				

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 14 – 2018 Opening Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2018 Opening Year No-Build				2018 Opening Year Build Phase 1				2018 Opening Year Build w/ Mitigation Phase 1				2018 Opening Year Build Phases 2-4				2018 Opening Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Market Street / Albacore Park Drive																								
Weekday Morning Peak Period																								
Albacore Park Drive ELT	0.48	21.1	C	<25/37	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive ERT	0.03	17.9	B	<25/<25	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive EB Approach	-	-	-	-	0.46	31.2	C	39/79	0.46	31.0	C	39/79					0.38	28.5	C	40/80				
Market Street NB LT	0.16	3.8	A	<25/<25	0.43	35.0	D	<25/59	0.44	35.1	D	<25/59					0.44	35.4	D	25/62				
Market Street NB TH	0.17	3.6	A	<25/41	0.17	3.7	A	28/53	0.17	3.7	A	28/52					0.18	4.5	A	30/54				
Market Street SB Approach	0.47	4.7	A	67/123	0.61	12.4	B	185/307	0.60	12.2	B	178/297					0.65	14.4	B	187/309				
Overall Intersection	**0.47**	**5.5**	**A**	**-**	**0.56**	**12.7**	**B**	**-**	**0.55**	**12.6**	**B**	**-**					**0.56**	**13.9**	**B**	**-**				
Weekday Evening Peak Period																								
Albacore Park Drive EB LT	0.73	19.3	B	72/153	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive EB RT	0.03	10.8	B	<25/<25	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive EB Approach	-	-	-	-	0.80	35.8	D	189/307	0.79	35.1	D	189/307					0.81	36.6	D	192/307				
Market Street NB LT	0.26	8.2	A	<25/33	0.50	34.5	C	48/102	0.50	34.5	C	48/103					0.51	35.0	D	50/105				
Market Street NB TH	0.55	9.5	A	75/111	0.46	9.5	A	118/153	0.45	9.5	A	115/148	Same as Build Condition				0.46	9.5	A	120/153	Same as Build Condition			
Market Street SB Approach	0.44	8.7	A	52/82	0.58	20.1	C	145/214	0.58	20.3	C	145/213					0.59	20.2	C	152/222				
Overall Intersection	**0.62**	**10.9**	**B**	**-**	**0.66**	**19.4**	**B**	**-**	**0.66**	**19.4**	**B**	**-**					**0.67**	**19.6**	**B**	**-**				
Saturday Midday Peak Period																								
Albacore Park Drive EB LT	0.50	14.4	B	29/73	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive EB RT	0.03	12.2	B	<25/<25	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive EB Approach	-	-	-	-	0.61	26.1	C	108/191	0.61	26.0	C	107/191					0.62	26.8	C	113/193				
Market Street NB LT	0.11	5.5	A	<25/<25	0.44	32.6	C	27/65	0.44	32.5	C	27/65					0.44	33.2	C	27/65				
Market Street NB TH	0.38	6.3	A	42/84	0.37	7.4	A	76/100	0.36	7.4	A	75/99					0.37	7.5	A	78/103				
Market Street SB Approach	0.40	6.4	A	42/88	0.56	15.8	B	135/201	0.55	15.8	B	134/200					0.56	15.9	B	141/208				
Overall Intersection	**0.43**	**7.5**	**A**	**-**	**0.58**	**14.7**	**B**	**-**	**0.58**	**14.4**	**B**	**-**					**0.59**	**14.8**	**B**	**-**				
Deer Street / Bridge Street																								
Weekday Morning Peak Period																								
Site Driveway EB Approach	0.01	8.9	A	<25	0.01	9.1	A	<25	0.01	10.4	B	<25					0.19	13.1	B	<25				
Deer Street WB Approach	0.00	0.1	A	<25	0.00	0.1	A	<25	0.03	2.4	A	<25					0.06	3.3	A	<25				
Bridge Street SB Approach	0.06	0.0	A	<25	0.08	0.0	A	<25	0.11	0.0	A	<25					0.17	0.0	A	<25				
Weekday Evening Peak Period																								
Site Driveway EB Approach	0.03	9.5	A	<25	0.03	10.0	B	<25	0.13	10.7	B	<25					0.38	15.0	B	43				
Deer Street WB Approach	0.01	0.6	A	<25	0.01	0.5	A	<25	0.01	0.8	A	<25	Same as Build Condition				0.04	1.8	A	<25	Same as Build Condition			
Bridge Street SB Approach	0.04	0.0	A	<25	0.07	0.0	A	<25	0.08	0.0	A	<25					0.15	0.0	A	<25				
Saturday Midday Peak Period																								
Site Driveway EB Approach	0.03	9.3	A	<25	0.03	10.0	A	<25	0.05	10.3	B	<25					0.36	15.5	C	41				
Deer Street WB Approach	0.01	0.8	A	<25	0.01	0.5	A	<25	0.02	1.0	A	<25					0.05	2.3	A	<25				
Bridge Street SB Approach	0.04	0.0	A	<25	0.08	0.0	A	<25	0.08	0.0	A	<25					0.18	0.0	A	<25				
Bridge Street / Hanover Street																								
Weekday Morning Peak Period																								
Hanover Street EB Approach	0.06	8.1	A	<25	0.07	8.2	A	<25	0.07	8.4	A	<25					0.07	8.6	A	<25				
Hanover Street WB Approach	0.04	7.4	A	<25	0.06	7.7	A	<25	0.07	7.7	A	<25	Same as Build Condition				0.08	7.9	A	<25	Same as Build Condition			
Bridge Street NB Approach	0.06	7.0	A	<25	0.10	7.3	A	<25	0.15	7.7	A	<25					0.20	8.2	A	<25				
Bridge Street SB Approach	0.07	8.0	A	<25	0.09	8.1	A	<25	0.10	8.2	A	<25					0.13	8.6	A	<25				

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 14 – 2018 Opening Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2018 Opening Year No-Build				2018 Opening Year Build Phase 1				2018 Opening Year Build w/ Mitigation Phase 1				2018 Opening Year Build Phases 2-4				2018 Opening Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Bridge Street / Hanover Street																								
Weekday Evening Peak Period																								
Hanover Street EB Approach	0.14	8.3	A	<25	0.15	8.6	A	<25	0.15	8.7	A	25					0.16	9.0	A	<25				
Hanover Street WB Approach	0.13	8.4	A	<25	0.15	8.7	A	<25	0.15	8.9	A	<25					0.17	9.2	A	<25				
Bridge Street NB Approach	0.18	8.2	A	<25	0.24	8.7	A	<25	0.25	8.9	A	<25					0.31	9.5	A	33				
Bridge Street SB Approach	0.12	8.3	A	<25	0.16	8.6	A	<25	0.19	8.9	A	<25					0.24	9.4	A	<25				
Saturday Midday Peak Period													Same as Build Condition								Same as Build Condition			
Hanover Street EB Approach	0.11	7.9	A	<25	0.11	8.3	A	<25	0.12	8.3	A	<25					0.12	8.7	A	<25				
Hanover Street WB Approach	0.14	8.2	A	<25	0.16	8.6	A	<25	0.17	8.7	A	<25					0.20	9.2	A	<25				
Bridge Street NB Approach	0.13	7.8	A	<25	0.21	8.4	A	<25	0.22	8.6	A	<25					0.30	9.4	A	30				
Bridge Street SB Approach	0.10	8.0	A	<25	0.14	8.4	A	<25	0.15	8.5	A	<25					0.22	9.2	A	<25				
Bridge Street / Islington Street																								
Weekday Morning Peak Period																								
Islington Street EB Approach	0.02	1.0	A	<25	0.03	1.2	A	<25	0.04	1.5	A	<25	0.04	1.5	A	<25	0.05	2.0	A	<25	0.05	1.9	A	<25
Islington Street WB Approach	0.24	0.0	A	<25	0.26	0.0	A	<25	0.28	0.0	A	<25	0.28	0.0	A	<25	0.29	0.0	A	<25	0.29	0.0	A	<25
Bridge Street SB Approach	0.12	11.9	B	<25	0.16	12.5	B	<25	0.16	12.7	B	<25	0.15	12.3	B	<25	0.19	13.1	B	<25	0.19	13.1	B	<25
Weekday Evening Peak Period																								
Islington Street EB Approach	0.09	3.0	A	<25	0.11	3.2	A	<25	0.11	3.3	A	<25	0.11	3.3	A	<25	0.12	3.5	A	<25	0.12	3.5	A	<25
Islington Street WB Approach	0.21	0.0	A	<25	0.24	0.0	A	<25	0.25	0.0	A	<25	0.25	0.0	A	<25	0.26	0.0	A	<25	0.26	0.0	A	<25
Bridge Street SB Approach	0.21	12.3	B	<25	0.26	13.3	B	26	0.27	13.4	B	27	0.25	12.7	B	25	0.29	13.8	B	30	0.29	13.8	B	30
Saturday Midday Peak Period																								
Islington Street EB Approach	0.06	2.0	A	<25	0.08	2.4	A	<25	0.09	2.5	A	<25	0.09	2.5	A	<25	0.10	2.9	A	<25	0.10	2.9	A	<25
Islington Street WB Approach	0.25	0.0	A	<25	0.29	0.0	A	<25	0.29	0.0	A	<25	0.29	0.0	A	<25	0.31	0.0	A	<25	0.31	0.0	A	<25
Bridge Street SB Approach	0.15	11.8	B	<25	0.20	12.8	B	<25	0.20	12.8	B	<25	0.20	12.8	B	<25	0.23	13.3	B	<25	0.23	13.3	B	<25

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 15 – 2028 Future Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2028 Future Year No-Build				2028 Future Year Build Phase 1				2028 Future Year Build w/ Mitigation Phase 1				2028 Future Year Build Phases 2-4				2028 Future Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Maplewood Avenue / Cutts Street / Route 1 Bypass SB Ramps																								
Weekday Morning Peak Period																								
Maplewood Avenue EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25					0.00	0.0	A	<25				
Maplewood Avenue WB Approach	0.23	6.7	A	<25	0.29	7.2	A	30	0.29	7.2	A	30					0.32	7.4	A	35				
Route 1 Bypass NB Approach	0.10	16.9	C	<25	0.29	22.5	C	30	0.29	22.4	C	30					0.36	27.4	D	38				
Cutts Street SB Approach	0.21	26.2	D	<25	0.31	40.8	E	30	0.31	40.7	E	30					0.37	52.4	F	38				
Weekday Evening Peak Period																								
Maplewood Avenue EB Approach	0.01	0.4	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25					0.01	0.3	A	<25				
Maplewood Avenue WB Approach	0.35	7.3	A	41	0.46	8.7	A	62	0.46	8.7	A	62	Same as Build Condition				0.51	9.4	A	74	Same as Build Condition			
Route 1 Bypass NB Approach	0.14	23.1	C	<25	1.45	352.4	F	229	1.45	349.7	F	232					1.98	597.2	F	297				
Cutts Street SB Approach	0.20	50.7	F	<25	0.43	129.6	F	38	0.43	129.9	F	38					0.58	207.6	F	50				
Saturday Midday Peak Period																								
Maplewood Avenue EB Approach	0.01	0.3	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25					0.01	0.2	A	<25				
Maplewood Avenue WB Approach	0.22	6.0	A	<25	0.30	6.8	A	32	0.30	6.7	A	32					0.34	7.1	A	38				
Route 1 Bypass NB Approach	0.09	18.6	C	<25	0.73	83.0	F	105	0.73	82.8	F	106					0.95	150.3	F	144				
Cutts Street SB Approach	0.12	25.2	D	<25	0.20	42.0	E	<25	0.20	42.1	E	<25					0.25	55.1	F	<25				
Maplewood Avenue / Route 1 Bypass NB Ramps																								
Weekday Morning Peak Period																								
Maplewood Avenue EB Approach	0.08	0.0	A	<25	0.12	0.0	A	<25	0.12	0.0	A	<25					0.13	0.0	A	<25				
Maplewood Avenue WB Approach	0.23	0.0	A	<25	0.28	0.0	A	<25	0.28	0.0	A	<25					0.31	0.0	A	<25				
Route 1 Bypass NBL	0.10	13.5	B	<25	0.14	16.1	C	<25	0.14	16.1	C	<25					0.15	17.3	C	<25				
Route 1 Bypass NBR	0.42	11.7	B	52	0.55	14.4	B	87	0.55	14.4	B	87					0.63	16.5	C	114				
Weekday Evening Peak Period																								
Maplewood Avenue EB Approach	0.12	0.0	A	<25	0.19	0.0	A	<25	0.19	0.0	A	<25					0.21	0.0	A	<25				
Maplewood Avenue WB Approach	0.42	0.0	A	<25	0.51	0.0	A	<25	0.51	0.0	A	<25	Same as Build Condition				0.55	0.0	A	<25	Same as Build Condition			
Route 1 Bypass NBL	0.15	19.3	C	<25	0.25	27.7	D	<25	0.25	27.6	D	<25					0.28	32.4	D	28				
Route 1 Bypass NBR	0.34	11.4	B	38	0.50	14.4	B	70	0.50	14.5	B	71					0.57	16.4	C	90				
Saturday Midday Peak Period																								
Maplewood Avenue EB Approach	0.10	0.0	A	<25	0.14	0.0	A	<25	0.14	0.0	A	<25					0.16	0.0	A	<25				
Maplewood Avenue WB Approach	0.27	0.0	A	<25	0.35	0.0	A	<25	0.35	0.0	A	<25					0.39	0.0	A	<25				
Route 1 Bypass NBL	0.13	14.4	B	<25	0.19	18.2	C	<25	019	18.2	C	<25					0.22	20.5	C	<25				
Route 1 Bypass NBR	0.38	11.6	B	45	0.53	14.3	B	79	0.53	14.4	B	80					0.62	16.7	C	108				
Maplewood Avenue / Dennett Street / Jackson Hill Street																								
Weekday Morning Peak Period																								
Maplewood Avenue EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25					0.00	0.0	A	<25				
Maplewood Avenue WB Approach	0.03	0.9	A	<25	0.04	1.0	A	<25	0.04	1.0	A	<25					0.04	1.2	A	<25				
Dennett Street NB Approach	0.22	15.2	C	<25	0.32	19.7	C	34	0.32	19.7	C	34					0.40	23.5	C	46				
Jackson Hill Street SB Approach	0.04	19.7	C	<25	0.06	27.1	D	<25	0.06	27.1	D	<25					0.08	33.8	D	<25				
Weekday Evening Peak Period													Same as Build Condition								Same as Build Condition			
Maplewood Avenue EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25					0.00	0.0	A	<25				
Maplewood Avenue WB Approach	0.06	1.6	A	<25	0.08	2.1	A	<25	0.09	2.2	A	<25					0.10	2.5	A	<25				
Dennett Street NB Approach	0.16	14.5	B	<25	0.26	19.9	C	26	0.27	20.1	C	27					0.33	23.5	C	34				
Jackson Hill Street SB Approach	0.08	24.4	C	<25	0.14	38.1	E	<25	0.14	38.9	E	<25					0.17	48.9	E	<25				

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 15 – 2028 Future Year Intersection Capacity and Queue Analysis Summary

Intersection / Lane Group	2016 Existing				2028 Future Year No-Build				2028 Future Year Build Phase 1				2028 Future Year Build w/ Mitigation Phase 1				2028 Future Year Build Phases 2-4				2028 Future Year Build w/ Mitigation Phases 2-4			
	V/C[a]	Delay[b]	LOS[c]	Queue[d]	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
Maplewood Avenue / Dennett Street / Jackson Hill Street																								
Saturday Midday Peak Period																								
Maplewood Avenue EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25					0.00	0.0	A	<25				
Maplewood Avenue WB Approach	0.03	1.1	A	<25	0.05	1.4	A	<25	0.05	1.3	A	<25	Same as Build Condition				0.06	1.6	A	<25	Same as Build Condition			
Dennett Street NB Approach	0.16	14.8	B	<25	0.27	19.9	C	27	0.27	20.1	C	26					0.34	23.9	C	36				
Jackson Hill Street SB Approach	0.04	23.0	C	<25	0.06	35.5	E	<25	0.06	35.6	E	<25					0.08	46.0	E	<25				
Maplewood Avenue / Raynes Avenue																								
Weekday Morning Peak Period																								
Raynes Avenue WB Approach	0.12	14.7	B	<25	0.18	18.8	C	<25	0.18	18.8	C	<25					0.22	22.8	C	<25				
Maplewood Avenue NB Approach	0.22	0.0	A	<25	0.27	0.0	A	<25	0.27	0.0	A	<25					0.30	0.0	A	<25				
Maplewood Avenue SBL Approach	0.04	1.0	A	<25	0.05	1.2	A	<25	0.05	1.2	A	<25					0.05	1.2	A	<25				
Weekday Evening Peak Period																								
Raynes Avenue WB Approach	0.27	20.3	C	27	0.50	38.5	E	62	0.50	38.8	E	62					0.59	52.6	F	80				
Maplewood Avenue NB Approach	0.39	0.0	A	<25	0.48	0.0	A	<25	0.48	0.0	A	<25	Same as Build Condition				0.52	0.0	A	<25	Same as Build Condition			
Maplewood Avenue SBL Approach	0.02	0.7	A	<25	0.03	0.8	A	<25	0.03	0.8	A	<25					0.03	0.9	A	<25				
Saturday Midday Peak Period																								
Raynes Avenue WB Approach	0.11	13.9	B	<25	0.17	18.9	C	<25	0.18	18.9	C	<25					0.21	22.8	C	<25				
Maplewood Avenue NB Approach	0.30	0.0	A	<25	0.38	0.0	A	<25	0.38	0.0	A	<25					0.42	0.0	A	<25				
Maplewood Avenue SBL Approach	0.00	0.1	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25					0.01	0.2	A	<25				
Maplewood Avenue / Vaughan Street / Railroad Driveway																								
Weekday Morning Peak Period																								
Railroad Driveway EB Approach	0.02	18.3	C	<25	0.03	25.2	D	<25	0.03	25.2	D	<25	0.03	25.3	D	<25	0.04	31.7	D	<25	0.04	32.0	D	<25
Vaughan Street WB Approach	0.07	18.4	C	<25	0.12	26.0	D	<25	0.12	26.0	D	<25	0.12	26.1	D	<25	0.15	33.5	D	<25	0.16	33.9	D	<25
Maplewood Avenue NB Approach	0.00	0.1	A	<25	0.01	0.1	A	<25	0.01	0.1	A	<25	0.01	0.1	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25
Maplewood Avenue SB Approach	0.01	0.2	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25
Weekday Evening Peak Period																								
Railroad Driveway EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25
Vaughan Street WB Approach	0.17	25.9	D	<25	0.35	54.0	F	35	0.34	52.4	F	34	0.37	58.9	F	38	0.44	75.0	F	46	0.56	107.6	F	59
Maplewood Avenue NB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25
Maplewood Avenue SB Approach	0.00	0.1	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25
Saturday Midday Peak Period																								
Railroad Driveway EB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25
Vaughan Street WB Approach	0.14	21.3	C	<25	0.30	40.7	E	29	0.30	41.1	E	29	0.30	41.0	E	29	0.39	57.5	F	40	0.43	68.2	F	46
Maplewood Avenue NB Approach	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25
Maplewood Avenue SB Approach	0.01	0.2	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 15 – 2028 Future Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2028 Future Year No-Build				2028 Future Year Build Phase 1				2028 Future Year Build w/ Mitigation Phase 1				2028 Future Year Build Phases 2-4				2028 Future Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Maplewood Avenue / Deer Street																								
Weekday Morning Peak Period																								
Deer Street EB Approach	0.38	37.9	D	41/79	0.47	34.9	C	62/118	0.48	34.7	C	65/123	-	-	-	-	0.60	26.2	C	115/317	-	-	-	-
Deer Street EB LT	-	-	-	-	-	-	-	-	-	-	-	-	0.32	34.6	C	34/72	-	-	-	-	0.59	34.5	C	62/85
Deer Street EB TH/RT	-	-	-	-	-	-	-	-	-	-	-	-	0.16	32.8	C	<25/54	-	-	-	-	0.36	34.0	C	38/70
Deer Street WB LT	0.76	53.8	D	103/204	0.73	46.3	D	111/258	0.72	45.3	D	110/259	0.75	49.6	D	113/250	0.46	23.6	C	84/267	0.65	35.6	D	90/128
Deer Street WB TH/RT	0.21	36.0	D	25/71	0.23	32.0	C	35/94	0.28	32.2	C	48/113	0.31	34.3	C	50/113	0.23	20.4	C	56/149	0.52	35.7	D	73/121
Maplewood Avenue NB LT	0.03	13.7	B	<25/<25	0.05	21.7	C	<25/25	0.10	21.6	C	<25/44	0.09	14.7	B	<25/34	0.72	78.2	E	25/108	0.27	11.1	B	<25/<25
Maplewood Avenue NB TH	0.34	14.8	B	47/297	0.47	23.1	C	141/377	0.48	23.1	C	142/377	0.45	17.2	B	138/374	0.75	44.5	D	162/369	0.46	13.2	B	169/169
Maplewood Avenue NB RT	0.09	18.3	B	<25/29	0.11	39.2	D	<25/89	0.11	39.1	D	<25/91	0.11	19.2	B	<25/50	0.11	69.2	E	27/91	0.12	9.6	A	<25/<25
Maplewood Avenue SB LT	0.10	7.6	A	<25/45	0.18	10.8	B	<25/60	0.19	11.0	B	<25/60	0.17	9.8	A	<25/60	0.32	21.0	C	29/60	0.18	11.8	B	<25/45
Maplewood Avenue SB TH/RT	0.39	10.0	A	103/299	0.57	15.7	B	186/413	0.58	16.3	B	188/415	0.56	14.4	B	173/415	0.95	52.4	D	349/559	0.86	34.5	D	314/544
Overall Intersection	**0.47**	**21.2**	**C**	**-**	**0.61**	**25.9**	**C**	**-**	**0.62**	**26.0**	**C**	**-**	**0.61**	**22.5**	**C**	**-**	**0.78**	**42.8**	**D**	**-**	**0.75**	**26.9**	**C**	**-**
Weekday Evening Peak Period																								
Deer Street EB Approach	0.61	45.0	D	97/147	0.48	26.8	C	114/249	0.57	26.4	C	132/333	-	-	-	-	0.98	66.8	E	273/611	-	-	-	-
Deer Street EB LT	-	-	-	-	-	-	-	-	-	-	-	-	0.37	26.9	C	61/126	-	-	-	-	0.78	40.9	D	94/123
Deer Street EB TH/RT	-	-	-	-	-	-	-	-	-	-	-	-	0.25	25.3	C	69/134	-	-	-	-	0.69	40.5	D	110/150
Deer Street WB LT	0.79	60.1	E	112/207	0.63	31.1	C	144/359	0.61	28.5	C	130/369	0.62	32.6	C	150/349	0.67	30.4	C	127/384	0.81	42.8	D	111/158
Deer Street WB TH/RT	0.26	38.2	D	39/87	0.24	23.6	C	58/141	0.23	21.3	C	52/142	0.26	25.4	C	62/142	0.28	20.9	C	70/183	0.57	35.1	D	86/138
Maplewood Avenue NB LT	0.01	7.1	A	<25/<25	0.06	19.5	B	<25/<25	0.10	22.7	C	<25/<25	0.08	31.7	C	<25/28	0.39	32.1	C	30/38	0.24	21.5	C	<25/60
Maplewood Avenue NB TH	0.54	13.0	B	121/568	1.11	102.5	F	312/764	1.21	143.6	F	490/732	0.98	66.4	E	374/678	1.25	162.4	F	503/712	0.84	33.9	C	266/543
Maplewood Avenue NB RT	0.13	6.3	A	<25/<25	0.24	18.6	B	<25/<25	0.24	22.8	C	<25/<25	0.21	50.4	D	<25/113	0.24	23.9	C	32/32	0.17	45.0	D	<25/116
Maplewood Avenue SB LT	0.15	10.3	B	<25/58	0.48	26.2	C	35/78	0.48	27.1	C	40/78	0.52	25.9	C	33/92	0.48	27.6	C	42/78	0.43	18.7	B	27/60
Maplewood Avenue SB TH/RT	0.33	10.4	B	101/294	0.62	27.2	C	227/394	0.68	31.5	C	264/400	0.60	25.0	C	215/400	0.79	38.3	D	324/467	0.81	34.4	D	278/512
Overall Intersection	**0.56**	**21.2**	**C**	**-**	**0.79**	**47.9**	**D**	**-**	**0.80**	**58.9**	**E**	**-**	**0.75**	**40.5**	**D**	**-**	**1.01**	**68.6**	**E**	**-**	**0.80**	**36.6**	**D**	**-**
Saturday Midday Peak Period																								
Deer Street EB Approach	0.47	41.9	D	65/108	0.54	33.9	C	100/202	0.54	32.8	C	103/213	-	-	-	-	0.92	57.1	E	204/547	-	-	-	-
Deer Street EB LT	-	-	-	-	-	-	-	-	-	-	-	-	0.42	36.4	D	52/100	-	-	-	-	0.70	39.1	D	92/131
Deer Street EB TH/RT	-	-	-	-	-	-	-	-	-	-	-	-	0.23	33.7	C	42/87	-	-	-	-	0.68	45.8	D	101/155
Deer Street WB LT	0.74	54.9	D	115/183	0.78	46.6	D	164/372	0.76	44.1	D	162/376	0.87	63.0	E	176/334	0.69	33.5	C	122/392	0.80	43.8	D	133/221
Deer Street WB TH/RT	0.27	39.5	D	41/87	0.28	29.8	C	61/140	0.27	28.8	C	60/140	0.34	35.1	D	67/136	0.29	23.0	C	67/189	0.62	41.7	D	106/170
Maplewood Avenue NB LT	0.00	13.2	B	<25/<25	0.05	26.8	C	<25/<25	0.09	27.9	C	<25/<25	0.07	9.5	A	<25/<25	0.77	75.7	E	33/117	0.29	10.3	B	<25/<25
Maplewood Avenue NB TH	0.51	15.4	B	79/462	0.92	50.4	D	217/670	0.95	57.0	E	219/667	0.78	24.2	C	77/734	1.25	166.7	F	454/641	0.69	22.6	C	308/409
Maplewood Avenue NB RT	0.15	10.2	B	<25/26	0.25	34.4	C	36/88	0.25	36.8	D	37/90	0.24	12.1	B	<25/96	0.26	51.5	D	41/92	0.19	28.6	C	64/64
Maplewood Avenue SB LT	0.16	11.7	B	<25/61	0.54	25.5	C	34/86	0.54	26.5	C	35/85	0.40	19.1	B	29/88	0.51	29.2	C	47/82	0.35	16.9	B	29/60
Maplewood Avenue SB TH/RT	0.34	12.6	B	90/292	0.58	24.5	C	202/392	0.60	25.8	C	209/396	0.52	19.2	B	172/409	0.88	47.9	D	361/527	0.77	32.0	C	305/493
Overall Intersection	**0.49**	**21.6**	**C**	**-**	**0.74**	**37.1**	**D**	**-**	**0.75**	**39.0**	**D**	**-**	**0.70**	**27.8**	**C**	**-**	**0.93**	**72.7**	**E**	**-**	**0.77**	**32.0**	**C**	**-**

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 15 – 2028 Future Year Intersection Capacity and Queue Analysis Summary

Intersection / Lane Group	2016 Existing				2028 Future Year No-Build				2028 Future Year Build Phase 1				2028 Future Year Build w/ Mitigation Phase 1				2028 Future Year Build Phases 2-4				2028 Future Year Build w/ Mitigation Phases 2-4			
	V/C[a]	Delay[b]	LOS[c]	Queue[d]	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
Maplewood Avenue / Hanover Street																								
Weekday Morning Peak Period																								
Hanover Street EB LT	0.17	44.8	D	<25/28	0.14	40.9	D	<25/32	0.14	40.9	D	<25/32	0.14	40.9	D	<25/32	0.15	41.1	D	<25/32	0.11	33.7	C	<25/27
Hanover Street EB TH/TR	0.27	45.5	D	<25/48	0.21	41.4	D	<25/53	0.21	41.3	D	<25/53	0.21	41.3	D	<25/53	0.23	41.7	D	<25/58	0.18	34.2	C	<25/48
Hanover Street WB LT/TH	0.59	56.7	E	29/60	0.65	54.7	D	48/85	0.66	55.1	E	48/87	0.66	55.1	E	48/87	0.68	58.3	E	48/89	0.50	38.0	D	43/72
Hanover Street WB RT	0.08	36.9	D	<25/36	0.09	33.7	C	<25/37	0.09	34.0	C	<25/37	0.09	34.0	C	<25/37	0.09	34.1	C	<25/38	0.10	27.3	C	<25/30
Maplewood Avenue NB Approach	0.19	4.3	A	44/83	0.27	6.2	A	56/104	0.27	6.3	A	55/107	0.27	6.9	A	53/107	0.29	6.5	A	56/112	0.29	13.5	B	87/133
Maplewood Avenue SB LT	0.18	1.3	A	<25/<25	0.25	2.2	A	<25/56	0.21	2.1	A	<25/48	0.21	3.0	A	<25/49	0.22	2.3	A	<25/39	0.21	5.8	A	25/41
Maplewood Avenue SB TH/RT	0.29	1.9	A	26/88	0.37	3.1	A	38/158	0.37	3.1	A	40/172	0.37	3.8	A	52/209	0.38	3.4	A	61/158	0.37	7.2	A	105/242
Overall Intersection	**0.32**	**11.2**	**B**	**-**	**0.41**	**12.1**	**B**	**-**	**0.41**	**12.3**	**B**	**-**	**0.41**	**12.9**	**B**	**-**	**0.43**	**12.8**	**B**	**-**	**0.43**	**14.6**	**B**	**-**
Weekday Evening Peak Period																								
Hanover Street EB LT	0.38	44.6	D	40/51	0.46	43.7	D	51/62	0.46	43.8	D	51/61	0.44	43.2	D	51/60	0.42	42.4	D	50/61	0.37	33.6	C	40/48
Hanover Street EB TH/TR	0.30	43.5	D	42/52	0.32	41.4	D	51/60	0.36	42.0	D	56/63	0.35	41.6	D	55/61	0.39	41.5	D	62/67	0.34	33.1	C	42/46
Hanover Street WB LT/TH	0.65	54.0	D	73/122	0.76	59.7	E	96/156	0.77	63.0	E	92/150	0.75	60.3	E	92/147	0.82	71.2	E	92/167	0.71	46.8	D	73/120
Hanover Street WB RT	0.13	35.5	D	<25/47	0.15	33.0	C	<25/49	0.13	33.2	C	<25/48	0.13	32.6	C	<25/46	0.13	32.4	C	<25/48	0.32	26.6	C	46/83
Maplewood Avenue NB Approach	0.31	6.1	A	<25/141	0.73	6.7	A	<25/215	0.43	7.3	A	<25/227	0.44	6.8	A	<25/231	0.47	7.6	A	<25/266	0.46	13.4	B	100/243
Maplewood Avenue SB LT	0.22	2.9	A	<25/<25	0.34	5.5	A	<25/59	0.33	5.8	A	<25/57	0.33	4.7	A	31/79	0.35	7.0	A	<25/53	0.32	5.8	A	<25/43
Maplewood Avenue SB TH/RT	0.31	3.3	A	51/98	0.43	6.2	A	67/332	0.45	6.8	A	78/353	0.45	6.5	A	182/404	0.47	8.2	A	132/417	0.45	6.3	A	170/176
Overall Intersection	**0.37**	**15.6**	**B**	**-**	**0.50**	**16.4**	**B**	**-**	**0.51**	**16.9**	**B**	**-**	**0.51**	**16.2**	**B**	**-**	**0.55**	**17.9**	**B**	**-**	**0.55**	**16.4**	**B**	**-**
Saturday Midday Peak Period																								
Hanover Street EB LT	0.20	43.3	D	<25/45	0.26	42.0	D	26/58	0.27	42.3	D	26/58	0.25	41.0	D	26/55	0.27	42.3	D	27/58	0.19	34.4	C	<25/46
Hanover Street EB TH/TR	0.16	42.8	D	<25/53	0.17	40.8	D	25/63	0.17	41.0	D	25/63	0.16	39.9	D	<25/59	0.20	41.2	D	26/70	0.17	34.1	C	<25/56
Hanover Street WB LT/TH	0.65	54.4	D	69/109	0.84	73.9	E	101/187	0.85	76.2	E	102/186	0.79	64.4	E	100/153	0.87	80.8	F	104/189	0.69	46.5	D	86/129
Hanover Street WB RT	0.09	35.3	D	<25/34	0.11	33.2	C	<25/37	0.10	33.4	C	<25/37	0.10	32.5	C	<25/35	0.10	33.4	C	<25/37	0.19	27.9	C	<25/48
Maplewood Avenue NB Approach	0.40	7.6	A	50/158	0.56	10.3	B	161/227	0.56	10.1	B	162/234	058	10.7	B	177/281	0.61	10.6	B	176/224	0.50	14.3	B	151/264
Maplewood Avenue SB LT	0.27	5.0	A	49/37	0.44	6.7	A	58/45	0.43	6.7	A	53/45	0.44	14.7	B	64/77	0.45	7.3	A	53/46	0.35	10.0	A	51/64
Maplewood Avenue SB TH/RT	0.33	6.0	A	136/132	0.48	8.2	A	363/242	0.49	8.3	A	371/254	0.49	14.6	B	259/367	0.52	8.5	A	235/294	0.43	10.8	B	224/361
Overall Intersection	**0.38**	**15.0**	**B**	**-**	**0.53**	**18.0**	**B**	**-**	**0.53**	**18.1**	**B**	**-**	**0.53**	**19.8**	**B**	**-**	**0.56**	**18.8**	**B**	**-**	**0.56**	**17.8**	**B**	**-**
Maplewood Avenue / Middle Street / Congress Street / Islington Street																								
Weekday Morning Peak Period																								
Islington Street EB LT	0.71	55.6	E	73/133	0.71	50.6	D	94/190	0.71	51.9	D	91/184	0.76	57.0	E	93/163	0.71	51.9	D	91/184	0.69	45.2	D	84/124
Islington Street EB RT	0.09	37.7	D	<25/<25	0.10	34.4	C	<25/30	0.10	34.6	C	<25/30	0.10	35.3	D	<25/30	0.10	34.2	C	<25/30	0.11	29.5	C	<25/27
Congress Street WB LT	0.66	48.2	D	87/146	0.71	50.1	D	98/163	0.71	50.1	D	98/163	0.69	48.3	D	98/158	0.71	50.1	D	98/163	0.70	45.1	D	87/150
Congress Street WB TH	0.77	51.6	D	134/212	0.82	54.9	D	153/272	0.83	55.9	E	159/287	0.82	54.0	D	160/276	0.84	56.5	E	164/303	0.78	44.6	D	147/229
Congress Street WB RT	0.38	37.7	D	51/97	0.43	37.3	D	63/117	0.47	37.4	D	68/128	0.46	37.1	D	69/126	0.49	37.3	D	74/136	0.47	32.5	C	66/119
Middle Street NB Approach	0.19	20.0	C	42/107	0.30	24.5	C	68/143	0.35	25.0	C	73/152	0.34	13.1	B	<25/107	0.42	26.5	C	81/166	0.28	10.5	B	74/53
Maplewood Avenue SB TH	0.47	23.9	C	155/370	0.69	32.0	C	171/502	0.69	32.0	C	176/510	0.68	30.9	C	169/545	0.76	39.7	D	216/555	0.58	22.6	C	187/331
Maplewood Avenue SB RT	0.17	14.4	B	33/58	0.22	13.7	B	41/72	0.22	14.0	B	42/72	0.22	13.7	B	44/63	0.22	15.2	B	42/74	0.17	12.2	B	<25/90
Overall Intersection	**0.51**	**34.2**	**C**	**-**	**0.62**	**36.1**	**D**	**-**	**0.63**	**36.5**	**D**	**-**	**0.63**	**34.0**	**C**	**-**	**0.66**	**38.7**	**D**	**-**	**0.72**	**27.7**	**C**	**-**
Weekday Evening Peak Period																								
Islington Street EB LT	0.72	61.5	E	88/156	0.85	73.1	E	127/244	0.85	73.1	E	127/244	0.85	73.1	E	127/244	0.85	73.1	E	127/244	0.68	43.4	D	96/153
Islington Street EB RT	0.11	42.7	D	<25/55	0.12	40.6	D	<25/58	0.12	40.5	D	<25/58	0.12	40.5	D	<25/58	0.12	40.0	D	<25/58	0.14	29.4	C	<25/46
Congress Street WB LT	0.75	57.4	E	120/194	0.80	61.1	E	135/239	0.80	61.1	E	135/239	0.80	61.1	E	135/239	0.80	61.1	E	135/239	0.70	42.5	D	107/173
Congress Street WB TH	0.82	60.1	E	161/273	0.89	68.4	E	193/342	0.89	69.6	E	196/348	0.89	69.6	E	196/348	0.90	69.5	E	206/369	0.74	39.8	D	154/230
Congress Street WB RT	0.71	52.7	D	117/194	0.80	59.0	E	146/267	0.81	60.0	E	149/272	0.81	60.0	E	149/272	0.83	61.0	E	159/295	0.73	40.4	D	120/190
Middle Street NB Approach	0.27	24.0	C	105/140	0.52	30.6	C	158/203	0.57	31.9	C	164/211	0.57	19.4	B	165/165	0.71	37.6	D	185/272	0.47	19.4	B	34/142
Maplewood Avenue SB TH	0.58	29.4	C	284/418	0.86	46.8	D	453/635	0.91	56.5	E	496/680	0.91	48.1	D	515/677	1.00	75.5	E	572/755	0.81	31.5	C	340/539
Maplewood Avenue SB RT	0.14	16.6	B	<25/51	0.20	18.6	B	37/56	0.20	20.9	C	47/57	0.20	18.4	B	39/68	0.20	22.0	C	49/60	0.16	9.3	A	34/55
Overall Intersection	**0.56**	**40.7**	**D**	**-**	**0.70**	**48.1**	**D**	**-**	**0.73**	**51.2**	**D**	**-**	**0.73**	**46.4**	**D**	**-**	**0.77**	**57.3**	**E**	**-**	**0.86**	**30.9**	**C**	**-**

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 15 – 2028 Future Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2028 Future Year No-Build				2028 Future Year Build Phase 1				2028 Future Year Build w/ Mitigation Phase 1				2028 Future Year Build Phases 2-4				2028 Future Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Maplewood Avenue / Middle Street / Congress Street / Islington Street																								
Saturday Midday Peak Period																								
Islington Street EB LT	0.71	62.5	E	78/168	0.80	68.0	E	115/251	0.81	68.6	E	113/248	0.81	70.1	E	110/225	0.81	68.6	E	113/248	0.79	61.1	E	98/198
Islington Street EB RT	0.12	42.2	D	<25/69	0.14	37.2	D	<25/71	0.14	37.2	D	<25/71	0.14	38.9	D	<25/75	0.14	35.9	D	<25/71	0.18	32.5	C	<25/66
Congress Street WB LT	0.79	61.9	E	125/232	0.86	70.9	E	145/274	0.86	70.9	E	145/274	0.77	55.7	E	141/217	0.86	70.9	E	145/274	0.77	51.7	D	127/203
Congress Street WB TH	0.90	69.0	E	209/372	0.87	58.6	E	275/458	0.86	57.9	E	280/461	0.86	57.9	E	280/461	0.86	55.0	E	306/492	0.78	42.3	D	211/317
Congress Street WB RT	0.78	55.6	E	153/280	0.78	51.0	D	192/359	0.79	51.5	D	197/371	0.79	51.5	D	197/371	0.79	49.5	D	228/399	0.88	58.1	E	173/314
Middle Street NB Approach	0.29	25.0	C	106/127	0.73	40.8	D	174/203	0.78	43.7	D	178/221	0.77	17.9	B	199/244	1.08	75.6	E	228/275	0.53	21.9	C	61/152
Maplewood Avenue SB TH	0.54	21.9	C	257/318	0.92	48.1	D	414/611	0.94	51.2	D	428/624	0.94	48.3	D	435/638	1.10	100.3	F	506/703	0.74	20.1	B	320/294
Maplewood Avenue SB RT	0.14	16.3	B	55/33	0.22	17.8	B	<25/47	0.22	17.7	B	<25/45	0.22	17.1	B	<25/49	0.23	19.3	B	27/40	0.16	7.2	A	<25/48
Overall Intersection	**0.57**	**42.7**	**D**	**-**	**0.74**	**48.8**	**D**	**-**	**0.75**	**50.0**	**D**	**-**	**0.73**	**43.0**	**D**	**-**	**0.80**	**67.3**	**E**	**-**	**0.89**	**33.7**	**C**	**-**
Middle Street / State Street																								
Weekday Morning Peak Period																								
State Street EB Approach	0.42	29.5	C	<25/70	0.48	32.0	C	31/78	0.48	32.2	C	31/78	0.64	53.3	D	0.59	0.49	33.0	C	34/78	0.44	38.7	D	43/57
Middle Street NB LT/TH	0.46	19.4	B	69/222	0.58	21.5	C	105/310	0.59	21.8	C	111/324	0.43	19.9	B	0.41	0.61	22.3	C	122/370	0.36	11.6	B	103/249
Middle Street NB TH	0.42	19.0	B	55/185	0.44	19.7	B	69/215	0.44	19.6	B	69/215	0.32	18.4	B	0.30	0.43	19.5	B	70/215	0.29	10.9	B	60/160
Middle Street SB LT	0.34	7.4	A	<25/120	0.44	8.4	A	32/152	0.45	8.5	A	33/152	0.45	13.9	B	0.44	0.48	8.9	A	35/161	0.39	4.4	A	37/83
Middle Street SB TH/RT	0.32	7.1	A	45/207	0.37	7.3	A	61/263	0.37	7.2	A	61/264	0.36	10.3	B	0.34	0.39	7.3	A	65/277	0.31	3.9	A	64/143
Overall Intersection	**0.37**	**13.8**	**B**	**-**	**0.46**	**14.9**	**B**	**-**	**0.47**	**15.0**	**B**	**-**	**0.41**	**17.7**	**B**	**-**	**0.50**	**15.2**	**B**	**-**	**0.42**	**9.4**	**A**	**-**
Weekday Evening Peak Period																								
State Street EB Approach	0.59	34.1	C	38/110	0.60	39.0	D	62/122	0.61	39.4	D	63/122	0.70	56.6	E	94/124	0.62	41.4	D	63/122	0.57	38.3	D	72/91
Middle Street NB LT/TH	0.56	22.2	C	97/291	0.78	31.9	C	184/451	0.78	33.9	C	187/463	0.66	34.1	C	244/429	0.79	33.8	C	204/509	0.57	21.4	C	210/320
Middle Street NB TH	0.56	22.4	C	81/253	0.63	28.8	C	119/287	0.62	28.4	C	119/287	0.53	30.9	C	155/276	0.59	27.1	C	119/287	0.46	19.6	B	124/206
Middle Street SB LT	0.54	9.8	A	42/199	0.74	22.5	C	87/396	0.78	25.2	C	96/424	0.69	31.9	C	159/311	0.85	34.0	C	115/471	0.70	28.9	C	140/233
Middle Street SB TH/RT	0.34	7.6	A	57/255	0.41	8.9	A	82/333	0.42	9.0	A	85/344	0.39	7.6	A	99/214	0.44	9.0	A	90/362	0.38	4.1	A	85/136
Overall Intersection	**0.52**	**16.6**	**B**	**-**	**0.67**	**24.1**	**C**	**-**	**0.70**	**24.5**	**C**	**-**	**0.64**	**27.4**	**C**	**-**	**0.75**	**26.3**	**C**	**-**	**0.71**	**19.2**	**B**	**-**
Saturday Midday Peak Period																								
State Street EB Approach	0.62	40.8	D	68/130	0.61	43.6	D	81/144	0.61	43.8	D	81/144	0.71	58.6	E	84/151	0.61	43.8	D	81/144	0.58	43.8	D	74/121
Middle Street NB LT/TH	0.63	27.4	C	209/333	0.83	39.5	D	324/566	0.83	40.1	D	329/574	0.87	53.3	D	330/517	0.90	47.3	D	387/634	0.65	26.3	C	269/423
Middle Street NB TH	0.56	26.0	C	157/263	0.59	29.4	C	184/301	0.59	29.3	C	184/301	0.62	38.8	D	185/281	0.59	29.3	C	184/301	0.51	23.7	C	142/247
Middle Street SB LT	0.64	13.6	B	139/241	0.96	56.4	E	285/522	0.98	61.4	E	295/533	0.84	43.1	D	341/482	1.10	102.4	F	371/615	0.76	35.1	C	195/337
Middle Street SB TH/RT	0.34	9.0	A	149/245	0.43	10.8	B	210/332	0.44	10.8	B	213/336	0.41	16.8	B	265/294	0.46	11.1	B	232/365	0.37	4.7	A	98/162
Overall Intersection	**0.56**	**20.0**	**C**	**-**	**0.78**	**34.5**	**C**	**-**	**0.80**	**35.9**	**D**	**-**	**0.71**	**39.0**	**D**	**-**	**0.88**	**47.9**	**D**	**-**	**0.76**	**23.3**	**C**	**-**
Deer Street / Russell Street																								
Weekday Morning Peak Period																								
Deer Street EB Approach	0.12	6.4	A	<25	0.17	6.9	A	<25	0.17	6.9	A	<25					0.18	7.0	A	<25				
Deer Street WB Approach	0.06	0.0	A	<25	0.07	0.0	A	<25	0.07	0.0	B	<25					0.07	0.0	A	<25				
Russell Street SB LT	0.03	12.7	B	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street SB RT	0.28	10.4	B	29	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street SB Approach	-	-	-	-	0.44	12.9	B	57	0.45	13.1	B	60					0.49	13.6	B	68				
Weekday Evening Peak Period													Same as Build Condition								Same as Build Condition			
Deer Street EB Approach	0.17	6.4	A	<25	0.24	7.0	A	<25	0.25	7.0	A	<25					0.26	7.2	A	27				
Deer Street WB Approach	0.06	0.0	A	<25	0.08	0.0	A	<25	0.08	0.0	A	<25					0.08	0.0	A	<25				
Russell Street SBL	0.02	15.8	C	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street SBR	0.31	10.6	B	33	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street SB Approach	-	-	-	-	0.70	21.0	C	147	0.71	21.5	C	151					0.76	24.6	C	178				

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 15 – 2028 Future Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2028 Future Year No-Build				2028 Future Year Build Phase 1				2028 Future Year Build w/ Mitigation Phase 1				2028 Future Year Build Phases 2-4				2028 Future Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Deer Street / Russell Street																								
Saturday Midday Peak Period																								
Deer Street EB Approach	0.16	6.1	A	<25	0.24	7.0	A	<25	0.24	7.0	A	<25					0.26	7.2	A	26				
Deer Street WB Approach	0.09	0.0	A	<25	0.12	0.0	A	<25	0.12	0.0	A	<25					0.12	0.0	A	<25				
Russell Street SB LT	0.05	16.2	C	<25	-	-	-	-	-	-	-	-	Same as Build Condition				-	-	-	-	Same as Build Condition			
Russell Street SB RT	0.32	11.4	B	34	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street SB Approach	-	-	-	-	0.82	31.9	D	211	0.82	31.6	D	210					0.89	40.2	E	263				
Russell Street / Green Street																								
Weekday Morning Peak Period																								
Green Street EB Approach	0.04	11.9	B	<25	0.06	13.4	B	<25	0.06	13.6	B	<25					0.06	14.0	B	<25				
Russell Street NB Approach	0.01	0.4	A	<25	0.01	0.3	A	<25	0.01	0.3	A	<25					0.01	0.3	A	<25				
Russell Street SB Approach	0.23	0.0	A	<25	0.30	0.0	A	<25	0.31	0.0	A	<25					0.32	0.0	A	<25				
Weekday Evening Peak Period																								
Green Street EB Approach	0.16	13.4	B	<25	0.26	18.6	C	26	0.26	18.8	C	26					0.28	20.1	C	28				
Russell Street NB Approach	0.01	0.3	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25	Same as Build Condition				0.01	0.2	A	<25	Same as Build Condition			
Russell Street SB Approach	0.19	0.0	A	<25	0.27	0.0	A	<25	0.27	0.0	A	<25					0.29	0.0	A	<25				
Saturday Midday Peak Period																								
Green Street EB Approach	0.05	11.8	B	<25	0.08	15.5	C	<25	0.08	15.5	C	<25					0.09	16.5	C	<25				
Russell Street NB Approach	0.01	0.3	A	<25	0.01	0.2	A	<25	0.01	0.2	A	<25					0.01	0.2	A	<25				
Russell Street SB Approach	0.18	0.0	A	<25	0.30	0.0	A	<25	0.30	0.0	A	<25					0.32	0.0	A	<25				
Market Street / Russell Street																								
Weekday Morning Peak Period																								
Russell Street EB LT	0.41	20.0	C	49	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB RT	0.01	10.7	B	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB Approach	-	-	-	-	0.31	8.2	A	35	0.29	7.8	A	34					0.32	8.1	A	37				
Market Street NB Approach	0.15	0.0	A	<25	0.29	6.3	A	37	0.29	6.3	A	37					0.29	6.5	A	38				
Market Street SBT	0.26	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SBR	0.23	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SB Approach	-	-	-	-	0.75	14.0	B	263	0.73	13.3	B	243					0.75	14.2	B	266				
Weekday Evening Peak Period																								
Russell Street EB LT	0.94	73.4	F	238	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB RT	0.01	9.9	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB Approach	-	-	-	-	0.51	10.4	B	83	0.51	10.5	B	86					0.55	11.2	B	97				
Market Street NB Approach	0.31	0.0	A	<25	0.69	16.4	C	163	0.67	15.5	C	148	Same as Build Condition				0.69	16.8	C	157	Same as Build Condition			
Market Street SBT	0.21	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SBR	0.20	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SB Approach	-	-	-	-	0.65	10.7	B	179	0.64	10.6	B	179					0.66	11.1	B	193				
Saturday Midday Peak Period																								
Russell Street EB LT	0.74	43.0	E	137	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB RT	0.02	10.3	B	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Russell Street EB Approach	-	-	-	-	0.44	9.6	A	64	0.44	9.4	A	62					0.47	10.0	A	71				
Market Street NB Approach	0.29	0.0	A	<25	0.60	12.5	B	122	0.60	12.3	B	119					0.61	13.0	B	126				
Market Street SBT	0.24	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SBR	0.15	0.0	A	<25	-	-	-	-	-	-	-	-					-	-	-	-				
Market Street SB Approach	-	-	-	-	0.63	10.4	B	170	0.63	10.3	B	167					0.65	10.8	B	183				

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 15 – 2028 Future Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2028 Future Year No-Build				2028 Future Year Build Phase 1				2028 Future Year Build w/ Mitigation Phase 1				2028 Future Year Build Phases 2-4				2028 Future Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Market Street / Albacore Park Drive																								
Weekday Morning Peak Period																								
Albacore Park Drive EB LT	0.48	21.1	C	<25/37	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive EB RT	0.03	17.9	B	<25/<25	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive EB Approach	-	-	-	-	0.43	30.2	C	45/87	0.43	30.0	C	45/87					0.43	30.2	C	45/88				
Market Street NB LT	0.16	3.8	A	<25/<25	0.46	37.0	D	27/64	0.45	36.7	D	27/64					0.47	37.1	D	28/67				
Market Street NB TH	0.17	3.6	A	<25/41	0.19	4.5	A	33/57	0.19	4.6	A	32/57					0.20	4.6	A	34/60				
Market Street SB Approach	0.47	4.7	A	67/123	0.70	15.5	B	222/359	0.69	15.3	B	214/347					0.70	15.6	B	223/362				
Overall Intersection	**0.47**	**5.5**	**A**	**-**	**0.61**	**14.8**	**B**	**-**	**0.60**	**14.7**	**B**	**-**					**0.62**	**14.9**	**B**	**-**				
Weekday Evening Peak Period																								
Albacore Park Drive EB LT	0.73	19.3	B	72/153	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive EB RT	0.03	10.8	B	<25/<25	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive EB Approach	-	-	-	-	0.89	46.2	D	230/356	0.89	45.9	D	229/356					0.89	47.3	D	233/356				
Market Street NB LT	0.26	8.2	A	<25/33	0.54	37.1	D	55/110	0.54	37.1	D	55/111	Same as Build Condition				0.55	37.7	D	57/112	Same as Build Condition			
Market Street NB TH	0.55	9.5	A	75/111	0.50	9.9	A	135/173	0.49	9.8	A	131/167					0.50	9.9	A	136/173				
Market Street SB Approach	0.44	8.7	A	52/82	0.62	21.0	C	167/240	0.62	21.0	C	167/239					0.63	21.2	C	175/247				
Overall Intersection	**0.62**	**10.9**	**B**	**-**	**0.72**	**22.0**	**C**	**-**	**0.71**	**22.0**	**C**	**-**					**0.72**	**22.3**	**C**	**-**				
Saturday Midday Peak Period																								
Albacore Park Drive EB LT	0.50	14.4	B	29/73	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive EB RT	0.03	12.2	B	<25/<25	-	-	-	-	-	-	-	-					-	-	-	-				
Albacore Park Drive EB Approach	-	-	-	-	0.70	31.7	C	131/232	0.70	31.7	C	131/232					0.71	32.3	C	134/236				
Market Street NB LT	0.11	5.5	A	<25/<25	0.35	31.1	C	30/68	0.35	31.1	C	30/68					0.35	31.4	C	30/68				
Market Street NB TH	0.38	6.3	A	42/84	0.39	7.3	A	85/112	0.38	7.3	A	84/110					0.39	7.4	A	88/115				
Market Street SB Approach	0.40	6.4	A	42/88	0.61	17.6	B	154/227	0.60	17.5	B	153/224					0.62	17.7	B	160/234				
Overall Intersection	**0.43**	**7.5**	**A**	**-**	**0.63**	**16.2**	**B**	**-**	**0.62**	**16.2**	**B**	**-**					**0.64**	**16.3**	**B**	**-**				
Deer Street / Bridge Street																								
Weekday Morning Peak Period																								
Site Driveway EB Approach	0.00	0.1	A	<25	0.00	0.1	A	<25	0.03	2.3	A	<25					0.06	3.2	A	<25				
Deer Street WB Approach	0.06	0.0	A	<25	0.08	0.0	A	<25	0.12	0.0	A	<25					0.18	0.0	A	<25				
Bridge Street NB Approach	0.01	8.9	A	<25	0.01	9.2	A	<25	0.01	10.6	B	<25					0.19	13.3	B	<25				
Weekday Evening Peak Period																								
Site Driveway EB Approach	0.01	0.6	A	<25	0.01	0.4	A	<25	0.01	0.8	A	<25					0.03	1.7	A	<25				
Deer Street WB Approach	0.04	0.0	A	<25	0.07	0.0	A	<25	0.08	0.0	A	<25	Same as Build Condition				0.15	0.0	A	<25	Same as Build Condition			
Bridge Street NB Approach	0.03	9.5	A	<25	0.03	10.1	B	<25	0.13	10.9	B	<25					0.38	15.1	C	44				
Saturday Midday Peak Period																								
Site Driveway EB Approach	0.01	0.8	A	<25	0.01	0.5	A	<25	0.02	1.0	A	<25					0.05	2.2	A	<25				
Deer Street WB Approach	0.04	0.0	A	<25	0.08	0.0	A	<25	0.09	0.0	A	<25					0.18	0.0	A	<25				
Bridge Street NB Approach	0.03	9.3	A	<25	0.03	10.0	B	<25	0.05	10.4	B	<25					0.37	15.8	C	42				
Bridge Street / Hanover Street																								
Weekday Morning Peak Period																								
Hanover Street EB Approach	0.06	8.1	A	<25	0.07	8.3	A	<25	0.07	8.4	A	<25					0.08	8.7	A	<25				
Hanover Street WB Approach	0.04	7.4	A	<25	0.06	7.8	A	<25	0.08	7.8	A	<25	Same as Build Condition				0.09	8.0	A	<25	Same as Build Condition			
Bridge Street NB Approach	0.06	7.0	A	<25	0.11	7.4	A	<25	0.16	7.8	A	<25					0.21	8.3	A	<25				
Bridge Street SB Approach	0.07	8.0	A	<25	0.10	8.2	A	<25	0.10	8.3	A	<25					0.14	8.7	A	<25				

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

Table 15 – 2028 Future Year Intersection Capacity and Queue Analysis Summary

	2016 Existing				2028 Future Year No-Build				2028 Future Year Build Phase 1				2028 Future Year Build w/ Mitigation Phase 1				2028 Future Year Build Phases 2-4				2028 Future Year Build w/ Mitigation Phases 2-4			
Intersection / Lane Group	**V/C[a]**	**Delay[b]**	**LOS[c]**	**Queue[d]**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**	**V/C**	**Delay**	**LOS**	**Queue**
Bridge Street / Hanover Street																								
Weekday Evening Peak Period																								
Hanover Street EB Approach	0.14	8.3	A	<25	0.17	8.8	A	<25	0.17	8.9	A	<25					0.18	9.3	A	<25				
Hanover Street WB Approach	0.13	8.4	A	<25	0.17	9.0	A	<25	0.17	9.1	A	<25					0.19	9.5	A	<25				
Bridge Street NB Approach	0.18	8.2	A	<25	0.26	9.0	A	25	0.28	9.2	A	28					0.33	9.9	A	38				
Bridge Street SB Approach	0.12	8.3	A	<25	0.18	8.8	A	<25	0.21	9.1	A	<25					0.26	9.7	A	25				
Saturday Midday Peak Period													Same as Build Condition								Same as Build Condition			
Hanover Street EB Approach	0.11	7.9	A	<25	0.13	8.5	A	<25	0.13	8.5	A	<25					0.14	9.0	A	<25				
Hanover Street WB Approach	0.14	8.2	A	<25	0.18	8.8	A	<25	0.19	8.9	A	<25					0.22	9.4	A	<25				
Bridge Street NB Approach	0.13	7.8	A	<25	0.22	8.6	A	<25	0.24	8.8	A	<25					0.32	9.7	A	35				
Bridge Street SB Approach	0.10	8.0	A	<25	0.16	8.6	A	<25	0.17	8.7	A	<25					0.24	9.5	A	<25				
Bridge Street / Islington Street																								
Weekday Morning Peak Period																								
Islington Street EB Approach	0.02	1.0	A	<25	0.03	1.2	A	<25	0.04	1.6	A	<25	0.04	1.6	A	<25	0.14	3.7	A	<25	0.06	2.0	A	<25
Islington Street WB Approach	0.24	0.0	A	<25	0.29	0.0	B	<25	0.31	0.0	A	<25	0.31	0.0	A	<25	0.29	0.0	A	<25	0.32	0.0	A	<25
Bridge Street SB Approach	0.12	11.9	B	<25	0.18	13.2	B	<25	0.18	13.4	B	<25	0.17	12.9	B	<25	0.33	14.8	B	36	0.21	13.8	B	<25
Weekday Evening Peak Period																								
Islington Street EB Approach	0.09	3.0	A	<25	0.12	3.4	A	<25	0.13	3.5	A	<25	0.13	3.5	A	<25	0.14	3.7	A	<25	0.14	3.7	A	<25
Islington Street WB Approach	0.21	0.0	A	<25	0.27	0.0	A	<25	0.27	0.0	A	<25	0.27	0.0	A	<25	0.29	0.0	A	<25	0.29	0.0	A	<25
Bridge Street SB Approach	0.21	12.3	B	<25	0.30	14.2	B	31	0.31	14.4	B	33	0.29	13.4	B	30	0.33	14.8	B	36	0.33	14.8	B	36
Saturday Midday Peak Period																								
Islington Street EB Approach	0.06	2.0	A	<25	0.09	2.6	A	<25	0.10	2.7	A	<25	0.10	2.7	A	<25	0.12	3.1	A	<25	0.12	3.1	A	<25
Islington Street WB Approach	0.25	0.0	A	<25	0.31	0.0	A	<25	0.32	0.0	A	<25	0.32	0.0	A	<25	0.34	0.0	A	<25	0.34	0.0	A	<25
Bridge Street SB Approach	0.15	11.8	B	<25	0.23	13.5	B	<25	0.23	13.6	B	<25	0.23	13.6	B	<25	0.26	14.2	B	26	0.27	14.5	B	27

[a] Volume-to-capacity ratio
[b] Delay expressed in seconds per vehicle (average)
[c] Level-of-Service
[d] 50th / 95th Percentile Queue (feet) [only 95th Percentile Queue expressed for unsignalized intersections]

V. CONCLUSION

TEC performed an extensive examination of the existing roadway and intersection conditions and the trip-generating characteristics, access locations, and the potential impacts of the new multi-modal trips from the proposed Deer Street Parking Garage and DSA private development projects. This report includes recommendations for physical improvements to certain intersections, transportation demand management techniques, intelligent parking and notification systems, and funding to mitigate the impacts of the public and private phases of development. The two closely-aligned projects are consistent with other planned City roadway and intersection projects such as the Maplewood Avenue Corridor Improvements, the Market Street Gateway and Roundabout projects, and the planned mitigation for the North End Portsmouth ("HarborCorp") project. The Maplewood Avenue traffic signal enhancements may also provide other reserve capacity for other future projects, such as a Maplewood Avenue Road Diet, or other Downtown traffic flow changes.

TEC recommends that the Technical Advisory Committee and Planning Board consider the mitigation recommendations provided in the prior section as conditions of approval for the two separate applications. If those improvements are implemented, the traffic generated by the proposed Deer Street Parking Garage and Deer Street Associates private development project can be efficiently and safely accommodated along the study area roadways with no noticeable impact to the long-term capacity of the study area roadways.