



Public Facilities Committee Agenda

City of Newton In City Council

Wednesday, May 4, 2022

The Public Facilities Committee will hold this meeting as a virtual meeting on Wednesday, May 4, at 7:00 pm. To view this meeting using Zoom use this link: <https://us02web.zoom.us/j/89956528669> or call 1-646-558-8656 and use the following Meeting ID: 899 5652 8669

Items Scheduled for Discussion:

Public Hearing

#285-22 Eversource petition for Grant of Location in JFK Circle and Green Street
EVERSOURCE ENERGY petitioning for a grant of location to install and maintain 40' ± of conduit in a northeasterly direction from pole 182/3 and install and maintain 370' ± southeasterly from Green Street thence turning southwesterly to the private property at 100 John F. Kennedy Circle. (Ward 1)

Referred to Public Facilities and Finance Committees

#292-22 Appropriation of \$1,500,000 for Transportation Network Improvement Program
HER HONOR THE MAYOR requesting authorization to appropriate and expend the sum of one million five hundred dollars (\$1,500,000) from June 30, 2021, Certified Free Cash for the Transportation Network Improvement Program to continue making progress on the City's roads, bike lanes, sidewalks and traffic calming efforts across the City.

Referred to Public Facilities and Finance Committees

#291-22 Appropriation of \$500,000 to fund the design of the pilot program for Washington Street from Lowell Ave to Newton Corner
HER HONOR THE MAYOR requesting authorization to appropriate and expend the sum of five hundred thousand dollars (\$500,00) from June 30, 2021 Certified Free Cash, derived from Host Community Agreement Funds, to fund the design of the pilot program/interim solution for Washington Street from Lowell Ave to Newton Corner.

The location of this meeting is accessible and reasonable accommodations will be provided to persons with disabilities who require assistance. If you need a reasonable accommodation, please contact the city of Newton's ADA Coordinator, Jini Fairley, at least two business days in advance of the meeting: jfairley@newtonma.gov or (617) 796-1253. The city's TTY/TDD direct line is: 617-796-1089. For the Telecommunications Relay Service (TRS), please dial 711.

Referred to Public Facilities and Finance Committees

#294-22

Appropriate \$3,200,000 for water main improvements in FY23

HER HONOR THE MAYOR requesting authorization to appropriate and expend the sum of three million two hundred dollars (\$3,200,000) and authorize a general obligation borrowing of an equal amount for water main improvements in FY23 as part of the City's Water Capital Improvement Plan and authorization to apply any premium received upon the sale of the bonds or notes, less the cost of preparing, issuing, and marketing them, and any accrued interest received upon the delivery of the bonds or notes to the costs of the project and to reduce the amount authorized to be borrowed for the project by like amount.

Chair's Note: *The Committee will be joined by the Public Safety & Transportation Committee for discussion on the following one item:*

Referred to Public Safety & Transportation and Public Facilities Committees

#243-22

Discussion regarding MassDOT's intersection project

HER HONOR THE MAYOR requesting a discussion of MassDOT's proposed modification to the roundabout design located at the Grove Street intersection from the I-95 SB off-ramp and Quinobequin Road consistent with the requirements of Riverside Special Permit #27-20(2), Condition 14c.

Public Facilities Held 7-0 on 04/06/22

Public Safety & Transportation Held 7-0 on 04/06/22

Respectfully submitted,

Alison M. Leary, Chair

**CITY OF NEWTON
MASSACHUSETTS**

RECEIVED

2022 APR 20 AM 9:13

PETITION for GRANT OF LOCATION

CITY CLERK

NEWTON, MA. 02459

To the Petitioner:

City of Newton Ordinance Section 23-52 requires that each petition for grant of location be submitted to the City Council before it is sent to the Public Works Department for a preliminary review. The comments of the Public Works Commissioner will be part of the record submitted to the City Council. Upon filing with the City Council, the petition will be scheduled for a public hearing before the Public Facilities Committee of the City Council. **The petitioner is responsible for ensuring that the petition is complete, and all required materials are for review.** Attached please find the City Engineer's Standard Requirements for Plans and the Department of Public Works Permit Processing brochure.

Grant of Location Process:

1. Applicant submits completed Petition Form and required materials to the City Council
2. Public Works Department conducts preliminary review and gives written comments to the applicant
3. Engineering Division files Petition Form with comments with the Clerk of the City Council
4. City Council schedules petition for a public hearing before the Public Facilities Committee of the City Council
5. Public Facilities Committee recommendations are forwarded to the City Council for a final decision

Questions may be directed to:

Lou Taverna, City Engineer, 617-796-1020

Cassidy Flynn, Clerk of the Public Facilities Committee 617-796-1213

I. IDENTIFICATION (Please Type or Print Clearly)

Company Name NSTAR ELECTRIC DBA EVERSOURCE ENGERGY
Address 180 Calvary Street Waltham, MA 02453

Phone Number 617-776-7300 Fax Number 781-314-5165

Contact Person Richard M. Schifone Title Supervisor Rights and Permits

Signature Richard M. Schifone Date 01/12/2022

If a telecommunications company, indicate how certified by the Department of Telecommunications and Energy:

II. DESCRIPTION OF PROJECT: to be completed by petitioner

A. Write here or attach a description of the project including, location, proposed time frame for completion, type of materials to be used, benefit provided to the City, project mitigation plan as applicable, street reconstruction plan including timetable for completion.

Eversource to install 370±feet of conduit in JOHN F. KENNEDY CIRCLE, Newton & install 40 feet of conduit in Green Street, Newton W.O. #5493936.

B. Include or attach a sketch to provide a visual description of the project. If plans are attached, provide: Title of Plan JOHN F. KENNEDY CIRCLE, NEWTON , Date of plan 12-09-21.

III. PUBLIC WORKS DEPARTMENT REVIEW

Date received by Public Works Department April 11, 2022

Check One:
Minor Project Major Project Lateral

(Refer to City Engineer Standard Requirements for Plans for definition of minor and major project)

Plans Submitted:
Certified Plot Plan Stamped Plans

DATE AND COMMENTS:

RECOMMENDATIONS:

This petition entails the power demand for the new Housing Authority building currently under construction. Eversource provided additional information indicating that due to the limitations of the existing wire & pole size and guying limitations a dedicated underground feed to the new building is necessary. The existing overhead lines and poles need to remain in order to maintain service to the adjacent customers. Eversource indicated that the underground infrastructure that is proposed could support an area conversion in the future should the City and neighbors be interested in pursuing that request at the City's cost.

The contractor installing the underground conduit shall obtain Street Opening, Trench & Sidewalk Crossing Permits prior to construction. Pedestrian access must be accommodated 24/7 for the duration in accordance with DPW requirements with extra care due to the elderly population living in this neighborhood. Siltation control shall be provided & maintained in all catch basins within the work zone. All restoration shall be per City Standards as indicated in the Permits. As built drawings shall be submitted to DPW in a PDF format.
John Daghljan, Associate City Engineer
April 11, 2022

V. RECOMMENDATION TO PUBLIC FACILITIES COMMITTEE:

Shawna Sullivan

Digitally signed by Shawna Sullivan
Date: 2022.04.12 16:35:17 -04'00'

Commissioner, Public Works

Date



285-22

180 Calvary Street
Waltham, Ma 02453

January 12, 2022

City Council
City of Newton
1000 Commonwealth Avenue
Newton, MA 02459

RE: John F. Kennedy Circle
Newton, MA
W.O. #5493936

Dear Members of the Council:

The enclosed petition and plan are being presented by the NSTAR ELECTRIC COMPANY dba EVERSOURCE ENERGY for the purpose of obtaining a Grant of Location to install approximately 370± feet of conduit in John F. Kennedy Circle and approximately 40± feet of conduit in Green Street.

This work is necessary to provide service to 100 John F. Kennedy Circle.

If you have any further questions, contact Joanne Callender at (781) 314-5054. Your prompt attention to this matter would be greatly appreciated.

Very truly yours,

Richard M. Schifone

Richard M. Schifone
Right and Permits, Supervisor

RMS/wls
Attachments

**PETITION OF NSTAR ELECTRIC COMPANY dba EVERSOURCE ENERGY FOR
LOCATION FOR CONDUITS AND MANHOLES**

To the City Council of the City of Newton Massachusetts

Respectfully represents **NSTAR ELECTRIC COMPANY dba EVERSOURCE ENERGY** a company incorporated for the transmission of electricity for lighting, heating or power, that it desires to construct a line for such transmission under the public way or ways hereinafter specified.

WHEREFORE, your petitioner prays that, after due notice and hearing as provided by law, the Council may by Order grant to your petitioner permission to construct, and a location for, such a line of conduits and manholes with the necessary wires and cables therein, said conduits and manholes to be located substantially as shown on the plan made by T. Thibault dated December 09, 2021 and filed herewith, under the following public way or ways of said City.

Green Street - **Northeasterly from pole 182/3, 10 feet southwest of John F. Kennedy Circle, install approximately 40 feet conduit.**

John F. Kennedy Circle - **Southeasterly from Green Street thence turning southwesterly, install 370 feet of Conduit to Private Property**

Install one Manhole # MH31386

W.O.# 5493936

NSTAR ELECTRIC COMPANY
dba EVERSOURCE ENERGY

By: Richard M. Schifone

Richard M. Schifone
Rights and Permits, Supervisor

Dated this _____, 2022

City of Newton, Massachusetts

Received and filed _____, 2022

ORDER FOR LOCATION FOR CONDUITS AND MANHOLES

285-22

City of Newton Massachusetts, January 12, 2022

In City Council

WHEREAS, **NSTAR ELECTRIC COMPANY dba EVERSOURCE ENERGY** has petitioned for permission to construct a line for the transmission of electricity for lighting, heating, or power under the public way or ways of the City hereinafter specified, and notice has been given and a hearing held on said petition as provided by law.

It is ORDERED that **NSTAR ELECTRIC COMPANY dba EVERSOURCE ENERGY** be and hereby is granted permission to construct, and a location for, such a line of conduits and manholes with the necessary wires and cables therein under the following public way or ways of said City:

Green Street - Northeasterly from pole 182/3, 10 feet southwest of John F. Kennedy Circle, install approximately 40 feet conduit.

John F. Kennedy Circle - Southeasterly from Green Street thence turning southwesterly, install 370 feet of Conduit to Private Property

Install one Manhole # MH31386

W.O.# 5493936

All construction work under this Order shall be in accordance with the following conditions:

1. Conduits and manholes shall be located as shown on plan made by T. Thibault dated December 9, 2021
2. Said Company shall comply with the requirements of existing ordinances and such as may hereafter be adopted governing the construction and maintenance of conduits and manholes.
3. All work shall be done to satisfaction of the City Council or such officer or officers as it may appoint to supervise the work.

A True Record. Attest: _____
City Clerk

Approved _____ 2022

Mayor

CERTIFICATE

I hereby certify that the foregoing Order was adopted after due notice and public hearing as prescribed by Section 22 of Chapter 166 of the General Laws (Ter. Ed.) and any additions thereto or amendments thereof, to wit:--after written notice of the time and place of the hearing mailed at least seven days prior to the date of the hearing by the City Clerk to all owners of real estate abutting upon that part of the way or ways upon, along or across which the line is to be constructed under said Order, as determined by the last preceding assessment for taxation and a public hearing held on the ___ day of _____ 2022, at City Council in the said City

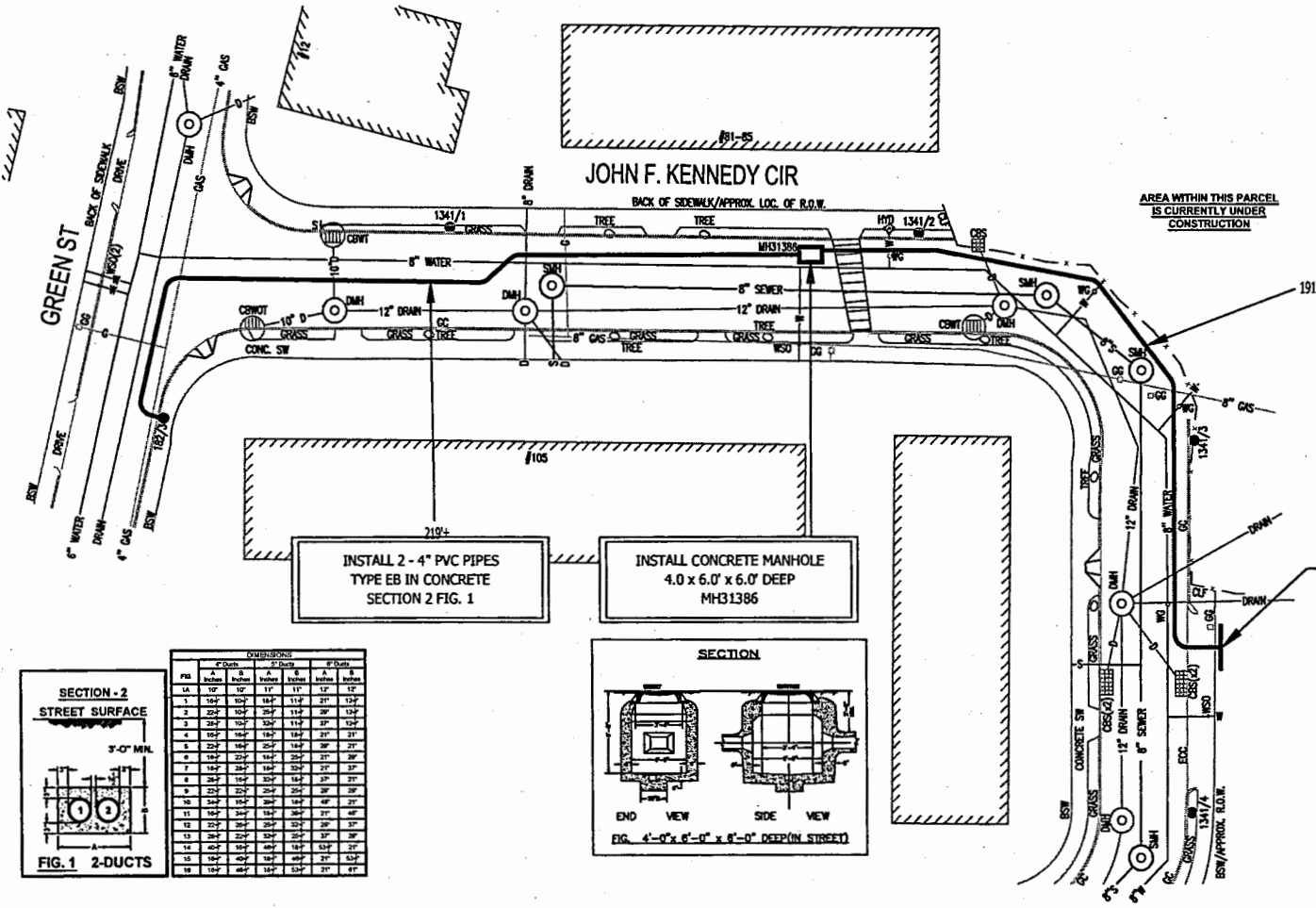
City Clerk

CERTIFICATE

I hereby certify that the foregoing are true copies of the Order of the City Council of the City of NEWTON Massachusetts duly adopted on the _____ day of _____, 2022 and recorded with the records of location Orders of said City. Book _____ Page _____ and of the certificate of notice of hearing thereon required by Section 22 of Chapter 166 of the General Laws (Ter. Ed.), and any additions thereto or amendments thereof, as the same appear of record.

Attest: _____
Clerk of City of NEWTON, Massachusetts

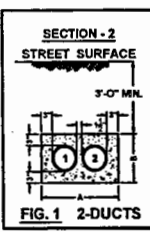
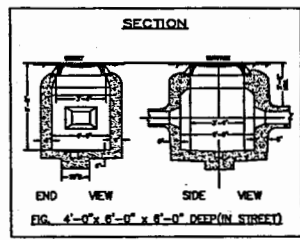
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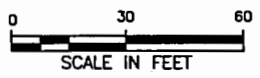
INSTALL 2 - 4" PVC PIPES
TYPE EB IN CONCRETE
SECTION 2 FIG. 1

INSTALL 2 - 4" PVC PIPES
TYPE EB IN CONCRETE
SECTION 2 FIG. 1

INSTALL CONCRETE MANHOLE
4.0 x 6.0' x 6.0' DEEP
MH31386



| Feet | 4" Ducts | | 6" Ducts | | 8" Ducts | |
|------|----------|-----|----------|-----|----------|-----|
| | A | B | A | B | A | B |
| 14 | 10" | 10" | 11" | 11" | 12" | 12" |
| 1 | 10" | 10" | 11" | 11" | 12" | 12" |
| 2 | 20" | 10" | 20" | 11" | 20" | 12" |
| 3 | 20" | 10" | 20" | 11" | 20" | 12" |
| 4 | 10" | 10" | 10" | 10" | 10" | 10" |
| 5 | 20" | 10" | 20" | 10" | 20" | 10" |
| 6 | 10" | 10" | 10" | 10" | 10" | 10" |
| 7 | 10" | 10" | 10" | 10" | 10" | 10" |
| 8 | 20" | 10" | 20" | 10" | 20" | 10" |
| 9 | 20" | 10" | 20" | 10" | 20" | 10" |
| 10 | 20" | 10" | 20" | 10" | 20" | 10" |
| 11 | 10" | 10" | 10" | 10" | 10" | 10" |
| 12 | 10" | 10" | 10" | 10" | 10" | 10" |
| 13 | 10" | 10" | 10" | 10" | 10" | 10" |
| 14 | 10" | 10" | 10" | 10" | 10" | 10" |
| 15 | 10" | 10" | 10" | 10" | 10" | 10" |
| 16 | 10" | 10" | 10" | 10" | 10" | 10" |



BY YOUR USE OF THE INFORMATION CONTAINED IN THIS MAP, YOU AGREE AND WAIVE ANY LIABILITY OF ANY KIND, EXPRESS OR IMPLIED, OR OTHER WITH RESPECT TO THE INFORMATION. NEITHER NSTAR ELECTRIC COMPANY, NSTAR GAS COMPANY NOR ITS PARENTS, AFFILIATES, OFFICERS, DIRECTORS, SHAREHOLDERS, EMPLOYEES OR AGENTS (COLLECTIVELY THE "NSTAR GROUP") SHALL BE LIABLE FOR ANY LOSS OR DAMAGE CAUSED BY FAILURE OR IN PART OF USE OF THIS INFORMATION OR IN RELIANCE THEREON TO THE MAXIMUM EXTENT ALLOWED BY LAW, YOU AGREE BY YOUR ACCEPTANCE OF THE INFORMATION TO RELEASE, DEFEND AND HOLD THE NSTAR GROUP HARMLESS FROM ANY SUCH LOSS OR DAMAGE.

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MASS. LAW
REQUIRES 72 HOURS ADVANCE NOTICE TO UTILITY COMPANIES BEFORE DIGGING BY ANYONE. CALL DIG-SAFE 1-888-344-7233

C# 211-21
Ward #
Work Order # 549336
Surveyed by: JC/BP
Research by: JC
Plotted by: BP
Proposed Structures: BP
Approved: T THEBAULT
P#

NSTAR EVERSOURCE
1185 MASSACHUSETTS AVE., CONCORD, MASS. 02122

Plan of JOHN F KENNEDY CIRCLE
NEWTON
Showing PROPOSED CONDUIT AND MANHOLE LOCATION
Scale 1"=30'
Date 12/09/2021
SHEET 1 of 1



City of Newton, Massachusetts
Office of the Mayor

T 292-22
(617) 796-1100

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(617) 796-1113

TDD
(617) 796-1089

E-mail
rfuller@newtonma.gov

RUTHANNE FULLER
MAYOR

April 25, 2022

Honorable City Council
Newton City Hall
1000 Commonwealth Avenue
Newton Centre, MA 02459

Councilors:

I respectfully submit a docket item to your Honorable Council requesting authorization to appropriate and expend the sum of \$1,500,000 from June 30, 2021, Certified Free Cash for our Transportation Network Improvement Program to continue making progress on our roads, bike lanes, sidewalks and traffic calming efforts across the City.

Thankfully, with the leadership of Commissioner Jim McGonagle and Deputy Commissioner Shawna Sullivan in DPW, our paving condition index continues to improve as we pave miles and miles of roads each year. We have a lot of work still in front of us to make our streets safer and smoother for those walking, riding or rolling.

Each year we "set aside" \$1.5 to \$2.5 million of Free Cash to supplement our snow removal budget with the hope that we will be able to repurpose those funds in the spring for our paving program if they were not required for snow removal. While this year's snow accumulation of 54 inches matched our "annual average," I am pleased to request that \$1.5 million of Free Cash be appropriated to supplement the funds needed for our paving program.

Thank you for your consideration of this matter.

Sincerely,

Ruthanne Fuller
Mayor

CITY CLERK
NEWTON, MA. 02459

2022 APR 25 PM 5:05

RECEIVED



City of Newton, Massachusetts
Office of the Mayor

RUTHANNE FULLER
MAYOR

291-22

Telephone
(617) 796-1100

Telefax
(617) 796-1113

TDD
(617) 796-1089

E-mail
rfuller@newtonma.gov

April 25, 2022

Honorable City Council
Newton City Hall
1000 Commonwealth Avenue
Newton Centre, MA 02459

Councilors:

I respectfully submit a docket item to your Honorable Council requesting the authorization to appropriate and expend the amount of \$500,000 from June 30, 2021 Certified Free Cash, derived from Host Community Agreement (HCA) Funds, to fund the design of the pilot program/interim solution for Washington Street from Lowell Ave to Newton Corner.

Host Community Agreement funds are received as General Fund Revenues. If unspent, the HCA funds drop to Free Cash. Prior to the start of Fiscal Year 2022, the City had accumulated \$577,460 of unspent HCA funds. Two of Newton's three active marijuana retail establishments, and two of the three delivery operators with signed HCAs, are located either right on Washington Street or directly off this major thoroughfare.

The envisioned project is a multi-phased complete streets "pilot" redesign of Washington Street, looking specifically at ensuring safe and accessible pedestrian crossings, providing safe linear bicycle access, slowing vehicle speeds, optimizing bus operations, and improving the public realm. The Designer will work under Planning, in concert with the Department of Public Works (DPW), the Mayor's Office, Public Safety, and other departments and the City Council, to provide planning/scoping, engineering analysis, concept design, construction plans, specifications, construction management services and evaluation for the redesign of Washington Street via a phased approach.

The project will build off previous work of the City's 2019 Washington Street Vision Plan and the Boston Region MPO's 2015 technical memorandum Washington Street Subregional Priority Roadway Study in Newton.

Project benefits will include:

- Improve the safety conditions for all road users, with particular focus on vulnerable users such as people with disabilities as well as older and younger users.
- Improve substantially biking, walking, pedestrian safety, and accessibility including increasing pedestrian crossings, ensuring accessibility, and providing protected bike lanes.
- Support public transit service, particularly optimizing bus operations and enhancing access to the commuter rail.
- Manage traffic flow including optimizing traffic signal operations.

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2022 APR 25 PM 5:05
CITY CLERK
NEWTON, MA. 02459

- Create a vibrant, welcoming and inviting public realm and boulevard through streetscape enhancements, sidewalk improvements, improved street lighting, stormwater management, plantings, and street furniture.

The design process will take place in the following phases:

Phase 1a – Develop design concept and Evaluation Criteria for Trial

The consultant will assist the City in designing an initial roadway redesign pilot for Washington Street from Chestnut Street to Lowell Avenue (other limits may be chosen in concert with the selected consultant) to demonstrate proof of concept to the public for the re-alignment of Washington Street from 4 to 3 lanes (including turn lanes). Public process and outreach will include:

- ~4 public meetings
- ~5 small meetings with Ward Councilors
- ~6 Group sessions with the City's Complete Streets Working Group
- ~2-3 City Council meetings (Public Facilities and/or Public Safety and Transportation)
- Bi-weekly project team meetings with internal team including Planning and DPW
- Meeting with MassDOT, as needed

Phase 1b – TIP Project Planning and Initiation–Determine a phased approach to design and implementation for a Mass DOT Transportation Improvement Program (TIP) funded project to reconstruct Washington Street from Chestnut Street to no farther east than Church Street.

Phase 2: 25% Design TIP Project– Details to be determined at completion of Phase 1B.

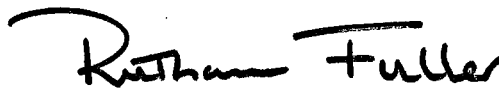
Phase 3: 25-100% Engineering Design TIP Project– Details to be determined at completion of prior phases.

Phase 4: Construction Phase Services - Details to be determined at completion of prior phases

Please see the attached memo from Nicole Freedman, Director of Transportation Planning, for further details on the project.

Thank you for your consideration of this matter.

Sincerely,



Ruthanne Fuller
Mayor



Ruthanne Fuller
Mayor

City of Newton, Massachusetts
Department of Planning and Development
1000 Commonwealth Avenue Newton, Massachusetts 02459

291-22

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(617) 796-1120
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www.newtonma.gov

Barney S. Heath
Director

MEMORANDUM

Date: April 22, 2022

To: Mayor Ruthanne Fuller
Maureen Lemieux, Chief Financial Officer
Jonathan Yeo, Chief Operating Officer

From: Barney Heath, Director of Planning & Development

CC: Nicole Freedman, Director of Transportation Planning

Subject: Request to Docket Item for Washington Street Design

At this time, we respectfully request that you docket with the Honorable City Council a request of \$500,000 to complete the design and engineering for a pilot redesign concept plan of Washington Street from Chestnut Street east to Church Street.

The envisioned project is a multi-phased complete streets "pilot" redesign of Washington Street, looking specifically at ensuring safe and accessible pedestrian crossings, providing safe linear bicycle access, slowing vehicle speeds, optimizing bus operations, and improving the public realm. The Designer will work under Planning, in concert with the Department of Public Works (DPW), the Mayor's Office, Public Safety, and other departments and the City Council, to provide planning/scoping, engineering analysis, concept design, construction plans, specifications, construction management services and evaluation for the redesign of Washington Street via a phased approach.

The project will build off previous work of the City's 2019 Washington Street Vision Plan and the Boston Region MPO's 2015 technical memorandum Washington Street Subregional Priority Roadway Study in Newton.

Project benefits will include:

- Improve the safety conditions for all road users, with particular focus on vulnerable users such as people with disabilities as well as older and younger users.
- Improve substantially biking, walking, pedestrian safety, and accessibility including increasing pedestrian crossings, ensuring accessibility, and providing protected bike lanes.

- Support public transit service, particularly optimizing bus operations and enhancing access to the commuter rail.
- Manage traffic flow including optimizing traffic signal operations.
- Create a vibrant, welcoming and inviting public realm and boulevard through streetscape enhancements, sidewalk improvements, improved street lighting, stormwater management, plantings, and street furniture.

The design process will take place in the following phases:

Phase 1a – Develop design concept and Evaluation Criteria for Trial

The consultant will assist the City in designing an initial roadway redesign pilot for Washington Street from Chestnut Street to Lowell Avenue (other limits may be chosen in concert with the selected consultant) to demonstrate proof of concept to the public for the re-alignment of Washington Street from 4 to 3 lanes (with turn lanes). Public process and outreach will include:

- ~4 public meetings
- ~5 small meetings with Ward Councilors
- ~6 Group sessions with the City's Complete Streets Working Group
- ~2-3 City Council meetings (Public Facilities and/or Public Safety and Transportation)
- Bi-weekly project team meetings with internal team including Planning and DPW
- Meeting with MassDOT, as needed

Phase 1b – TIP Project Planning and Initiation–Determine a phased approach to design and implementation for a Mass DOT Transportation Improvement Program (TIP) funded project to reconstruct Washington Street from Chestnut Street to no farther east than Church Street.

Phase 2: 25% Design TIP Project– Details to be determined at completion of Phase 1B.

Phase 3: 25-100% Engineering Design TIP Project– Details to be determined at completion of prior phases.

Phase 4: Construction Phase Services - Details to be determined at completion of prior phases



RUTHANNE FULLER
MAYOR

City of Newton, Massachusetts
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rfuller@newtonma.gov

April 26, 2022

NEWTON, MA. 02459
CITY CLERK

2022 APR 27 PM 12: 26

RECEIVED

Honorable City Council
Newton City Hall
1000 Commonwealth Avenue
Newton Centre, MA 02459

Councilors:

I respectfully docket this item to your Honorable Council requesting the authorization to borrow up to \$3,200,000 for water main improvements in FY 2023. This proposed borrowing will allow Public Works to continue implementing the \$40 million Water Capital Improvement Plan.

Each year as part of the Capital Improvement Plan, the City commits to borrow up to \$5,283,700 annually from City debt and MWRA loans to upgrade our water system, which will improve fire flows, reduce leakage and ensure the delivery of superior water quality. MWRA awards an annual loan of \$2,083,700 for water main improvements. The City then borrows the remaining \$3.2 million using the Water Fund for annual payments.

Water main rehabilitation projects for FY 2023 include the following:

Ward Street (Waverley Ave to Centre St): The MWRA is designing the removal and replacement of their 20-inch diameter cast iron water main in Ward Street. The city also has a 20-inch diameter cast iron water main in Ward Street, parallel to the MWRA water main. Both water mains were installed in the late 1800s, and are beyond their useful life. The existing 20-inch diameter cast iron water main will be removed and replaced with a new 20-inch diameter ductile iron water main. The city's consulting engineers are designing the water main replacement. MWRA's contractor will install the city's new water main in conjunction with installing the new MWRA water main. The MWRA will invoice the city for our cost of the water main installation. FY22 work includes Ward from Waverley to Manet Rd.

The program will also include the following roads:

Washington Street (Greenough Street to Auburn Street) 900 lf
Upham Street (Mague Place to Cherry Street) 900 lf
Taft Avenue (Hazelhurst Avenue to Harding Street) 1,163 lf
Brooks Avenue/Proctor Street (Washington Street to Walker Street) 1,150 lf
Rossmere Street (Watertown Street to Lowell Avenue) 560 lf

Washington Park (north side) (Walnut Street to Harvard Street) 1,550 lf
Crescent Square (Thornton Street to Waban Street) 300 lf
Commonwealth Avenue (carriage lane) (Higgins Street to Melrose Street) 275 lf
Pembroke Street (Nonantum Street to Tremont Street) 1,150 lf
Woodlawn Drive (Woodchester Drive to Ward Street) 1,440 lf
Bothfield Road (Ellison Road to Manomet Road) 725 lf
Hale Street (Eliot Street to Pennsylvania Avenue) 800 lf
Woodcliff Road (Centre Street to Dedham Street) 4,000 lf
Brookline Street (Vine Street to Pond Brook Road) 1,175 lf
Balcarres Road, 430 lf
Otis St, 2670 lf
Raymond Place, 164 lf

Please see the attached memo from DPW Commissioner Jim McGonagle for further details on the project.

Thank you for your consideration of this matter.

Sincerely,

A handwritten signature in black ink that reads "Ruthanne Fuller". The signature is written in a cursive, slightly stylized font.

Ruthanne Fuller
Mayor

DEPARTMENT OF PUBLIC WORKS

294-22

City of Newton

OFFICE OF THE COMMISSIONER

1000 Commonwealth Avenue

Newton Centre, MA 02459-1449

Ruthanne Fuller

Mayor

Date: April 11, 2022
To: Jonathan Yeo, Chief Operating Officer
Maureen Lemieux, Chief Financial Officer
From: James McGonagle, Commissioner
Subject: Request for Water Bond Borrowing Authorization,
\$3,200,000 for Water System Improvements FY 2023

I respectfully request authorization to borrow up to \$3,200,000 for water main improvements in FY 2023. This proposed borrowing will allow Public Works to implement a portion of the water main improvements as part of the \$40 million Water Capital Improvement Plan.

Each year as part of the Capital Improvement Plan, the City commits to borrow up to \$5,283,700 annually from City debt and MWRA loans to upgrade our water system, which will improve fire flows, and ensure the delivery of superior water quality. MWRA awards an annual loan of \$2,083,700 for water main improvements.

Water main rehabilitation projects for FY 2023 include the following:

Ward Street (Waverley Ave to Centre St): The MWRA is designing the removal and replacement of their 20-inch diameter cast iron water main in Ward Street. The city also has a 20-inch diameter cast iron water main in Ward Street, parallel to the MWRA water main. Both water mains were installed in the late 1800s, and are beyond their useful life. The existing 20-inch diameter cast iron water main will be removed and replaced with a new 20-inch diameter ductile iron water main. The city's consulting engineers are designing the water main replacement. MWRA's contractor will install the city's new water main in conjunction with installing the new MWRA water main. The MWRA will invoice the city for our cost of the water main installation.

The program will also include the following roads:

Washington Street (Greenough Street to Auburn Street) 900 lf
Upham Street (Mague Place to Cherry Street) 900 lf
Taft Avenue (Hazelhurst Avenue to Harding Street) 1,163 lf
Brooks Avenue/Proctor Street (Washington Street to Walker Street) 1,150 lf
Rossmere Street (Watertown Street to Lowell Avenue) 560 lf
Washington Park (north side) (Walnut Street to Harvard Street) 1,550 lf
Crescent Square (Thornton Street to Waban Street) 300 lf
Commonwealth Avenue (carriage lane) (Higgins Street to Melrose Street) 275 lf
Pembroke Street (Nonantum Street to Tremont Street) 1,150 lf
Woodlawn Drive (Woodchester Drive to Ward Street) 1,440 lf
Bothfield Road (Ellison Road to Manemet Road) 725 lf
Hale Street (Eliot Street to Pennsylvania Avenue) 800 lf
Woodcliff Road (Centre Street to Dedham Street) 4,000 lf
Brookline Street (Vine Street to Pond Brook Road) 1,175 lf

Telephone: 617-796-1009 • Fax: 617-796-1050 • Jmcgonagle@newtonma.gov

Balcarres Road, 430 lf
Otis St, 2670 lf
Raymond Place, 164 lf

Please docket this request with the City Clerk's office for consideration by the Honorable City Council.

cc: Shawna Sullivan, Deputy Commissioner
Louis M. Taverna, P.E., City Engineer
Tom Fitzgerald, Director of Utilities
Doug Valovcin, Deputy Director of Utilities
Kelley Cadman, DPW Budget Director
Stephen Curley, Comptroller
Ron Mendes, Treasurer



Ruthanne Fuller
Mayor

City of Newton, Massachusetts
Office of the Mayor

243-22

Telephone
(617) 796-1100
Fax
(617) 796-1113
TDD/TTY
(617) 796-1089
Email
rfuller@newtonma.gov

March 28, 2022

Honorable City Council
Newton City Hall
1000 Commonwealth Avenue
Newton, MA 02459

Honorable City Councilors:

I respectfully submit this docket item to this Honorable Council requesting a discussion of MassDOT's proposed modification to the roundabout design located at the Grove Street intersection with the I-95 SB off-ramp and Quinobequin Road consistent with the requirements of Riverside Special Permit #27-20 (2), Condition 14c.

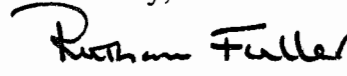
The relevant language from the Riverside Special Permit states:

Any material modifications to the final design of the Interchange Improvements by either MassDOT or FHWA will be considered consistent with the conceptually approved plan if, in the opinion of the Commissioner of Public Works, after consultation with the appropriate committee(s) of the City Council, the modified design achieves the same performance objectives as the conceptually approved design.

Please see the attached memo from Commissioner of Public Works James McGonagle and the detailed report from VHB on behalf of the project proponents.

Thank you for your consideration of this matter.

Sincerely,


Mayor Ruthanne Fuller

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NEWTON, MA. 02459

City of Newton
Ruthanne
Fuller

DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER
1000 Commonwealth Avenue
Newton Centre, MA 02459-1449

March 25, 2022

To: Jonathan Yeo, Chief Operating Officer
From: James McGonagle, Commissioner
Subject: Request for Docket Item for Discussion of Riverside Station Off-site Transportation Improvements

Consistent with the requirements of Special Permit #27-20(2), Condition 14.c., DPW would like to discuss MassDOT's proposed modification to the roundabout design located at the Grove Street intersection with the I-95 SB off-ramp and Quinobequin Road.

The relevant language from the Riverside Special Permit states:

Any material modifications to the final design of the Interchange Improvements by either MassDOT or FHWA will be considered consistent with the conceptually approved plan if, in the opinion of the Commissioner of Public Works, after consultation with the appropriate committee(s) of the City Council, the modified design achieves the same performance objectives as the conceptually approved design.

Sincerely,

James McGonagle
Commissioner of Public Works

cc: Shawna Sullivan, DPW Deputy Commissioner
Louis M. Taverna, P.E., City Engineer
Jason Sobel, P.E., PTOE, Director of Transportation Operations
Isaac Prizant, Transportation Engineer



To: City of Newton

Date: 02/04/2022

Memorandum

Project #: 10865.03

From: Randy Hart, Principal
Matthew Duranleau, PERe: Grove Street at I-95 Southbound Ramps
Potential Intersection Treatments

VHB, on behalf of Mark Development (the Proponent) has prepared this memorandum to discuss the evaluation of the various different treatments that were done for the intersection of Grove Street at the I-95 Southbound Ramps in Newton, Massachusetts. This intersection will be reconstructed as part of the approved Riverside redevelopment, which will include the construction of approximately 1,025,000 of new development on the existing site of the MBTA Riverside station parking lot and the Hotel Indigo. As part of the development, significant roadway improvements will be implemented, including the reconstruction of the I-95 Northbound Exit 38 off-ramp to Grove Street, an extension of Recreation Road to Grove Street, the installation of three adaptive traffic signals, and improvements at the intersection of Grove Street at the I-95 Southbound Ramps.

In the local and state filings, the intersection of Grove Street at the I-95 Southbound Ramps was proposed to be replaced with a single-lane roundabout with four approaches: Grove Street from the east and west, the I-95 Southbound Ramps from the south, and Asheville Road from the north. As development of the 25-percent design plans began, the Proponent has been in close coordination with MassDOT regarding all aspects of the offsite design. During these detailed consultations, MassDOT has stressed the need to create more deflection on the various approaches to the proposed intersection reconstruction, specifically the Grove Street westbound and I-95 Southbound Off-Ramp approaches to the intersection. Increasing deflection will slow the traffic entering the roundabout thereby enhancing the pedestrian environment.

Revised Roundabout Concept

To meet the requests of MassDOT, the roundabout has been shifted a short distance to the northeast and by doing so, the geometry and right-of-way doesn't allow for Asheville Road to be included in the roundabout. Under this scenario, Asheville Road becomes a right-in/right-out at Grove Street south of the roundabout and drivers exiting Asheville Road would only be able to take a right turn onto Grove Street. To access Grove Street eastbound, drivers would need to use Pine Grove Avenue or Pierrepont Road to turn left onto Grove Street instead. Alternatively, drivers could use Pierrepont Road to turn right onto Grove Street and reverse direction at the roundabout. The proposed roundabout would consist of three approaches: Grove Street from the east and west and the I-95 Southbound Ramps from the south.

The shifting of the roundabout is a minor change from what was previously contemplated for the design of this intersection, and the only significant change is the shifting of the Roundabout easterly and the treatment of Asheville Road. There are benefits and disadvantages associated with this change, which include the following:

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Benefits

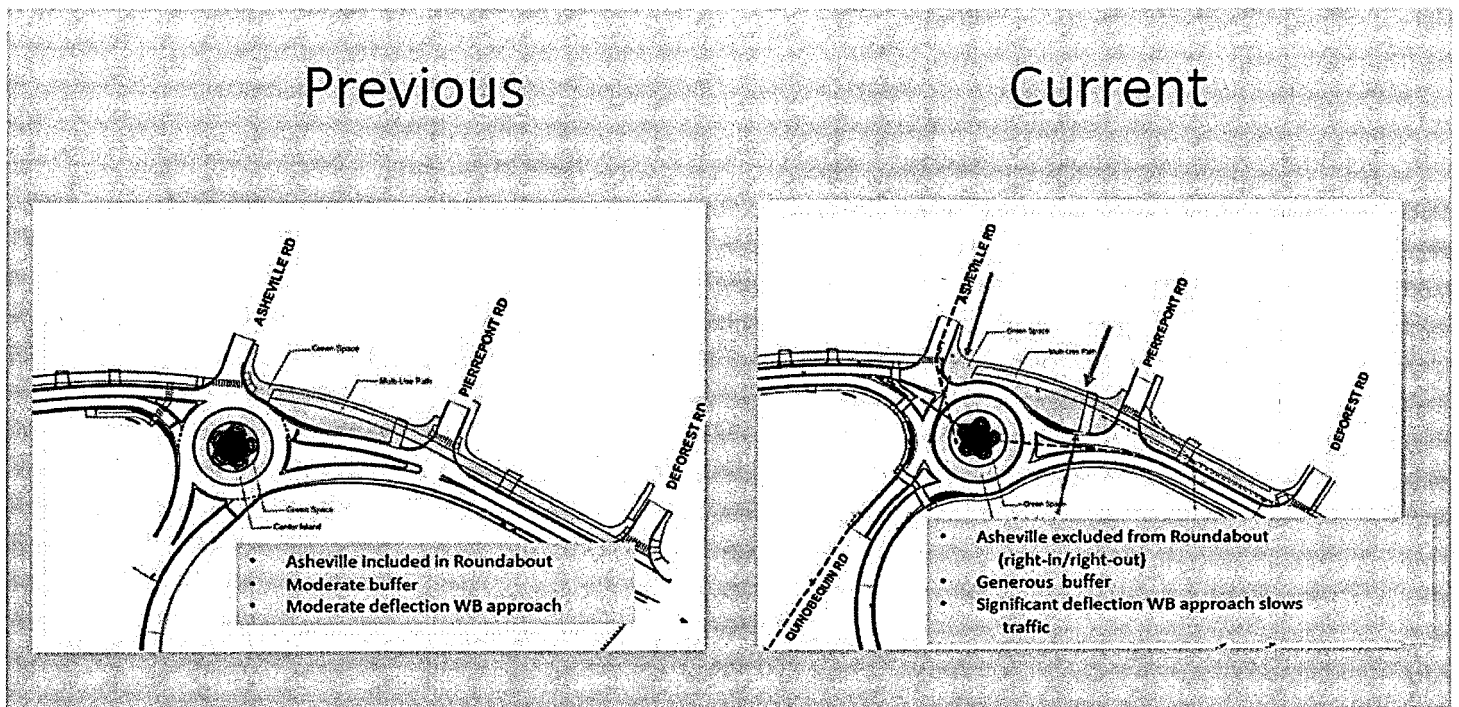
- › Increased deflection of the approaches will slow traffic even more than former concepts
- › Increased (substantially) green buffer between Grove Street and residents in northwest quadrant of intersection
- › Deemphasizes traffic movements onto Asheville Road (northern neighborhood traffic will likely not use Asheville to gain access to the roundabout)
- › Lower speed and more green space results in enhanced pedestrian environment

Detriments

- › Residents on Asheville Road will not be able to turn left at Grove Street from Asheville's intersection with Grove.

To demonstrate the two roundabout options that have been considered, Figure 1 provides a side-by-side comparison of the previous four-legged roundabout concept and the currently proposed three-legged roundabout concept.

Figure 1 Comparison of Previous and Current Roundabout Concepts





Additional Intersection Concepts

At the initial Riverside Redevelopment Liaison Committee meeting on Tuesday January 25, 2022, the revised concept for the roundabout was presented. The initial feedback from members of the community was concern for the changes that would be introduced to Asheville Road. As a result of the comments and concerns, additional review of potential options has been considered and further discussion is being planned with MassDOT and the City of Newton.

To aid in those conversations, this memorandum has been prepared to evaluate various options that have been considered. These include:

- › Original Four-Legged Roundabout Concept (with Asheville Road included)
- › Revised Three-Legged Roundabout Concept (with Asheville Road excluded)
- › Signalized intersection with slight shift of northbound approach (the I-95 Southbound Ramps approach is shifted slightly west from its current location to directly align with Asheville Road)
- › Signalized intersection in current location (each approach has the same geometry as existing conditions with the I-95 Southbound Ramps and Asheville Road slightly offset from each other)

Concept plans for the two signalized scenarios are provided in the Attachments to this memorandum.

The following section summarizes the intersection capacity results of the proposed roundabout and signalized intersection concepts.

Intersection Operations

To demonstrate future traffic operations at the intersection under different concept alternatives, intersection capacity analyses have been conducted based on the 2031 Build Conditions with mitigation traffic volumes as presented in the most recent MEPA filings for the Riverside redevelopment project¹. The traffic volumes present a future condition that includes a growth in traffic over existing conditions due to the Riverside redevelopment as well as due to other background projects. The intersection capacity analyses have been conducted for the weekday morning, weekday evening, and Saturday midday peak hours using Synchro 10 software for the signalized concepts and using Sidra 8 software for the roundabout concepts.

Roundabout Concepts

Table 1 presents a summary of the capacity analyses for intersection under the four-legged and three-legged roundabout alternatives. The intersection capacity worksheets are included in the Attachments to this memorandum.

¹ Supplemental Draft Environmental Impact Report, EEA No. 16024, Riverside Station Redevelopment; Prepared by VHB; May 17, 2021.



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Table 1 Roundabout Intersection Capacity Analysis Summary

| Location | 2031 Build Conditions w/ Mitigation Original Four-Legged Concept | | | | | 2031 Build Conditions w/ Mitigation Revised Three-Legged Concept | | | | |
|---|---|------------------|--------------------|------------------|---------------------------------|---|------|-----------|----------|--------------------|
| | D ^a | v/c ^b | Delay ^c | LOS ^d | 95 th Q ^e | D | v/c | Delay | LOS | 95 th Q |
| Grove Street at I-95 Southbound Ramps / Asheville Road | | | | | | | | | | |
| <u>Weekday Morning</u> | | | | | | | | | | |
| Grove Street EB LTR | 575 | 0.75 | 20 | C | 321 | 590 | 0.76 | 20 | C | 339 |
| Grove Street WB LTR | 380 | 0.38 | 7 | A | 50 | 380 | 0.38 | 7 | A | 50 |
| I-95 SB Off-Ramp NB LTR | 375 | 0.67 | 20 | C | 143 | 375 | 0.66 | 20 | C | 142 |
| Asheville Road SB LTR | 15 | 0.03 | 6 | A | 2 | n/a | n/a | n/a | n/a | n/a |
| Overall | | | 16 | C | | | | 16 | C | |
| <u>Weekday Evening</u> | | | | | | | | | | |
| Grove Street EB LTR | 260 | 0.43 | 12 | B | 56 | 265 | 0.43 | 12 | B | 57 |
| Grove Street WB LTR | 730 | 0.76 | 17 | C | 212 | 730 | 0.75 | 17 | C | 212 |
| I-95 SB Off-Ramp NB LTR | 190 | 0.25 | 7 | A | 25 | 190 | 0.25 | 7 | A | 25 |
| Asheville Road SB LTR | 10 | 0.02 | 8 | A | 1 | n/a | n/a | n/a | n/a | n/a |
| Overall | | | 14 | B | | | | 14 | B | |
| <u>Saturday Midday</u> | | | | | | | | | | |
| Grove Street EB LTR | 220 | 0.28 | 7 | A | 29 | 235 | 0.29 | 7 | A | 31 |
| Grove Street WB LTR | 350 | 0.36 | 7 | A | 45 | 350 | 0.36 | 7 | A | 45 |
| I-95 SB Off-Ramp NB LTR | 280 | 0.33 | 7 | A | 37 | 280 | 0.32 | 7 | A | 37 |
| Asheville Road SB LTR | 15 | 0.02 | 5 | A | 2 | n/a | n/a | n/a | n/a | n/a |
| Overall | | | 7 | A | | | | 7 | A | |

Source: analyzed with Sidra 8 software.

- a Demand (input)
- b volume-to-capacity ratio
- c average total delay, in seconds per vehicle
- d level of service
- e 95th percentile queue length, measured in feet

As shown in Table 1, the intersection with either roundabout concept is proposed to operate at overall LOS C or better during each peak hour. Each approach is also expected to operate at LOS C or better and the queues on each approach are expected to be less than 350 feet during each peak hour. Operations are expected to be comparable between the four-legged and the three-legged roundabout concepts.

Signalized Intersection Concepts

Table 2 presents a summary of the capacity analyses for intersection under the two different signalized alternatives (Concept 1 assumes the I-95 Southbound Ramps approach is shifted slightly west to directly align with Asheville Road and Concept 2 assumes each approach has the same geometry as under existing conditions). The intersection capacity worksheets are included in the Attachments to this memorandum.



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Table 2 Four-Legged Signalized Intersection Capacity Analysis

| Location | 2031 Build Conditions w/ Mitigation Concept 1 | | | | | 2031 Build Conditions w/ Mitigation Concept 2 | | | | |
|---|--|--------------------|------------------|---------------------------------|---------------------------------|--|-------|-----|--------------------|--------------------|
| | v/c ^a | Delay ^b | LOS ^c | 50 th Q ^d | 95 th Q ^e | v/c | Delay | LOS | 50 th Q | 95 th Q |
| Grove Street at I-95 Southbound Ramps / Asheville Road | | | | | | | | | | |
| <u>Weekday Morning</u> | | | | | | | | | | |
| Grove Street EB LTR | 0.80 | 27 | C | 192 | #526 | 0.73 | 24 | C | 158 | #587 |
| Grove Street WB L | 0.45 | 7 | A | 22 | 103 | 0.50 | 11 | B | 22 | 148 |
| Grove Street WB TR | 0.12 | 5 | A | 12 | 61 | 0.12 | 6 | A | 12 | 81 |
| I-95 SB Off-Ramp NB LT | 0.03 | 33 | C | 2 | 15 | 0.03 | 31 | C | 2 | 15 |
| I-95 SB Off-Ramp NB R | 0.64 | 25 | C | 115 | #374 | 0.74 | 32 | C | 120 | #426 |
| Asheville Road SB LTR | 0.10 | 35 | C | 6 | 28 | 0.10 | 34 | C | 5 | 29 |
| Overall | | 21 | C | | | | 22 | C | | |
| <u>Weekday Evening</u> | | | | | | | | | | |
| Grove Street EB LTR | 0.58 | 27 | C | 81 | 220 | 0.64 | 32 | C | 86 | #302 |
| Grove Street WB L | 0.56 | 8 | A | 46 | 212 | 0.61 | 13 | B | 47 | #344 |
| Grove Street WB TR | 0.23 | 5 | A | 26 | 122 | 0.25 | 7 | A | 26 | 162 |
| I-95 SB Off-Ramp NB LT | 0.25 | 33 | C | 14 | 62 | 0.28 | 34 | C | 15 | 62 |
| I-95 SB Off-Ramp NB R | 0.20 | 10 | B | 19 | 102 | 0.19 | 11 | B | 22 | 104 |
| Asheville Road SB LTR | 0.04 | 31 | C | 2 | 18 | 0.04 | 33 | C | 3 | 18 |
| Overall | | 13 | B | | | | 16 | B | | |
| <u>Saturday Midday</u> | | | | | | | | | | |
| Grove Street EB LTR | 0.51 | 23 | C | 51 | 173 | 0.50 | 23 | C | 49 | 188 |
| Grove Street WB L | 0.36 | 7 | A | 22 | 104 | 0.36 | 9 | A | 20 | 131 |
| Grove Street WB TR | 0.12 | 6 | A | 11 | 56 | 0.12 | 7 | A | 10 | 71 |
| I-95 SB Off-Ramp NB LT | 0.16 | 25 | C | 9 | 52 | 0.18 | 28 | C | 9 | 56 |
| I-95 SB Off-Ramp NB R | 0.32 | 11 | B | 28 | 157 | 0.33 | 14 | B | 28 | 194 |
| Asheville Road SB LTR | 0.08 | 26 | C | 4 | 27 | 0.07 | 30 | C | 4 | 30 |
| Overall | | 13 | B | | | | 15 | B | | |

Source: analyzed with Synchro 10 software.

Note: analyzed with right turns on red prohibited on all approaches to provide a conservative analysis.

- a volume-to-capacity ratio
- b average delay in seconds per vehicle
- c level of service
- d 50th percentile queue length, measured in feet
- e 95th percentile queue length, measured in feet
- # 95th percentile volume exceeds capacity, queue may be longer

As shown in Table 2, the intersection with the four-legged signalized concept is proposed to operate at overall LOS C or better during each peak hour under both concepts. Each approach is also expected to operate at LOS C or better during each peak hour under both concepts.

Overall, operations are slightly better under signalized Concept 1 compared to signalized Concept 2. Under Concept 1, the I-95 Southbound Ramps is shifted slightly west to directly align with Asheville Road. This means that the Asheville Road and the I-95 Southbound Ramps approaches can run concurrently and have green lights at the same time. Under Concept 2, the two approaches cannot run concurrently and have green lights at different times due to the



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approaches being offset from each other. By not allowing the two approaches to run at the same time, there is additional lost time at the intersection with the needed yellow and all-red time for the additional signal phase, which causes slightly higher delays and queues for all the approaches.

It should be noted that under both signalized concepts the queues are expected to be longer than compared to the roundabout concepts. For example, during the weekday morning peak hour, the 95th-percentile queue on the Grove Street eastbound approach is expected to be approximately 526 feet or 587 feet under the two signalized concepts but only 339 feet under the three-legged roundabout concept. In addition, the 95th-percentile queue on the I-95 Southbound Off-Ramp is expected to be approximately 374 feet or 426 feet during the weekday morning peak hour under the two signalized concepts but only 142 feet under the three-legged roundabout option.

Comparison of Options

The operational analyses presented above show the difference in operations between a roundabout and traffic signal options. As highlighted, there is significant difference in vehicle queuing along Grove Street northbound and on the Southbound Ramp. To demonstrate, visually, the differences in options the following two graphics have been created to demonstrate the difference between the two critical periods. Figure 2 and Figure 3 provide illustrative comparisons of the 95th-percentile queues during the weekday morning peak hour on the Grove Street eastbound and I-95 SB Off-Ramp northbound approaches, respectively.

Figure 2 Grove Street Eastbound Approach Weekday Morning Peak Hour 95th Percentile Queues



Figure 3 I-95 SB Off-Ramp Northbound Approach Weekday Morning Peak Hour 95th Percentile Queues





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As shown in Figures 1 and 2, queues on critical approaches to the intersection are substantially shorter with the roundabout proposed. This is particularly true along the I-95 Southbound Off-Ramp, where the queue under the proposed roundabout concept is less than one-third the length of the queue under the potential signalized options.

As part of the proposed Project, the Proponent is being required to do clearing in the interior of the I-95 Southbound Grove Street Off-Ramp to increase sight lines to ensure visibility to back of queue is available. This is a very important safety consideration for MassDOT and therefore treatments that minimize ramp queues should be considered preferable.

In addition, a major difference between the proposed roundabout concept and the signalized options is the elimination of the right-turn slip lane from the I-95 Southbound Off-Ramp to Grove Street eastbound. Under existing conditions, the slip lane does not provide adequate deflection to significantly reduce the speed of drivers exiting the interstate. Although the signalized options would include a signal on the slip lane, drivers will still be able to travel at high speeds onto Grove Street without significantly slowing down when the signal is green. Under the roundabout concept, the slip lane is eliminated, and all right-turning traffic must travel through the roundabout. The deflection provided in the three-legged roundabout will force drivers to slow down as they turn onto Grove Street.

Conclusion

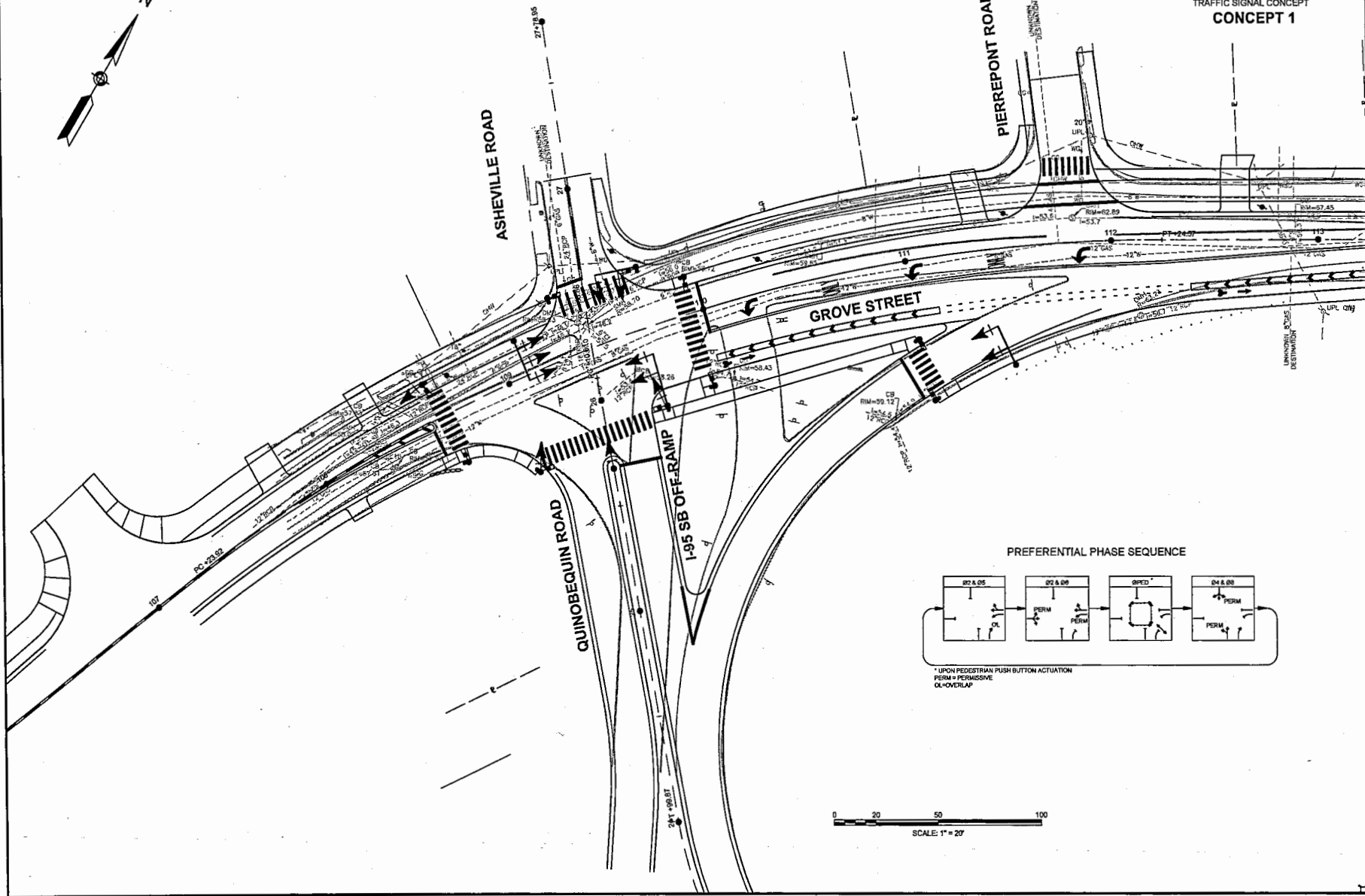
As outlined in this memorandum, future traffic conditions at the intersection of Grove Street at the I-95 Southbound Ramps are expected to operate at acceptable levels-of-service under both the roundabout concepts and the four-legged signalized concepts. However, the queues on each approach are expected to be much shorter under the roundabout concepts than under the signalized concepts. In addition, the three-legged roundabout concept is expected to provide improved safety for all users over the signalized concepts with lower vehicle speeds through the intersection and the elimination of the right-turn slip lane from the I-95 Southbound Off-Ramp to Grove Street eastbound.

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Attachments

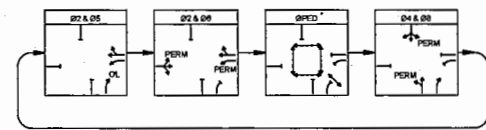
Attachments

- > Concept Plans – Signalized
- > Intersection Capacity Analyses – Roundabout
- > Intersection Capacity Analyses – Signalized

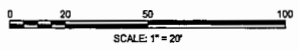
NEWTON
GROVE STREET AT I-95 SB RAMP
TRAFFIC SIGNAL CONCEPT
CONCEPT 1



PREFERENTIAL PHASE SEQUENCE



* UPON PEDESTRIAN PUSH BUTTON ACTUATION
PERM = PERMISSIVE
OL = OVERLAP



NEWTON
GROVE STREET AT I-95 SB RAMPS
TRAFFIC SIGNAL CONCEPT
CONCEPT 2

PIERREPONT ROAD

GROVE STREET

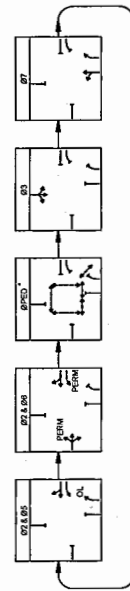
QUINOBEQUIN ROAD

I-95 SB OFF-RAMP

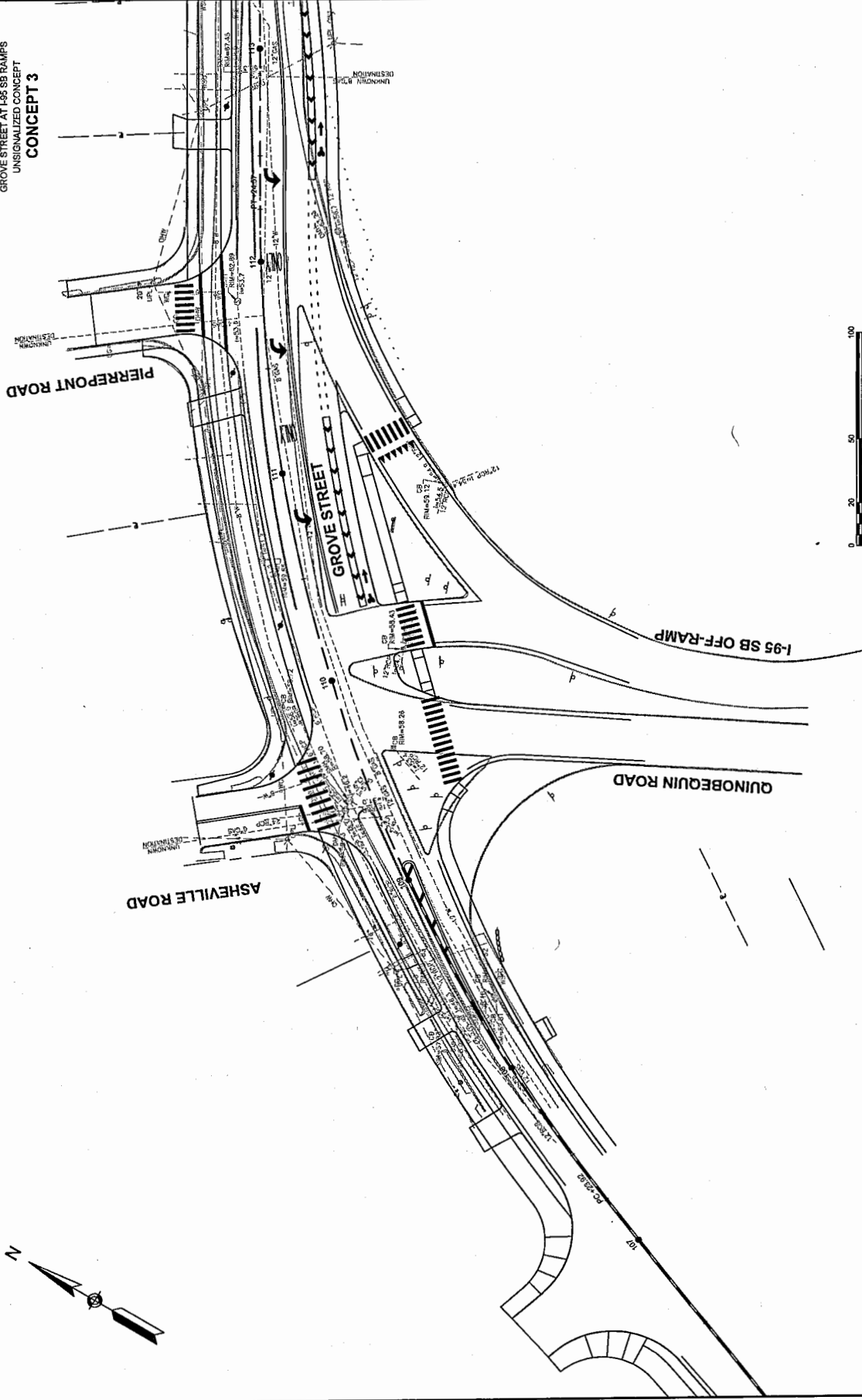
ASHEVILLE ROAD



PREFERENTIAL PHASE SEQUENCE



NEWTON
GROVE STREET AT I-95 SB RAMPS
UNSIGNALIZED CONCEPT
CONCEPT 3



LANE SUMMARY

 Site: 101 [Weekday Morning_2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps

Site Category: (None)

Roundabout

| Lane Use and Performance | | | | | | | | | | | | | |
|--------------------------|----------------|---------|---------------|-----------------|-----------------|----------------------|------------------|-------------------|------------|-------------|-------------------|----------------|------------------|
| | Demand Flows | | | Deg Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue | | Lane Config | Lane Length ft | Cap. Adj. % | Prob. Block % |
| | Total veh/h | HV % | Cap. veh/h | | | | | Veh | Dist ft | | | | |
| South: I-95 SB Ramps | | | | | | | | | | | | | |
| Lane 1 ^d | 409 | 2.0 | 615 | 0.665 | 100 | 20.0 | LOS C | 5.6 | 143.1 | Full | 1600 | 0.0 | 0.0 |
| Approach | 409 | 2.0 | | 0.665 | | 20.0 | LOS C | 5.6 | 143.1 | | | | |
| East: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 413 | 3.0 | 1089 | 0.379 | 100 | 7.2 | LOS A | 2.0 | 50.1 | Full | 1600 | 0.0 | 0.0 |
| Approach | 413 | 3.0 | | 0.379 | | 7.2 | LOS A | 2.0 | 50.1 | | | | |
| North: Asheville Road | | | | | | | | | | | | | |
| Lane 1 ^d | 17 | 7.0 | 690 | 0.025 | 100 | 5.5 | LOS A | 0.1 | 2.1 | Full | 1600 | 0.0 | 0.0 |
| Approach | 17 | 7.0 | | 0.025 | | 5.5 | LOS A | 0.1 | 2.1 | | | | |
| West: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 626 | 2.0 | 832 | 0.752 | 100 | 20.0 | LOS C | 12.6 | 321.1 | Full | 1600 | 0.0 | 0.0 |
| Approach | 626 | 2.0 | | 0.752 | | 20.0 | LOS C | 12.6 | 321.1 | | | | |
| Intersection | 1465 | 2.3 | | 0.752 | | 16.2 | LOS C | 12.6 | 321.1 | | | | |

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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Organisation: VANASSE HANGEN BRUSTLIN INC. | Processed: Thursday, February 18, 2021 7:49:09 AM

Project: \\vhb\gbl\proj\Wat-TS10865.03 Mark Inv Riverside Newto\tech\Traffic\Sidra\TIA\February 2021 TIA\Grove Street at I-95 SB Ramps_Ashville Road_No Slip Lane.sip8

LANE SUMMARY

Site: 101 [Weekday Evening_2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps

Site Category: (None)

Roundabout

| Lane Use and Performance | | | | | | | | | | | | | |
|--------------------------|----------------|---------|--------------|-----------------|-----------------|----------------------|------------------|-------------------|------------|-------------|-------------------|--------------|-----------------|
| | Demand Flows | | | Deg Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue | | Lane Config | Lane Length ft | Cap Adj % | Prob Block % |
| | Total veh/h | HV % | Cap veh/h | | | | | Veh | Dist ft | | | | |
| South: I-95 SB Ramps | | | | | | | | | | | | | |
| Lane 1 ^d | 207 | 5.0 | 840 | 0.246 | 100 | 6.9 | LOS A | 0.9 | 24.7 | Full | 1600 | 0.0 | 0.0 |
| Approach | 207 | 5.0 | | 0.246 | | 6.9 | LOS A | 0.9 | 24.7 | | | | |
| East: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 793 | 2.0 | 1051 | 0.755 | 100 | 16.9 | LOS C | 8.3 | 212.0 | Full | 1600 | 0.0 | 0.0 |
| Approach | 793 | 2.0 | | 0.755 | | 16.9 | LOS C | 8.3 | 212.0 | | | | |
| North: Asheville Road | | | | | | | | | | | | | |
| Lane 1 ^d | 9 | 0.0 | 486 | 0.018 | 100 | 7.6 | LOS A | 0.1 | 1.4 | Full | 1600 | 0.0 | 0.0 |
| Approach | 9 | 0.0 | | 0.018 | | 7.6 | LOS A | 0.1 | 1.4 | | | | |
| West: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 284 | 3.0 | 665 | 0.427 | 100 | 11.5 | LOS B | 2.2 | 56.0 | Full | 1600 | 0.0 | 0.0 |
| Approach | 284 | 3.0 | | 0.427 | | 11.5 | LOS B | 2.2 | 56.0 | | | | |
| Intersection | 1292 | 2.7 | | 0.755 | | 14.1 | LOS B | 8.3 | 212.0 | | | | |

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.


d Dominant lane on roundabout approach

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Project: \\vhb\gbl\proj\Wat-TS\10865.03 Mark Inv Riverside Newto\tech\Traffic\Sidra\TIA\February 2021 TIA\Grove Street at I-95 SB Ramps_Ashville Road_No Slip Lane.sip8

LANE SUMMARY

 Site: 101 [Saturday Midday_2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps
 Site Category: (None)
 Roundabout

| Lane Use and Performance | | | | | | | | | | | | | |
|--------------------------|----------------|---------|--------------|------------------|-----------------|----------------------|------------------|-------------------|------------|-------------|-------------------|----------------|------------------|
| | Demand Flows | | | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue | | Lane Config | Lane Length ft | Cap. Adj. % | Prob. Block % |
| | Total veh/h | HV % | Cap veh/h | | | | | Veh | Dist ft | | | | |
| South: I-95 SB Ramps | | | | | | | | | | | | | |
| Lane 1 ^d | 304 | 1.0 | 934 | 0.326 | 100 | 7.3 | LOS A | 1.5 | 37.1 | Full | 1600 | 0.0 | 0.0 |
| Approach | 304 | 1.0 | | 0.326 | | 7.3 | LOS A | 1.5 | 37.1 | | | | |
| East: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 380 | 1.0 | 1065 | 0.357 | 100 | 7.0 | LOS A | 1.8 | 45.2 | Full | 1600 | 0.0 | 0.0 |
| Approach | 380 | 1.0 | | 0.357 | | 7.0 | LOS A | 1.8 | 45.2 | | | | |
| North: Asheville Road | | | | | | | | | | | | | |
| Lane 1 ^d | 17 | 0.0 | 745 | 0.023 | 100 | 5.1 | LOS A | 0.1 | 1.9 | Full | 1600 | 0.0 | 0.0 |
| Approach | 17 | 0.0 | | 0.023 | | 5.1 | LOS A | 0.1 | 1.9 | | | | |
| West: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 239 | 1.0 | 855 | 0.280 | 100 | 7.2 | LOS A | 1.2 | 29.3 | Full | 1600 | 0.0 | 0.0 |
| Approach | 239 | 1.0 | | 0.280 | | 7.2 | LOS A | 1.2 | 29.3 | | | | |
| Intersection | 941 | 1.0 | | 0.357 | | 7.1 | LOS A | 1.8 | 45.2 | | | | |

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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Project: \\vhb\gb\proj\Wat-TS\10865.03 Mark Inv Riverside Newto\tech\Traffic\Sidra\TIA\February 2021 TIA\Grove Street at I-95 SB Ramps_Ashville Road_No Slip Lane.sip8

LANE SUMMARY

 Site: 101 [Weekday Morning_2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps

Site Category: (None)

Roundabout

| Lane Use and Performance | | | | | | | | | | | | | |
|--------------------------|----------------|---------|--------------|------------------|-----------------|----------------------|------------------|-------------------|------------|-------------|-------------------|----------------|-------------------|
| | Demand Flows | | | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue | | Lane Config | Lane Length ft | Cap. Adj. % | Prob. Block. % |
| | Total veh/h | HV % | Cap veh/h | | | | | Veh | Dist ft | | | | |
| South: I-95 SB Ramps | | | | | | | | | | | | | |
| Lane 1 ^d | 408 | 2.0 | 616 | 0.662 | 100 | 19.9 | LOS C | 5.6 | 141.8 | Full | 1600 | 0.0 | 0.0 |
| Approach | 408 | 2.0 | | 0.662 | | 19.9 | LOS C | 5.6 | 141.8 | | | | |
| East: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 413 | 3.0 | 1091 | 0.379 | 100 | 7.2 | LOS A | 2.0 | 50.0 | Full | 1600 | 0.0 | 0.0 |
| Approach | 413 | 3.0 | | 0.379 | | 7.2 | LOS A | 2.0 | 50.0 | | | | |
| West: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 641 | 2.0 | 847 | 0.757 | 100 | 20.0 | LOS C | 13.4 | 339.3 | Full | 1600 | 0.0 | 0.0 |
| Approach | 641 | 2.0 | | 0.757 | | 20.0 | LOS C | 13.4 | 339.3 | | | | |
| Intersection | 1462 | 2.3 | | 0.757 | | 16.3 | LOS C | 13.4 | 339.3 | | | | |

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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Project: \\vhb\gbl\proj\Wat-TS\10865.03 Mark Inv Riverside Newto\tech\Traffic\Sidra\TIAS\February 2021 TIA\January 2022_No Asheville Road Approach\Grove Street at I-95 SB Ramps_Ashville Road_No Slip Lane.sip8

LANE SUMMARY

Site: 101 [Weekday Evening 2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps

Site Category: (None)

Roundabout

| Lane Use and Performance | | | | | | | | | | | | | |
|--------------------------|----------------|------|---------------|-----------------|-----------------|----------------------|------------------|-------------------|------------|-------------|-------------------|----------------|------------------|
| | Demand Flows | | | Deg Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue | | Lane Config | Lane Length ft | Cap. Adj. % | Prob. Block % |
| | Total veh/h | HV % | Cap. veh/h | | | | | Veh | Dist ft | | | | |
| South: I-95 SB Ramps | | | | | | | | | | | | | |
| Lane 1 ^d | 207 | 5.0 | 841 | 0.245 | 100 | 6.9 | LOS A | 0.9 | 24.6 | Full | 1600 | 0.0 | 0.0 |
| Approach | 207 | 5.0 | | 0.245 | | 6.9 | LOS A | 0.9 | 24.6 | | | | |
| East: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 793 | 2.0 | 1052 | 0.754 | 100 | 16.8 | LOS C | 8.3 | 211.8 | Full | 1600 | 0.0 | 0.0 |
| Approach | 793 | 2.0 | | 0.754 | | 16.8 | LOS C | 8.3 | 211.8 | | | | |
| West: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 288 | 3.0 | 670 | 0.430 | 100 | 11.5 | LOS B | 2.2 | 57.0 | Full | 1600 | 0.0 | 0.0 |
| Approach | 288 | 3.0 | | 0.430 | | 11.5 | LOS B | 2.2 | 57.0 | | | | |
| Intersection | 1288 | 2.7 | | 0.754 | | 14.1 | LOS B | 8.3 | 211.8 | | | | |

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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Project: \\vhb\gb\proj\Wat-TS\10865.03 Mark Inv Riverside Newto\tech\Traffic\Sidra\TIA\February 2021 TIA\January 2022_No Asheville Road Approach\Grove Street at I-95 SB Ramps_Ashville Road_No Slip Lane.sip8

LANE SUMMARY

Site: 101 [Saturday Midday_2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps

Site Category: (None)

Roundabout

| Lane Use and Performance | Demand Flows | | | Deg Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue | | Lane Config | Lane Length ft | Cap. Adj. % | Prob. Block % |
|--------------------------|----------------|------|---------------|-----------------|-----------------|----------------------|------------------|-------------------|------------|-------------|-------------------|----------------|------------------|
| | Total veh/h | HV % | Cap. veh/h | | | | | Veh | Dist ft | | | | |
| South: I-95 SB Ramps | | | | | | | | | | | | | |
| Lane 1 ^d | 304 | 1.0 | 939 | 0.324 | 100 | 7.3 | LOS A | 1.5 | 36.9 | Full | 1600 | 0.0 | 0.0 |
| Approach | 304 | 1.0 | | 0.324 | | 7.3 | LOS A | 1.5 | 36.9 | | | | |
| East: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 380 | 1.0 | 1071 | 0.355 | 100 | 7.0 | LOS A | 1.8 | 44.9 | Full | 1600 | 0.0 | 0.0 |
| Approach | 380 | 1.0 | | 0.355 | | 7.0 | LOS A | 1.8 | 44.9 | | | | |
| West: Grove Street | | | | | | | | | | | | | |
| Lane 1 ^d | 250 | 1.0 | 869 | 0.288 | 100 | 7.2 | LOS A | 1.2 | 30.5 | Full | 1600 | 0.0 | 0.0 |
| Approach | 250 | 1.0 | | 0.288 | | 7.2 | LOS A | 1.2 | 30.5 | | | | |
| Intersection | 935 | 1.0 | | 0.355 | | 7.2 | LOS A | 1.8 | 44.9 | | | | |

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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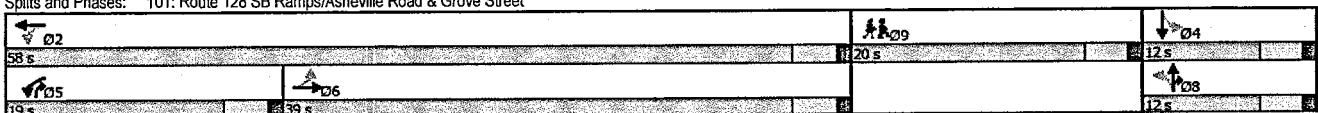
Project: \\vhb\gbl\proj\Wat-TS\10865.03 Mark Inv Riverside Newto\tech\Traffic\Sidra\TIAS\February 2021 TIA\January 2022_No Asheville Road Approach\Grove Street at I-95 SB Ramps_Ashville Road_No Slip Lane.sip8



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR | Ø9 |
|-------------------------|-------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|------|------|
| Lane Configurations | | ↔ | | ↔ | ↔ | | | ↔ | ↔ | | ↔ | | |
| Traffic Volume (vph) | 1 | 520 | 55 | 240 | 135 | 5 | 5 | 1 | 370 | 10 | 5 | 0 | |
| Future Volume (vph) | 1 | 520 | 55 | 240 | 135 | 5 | 5 | 1 | 370 | 10 | 5 | 0 | |
| Ideal Flow (vchpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | |
| Storage Length (ft) | 0 | 0 | 0 | 200 | 0 | 0 | 0 | 0 | 200 | 0 | 0 | 0 | |
| Storage Lanes | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | | |
| Satd. Flow (prot) | 0 | 1835 | 0 | 1752 | 1834 | 0 | 0 | 1788 | 1583 | 0 | 1717 | 0 | |
| Flt Permitted | | | | 0.243 | | | | 0.837 | | | 0.843 | | |
| Satd. Flow (perm) | 0 | 1835 | 0 | 448 | 1834 | 0 | 0 | 1559 | 1583 | 0 | 1497 | 0 | |
| Right Turn on Red | | | No | | | No | | | No | | | No | |
| Satd. Flow (RTOR) | | | | | | | | | | | | | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | | |
| Link Distance (ft) | | 1604 | | | 920 | | | 838 | | | 182 | | |
| Travel Time (s) | | 36.5 | | | 20.9 | | | 19.0 | | | 4.1 | | |
| Confl. Peds. (#/hr) | 7 | | | | | 7 | | | | | | | |
| Confl. Bikes (#/hr) | | | 1 | | | 1 | | | | | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | |
| Heavy Vehicles (%) | 2% | 2% | 2% | 3% | 3% | 3% | 2% | 2% | 2% | 7% | 7% | 7% | |
| Shared Lane Traffic (%) | | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 626 | 0 | 261 | 152 | 0 | 0 | 6 | 402 | 0 | 16 | 0 | |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | pt+ov | Perm | NA | | |
| Protected Phases | | 6 | | 5 | 2 | | | 8 | 5 | | 4 | | 9 |
| Permitted Phases | 6 | | | 2 | | | 8 | | | 4 | | | |
| Detector Phase | 6 | 6 | | 5 | 2 | | 8 | 8 | 5 | 4 | 4 | | |
| Switch Phase | | | | | | | | | | | | | |
| Minimum Initial (s) | 10.0 | 10.0 | | 6.0 | 10.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 4.0 |
| Minimum Split (s) | 14.0 | 14.0 | | 10.0 | 14.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 20.0 |
| Total Split (s) | 39.0 | 39.0 | | 19.0 | 58.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | | 20.0 |
| Total Split (%) | 43.3% | 43.3% | | 21.1% | 64.4% | | 13.3% | 13.3% | | 13.3% | 13.3% | | 22% |
| Yellow Time (s) | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 |
| All-Red Time (s) | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 |
| Lost Time Adjust (s) | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 |
| Total Lost Time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 |
| Lead/Lag | Lag | Lag | | Lead | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | | |
| Recall Mode | Min | Min | | None | Min | | None | None | | None | None | | None |
| Act Effct Green (s) | 28.0 | | | 45.8 | 45.8 | | 8.4 | 26.1 | | | 6.8 | | |
| Actuated g/C Ratio | 0.43 | | | 0.70 | 0.70 | | 0.13 | 0.40 | | | 0.10 | | |
| v/c Ratio | 0.80 | | | 0.45 | 0.12 | | 0.03 | 0.64 | | | 0.10 | | |
| Control Delay | 27.0 | | | 7.0 | 4.5 | | 33.0 | 25.3 | | | 34.5 | | |
| Queue Delay | 0.0 | | | 0.0 | 0.0 | | 0.0 | 0.0 | | | 0.0 | | |
| Total Delay | 27.0 | | | 7.0 | 4.5 | | 33.0 | 25.3 | | | 34.5 | | |
| LOS | C | | | A | A | | C | C | | | C | | |
| Approach Delay | 27.0 | | | | 6.1 | | 25.4 | | | | 34.5 | | |
| Approach LOS | C | | | | A | | C | | | | C | | |
| Queue Length 50th (ft) | 192 | | | 22 | 12 | | 2 | 115 | | | 6 | | |
| Queue Length 95th (ft) | #526 | | | 103 | 61 | | 15 | #374 | | | 28 | | |
| Internal Link Dist (ft) | 1524 | | | | 840 | | | 758 | | | 102 | | |
| Turn Bay Length (ft) | | | | 200 | | | | 200 | | | | | |
| Base Capacity (vph) | 1026 | | | 626 | 1531 | | 199 | 683 | | | 191 | | |
| Starvation Cap Reductn | 0 | | | 0 | 0 | | 0 | 0 | | | 0 | | |
| Spillback Cap Reductn | 0 | | | 0 | 0 | | 0 | 0 | | | 0 | | |
| Storage Cap Reductn | 0 | | | 0 | 0 | | 0 | 0 | | | 0 | | |
| Reduced v/c Ratio | 0.61 | | | 0.42 | 0.10 | | 0.03 | 0.59 | | | 0.08 | | |

Intersection Summary
 Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 65.4
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.80
 Intersection Signal Delay: 20.7
 Intersection LOS: C
 Intersection Capacity Utilization 68.7%
 ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street

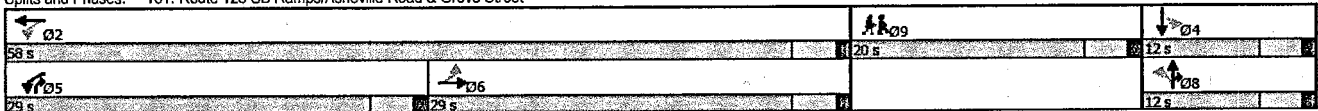




| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR | Ø9 |
|-------------------------|-------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|------|------|
| Lane Configurations | ↔ | | | ↔ | ↔ | | ↔ | ↔ | | ↔ | ↔ | | |
| Traffic Volume (vph) | 1 | 215 | 45 | 445 | 275 | 10 | 40 | 5 | 145 | 5 | 2 | 1 | |
| Future Volume (vph) | 1 | 215 | 45 | 445 | 275 | 10 | 40 | 5 | 145 | 5 | 2 | 1 | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | |
| Storage Length (ft) | 0 | | 0 | 200 | | 0 | 0 | | 200 | 0 | | 0 | |
| Storage Lanes | 0 | | 0 | 1 | | 0 | 0 | | 1 | 0 | | 0 | |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | | |
| Satd. Flow (prot) | 0 | 1802 | 0 | 1770 | 1851 | 0 | 0 | 1732 | 1538 | 0 | 1812 | 0 | |
| Flt Permitted | | 0.999 | | 0.341 | | | | 0.743 | | | 0.813 | | |
| Satd. Flow (perm) | 0 | 1800 | 0 | 635 | 1851 | 0 | 0 | 1344 | 1538 | 0 | 1518 | 0 | |
| Right Turn on Red | | | No | | | No | | | No | | | No | |
| Satd. Flow (RTOR) | | | | | | | | | | | | | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | | 30 | |
| Link Distance (ft) | | 1604 | | | 883 | | | 838 | | | | 182 | |
| Travel Time (s) | | 36.5 | | | 20.1 | | | 19.0 | | | | 4.1 | |
| Confl. Peds. (#/hr) | 16 | | | | | 16 | | | | | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | |
| Heavy Vehicles (%) | 3% | 3% | 3% | 2% | 2% | 2% | 5% | 5% | 5% | 0% | 0% | 0% | |
| Shared Lane Traffic (%) | | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 284 | 0 | 484 | 310 | 0 | 0 | 48 | 158 | 0 | 8 | 0 | |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | pt+ov | Perm | NA | NA | |
| Protected Phases | | 6 | | 5 | 2 | | | 8 | 5.8 | | 4 | | 9 |
| Permitted Phases | 6 | | | 2 | | | 8 | | | 4 | | | |
| Detector Phase | 6 | 6 | | 5 | 2 | | 8 | 8 | 5.8 | | 4 | 4 | |
| Switch Phase | | | | | | | | | | | | | |
| Minimum Initial (s) | 10.0 | 10.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 4.0 |
| Minimum Split (s) | 14.0 | 14.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 20.0 |
| Total Split (s) | 29.0 | 29.0 | | 29.0 | 58.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | | 20.0 |
| Total Split (%) | 32.2% | 32.2% | | 32.2% | 64.4% | | 13.3% | 13.3% | | 13.3% | 13.3% | | 22% |
| Yellow Time (s) | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 |
| All-Red Time (s) | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 |
| Lost Time Adjust (s) | | 0.0 | | 0.0 | 0.0 | | | 0.0 | | | 0.0 | | |
| Total Lost Time (s) | | 4.0 | | 4.0 | 4.0 | | | 4.0 | | | 4.0 | | |
| Lead/Lag | Lag | Lag | | Lead | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | | |
| Recall Mode | Min | Min | | None | None | | None | None | | None | None | | None |
| Act Effct Green (s) | 15.2 | | | 40.4 | 41.9 | | | 8.1 | 29.5 | | 8.1 | | |
| Actuated g/C Ratio | 0.27 | | | 0.72 | 0.74 | | | 0.14 | 0.52 | | 0.14 | | |
| v/c Ratio | 0.58 | | | 0.56 | 0.23 | | | 0.25 | 0.20 | | 0.04 | | |
| Control Delay | 26.7 | | | 8.1 | 5.0 | | | 33.0 | 10.4 | | 31.0 | | |
| Queue Delay | 0.0 | | | 0.0 | 0.0 | | | 0.0 | 0.0 | | 0.0 | | |
| Total Delay | 26.7 | | | 8.1 | 5.0 | | | 33.0 | 10.4 | | 31.0 | | |
| LOS | C | | | A | A | | | C | B | | C | | |
| Approach Delay | 26.7 | | | | 6.9 | | | 15.6 | | | 31.0 | | |
| Approach LOS | C | | | | A | | | B | | | C | | |
| Queue Length 50th (ft) | 81 | | | 46 | 26 | | | 14 | 19 | | 2 | | |
| Queue Length 95th (ft) | 220 | | | 212 | 122 | | | 62 | 102 | | 18 | | |
| Internal Link Dist (ft) | 1524 | | | | 803 | | | 758 | | | 102 | | |
| Turn Bay Length (ft) | | | | 200 | | | | | 200 | | | | |
| Base Capacity (vph) | | 907 | | 1027 | 1660 | | | 216 | 975 | | 244 | | |
| Starvation Cap Reductn | 0 | | | 0 | 0 | | | 0 | 0 | | 0 | | |
| Spillback Cap Reductn | 0 | | | 0 | 0 | | | 0 | 0 | | 0 | | |
| Storage Cap Reductn | 0 | | | 0 | 0 | | | 0 | 0 | | 0 | | |
| Reduced v/c Ratio | | 0.31 | | 0.47 | 0.19 | | | 0.22 | 0.16 | | 0.03 | | |

| Intersection Summary | |
|------------------------------------|------------------------|
| Area Type: | Other |
| Cycle Length: | 90 |
| Actuated Cycle Length: | 56.3 |
| Natural Cycle: | 65 |
| Control Type: | Actuated-Uncoordinated |
| Maximum v/c Ratio: | 0.58 |
| Intersection Signal Delay: | 12.8 |
| Intersection Capacity Utilization: | 53.8% |
| ICU Level of Service: | A |
| Intersection LOS: | B |
| Analysis Period (min): | 15 |

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street





| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR | Ø9 |
|-------------------------|-------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|------|------|
| Lane Configurations | ↔ | | ↕ | | ↕ | | ↕ | | ↕ | | ↕ | | |
| Traffic Volume (vph) | 5 | 150 | 65 | 230 | 115 | 5 | 35 | 5 | 240 | 10 | 5 | 1 | |
| Future Volume (vph) | 5 | 150 | 65 | 230 | 115 | 5 | 35 | 5 | 240 | 10 | 5 | 1 | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | |
| Storage Length (ft) | 0 | | 0 | 200 | | 0 | 0 | | 200 | 0 | | 0 | |
| Storage Lanes | 0 | | 0 | 1 | | 0 | 0 | | 1 | 0 | | 0 | |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | | |
| Satd. Flow (prot) | 0 | 1804 | 0 | 1787 | 1868 | 0 | 0 | 1802 | 1599 | 0 | 1828 | 0 | |
| Flt Permitted | | 0.995 | | 0.398 | | | | 0.767 | | | 0.849 | | |
| Satd. Flow (perm) | 0 | 1797 | 0 | 749 | 1868 | 0 | 0 | 1443 | 1599 | 0 | 1800 | 0 | |
| Right Turn on Red | | | No | | | No | | | No | | | No | |
| Satd. Flow (RTOR) | | | | | | | | | | | | | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | | |
| Link Distance (ft) | | 1604 | | | 883 | | | 759 | | | 182 | | |
| Travel Time (s) | | 36.5 | | | 20.1 | | | 17.3 | | | 4.1 | | |
| Confl. Peds. (#/hr) | 4 | | | | | 4 | | | | | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | |
| Heavy Vehicles (%) | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 0% | 0% | 0% | |
| Shared Lane Traffic (%) | | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 239 | 0 | 250 | 130 | 0 | 0 | 43 | 261 | 0 | 17 | 0 | |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | pt+ov | Perm | NA | | |
| Protected Phases | | 6 | | 5 | 2 | | | 8 | 5 8 | | 4 | | 9 |
| Permitted Phases | 6 | | | 2 | | | 8 | | | 4 | | | |
| Detector Phase | 6 | 6 | | 5 | 2 | | 8 | 8 | 5 8 | | 4 | 4 | |
| Switch Phase | | | | | | | | | | | | | |
| Minimum Initial (s) | 10.0 | 10.0 | | 6.0 | 10.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 4.0 |
| Minimum Split (s) | 14.0 | 14.0 | | 10.0 | 14.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 20.0 |
| Total Split (s) | 34.0 | 34.0 | | 23.0 | 57.0 | | 13.0 | 13.0 | | 13.0 | 13.0 | | 20.0 |
| Total Split (%) | 37.8% | 37.8% | | 25.6% | 63.3% | | 14.4% | 14.4% | | 14.4% | 14.4% | | 22% |
| Yellow Time (s) | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 |
| All-Red Time (s) | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 |
| Lost Time Adjust (s) | | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | |
| Total Lost Time (s) | | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | |
| Lead/Lag | Lag | Lag | | Lead | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | | |
| Recall Mode | Min | Min | | None | Min | | None | None | | None | None | | None |
| Act Effct Green (s) | 12.9 | | | 29.4 | 29.4 | | | 9.0 | 25.5 | | 6.9 | | |
| Actuated g/C Ratio | 0.26 | | | 0.59 | 0.59 | | | 0.18 | 0.52 | | 0.14 | | |
| v/c Ratio | 0.51 | | | 0.36 | 0.12 | | | 0.16 | 0.32 | | 0.08 | | |
| Control Delay | 22.5 | | | 7.4 | 5.9 | | | 25.0 | 10.8 | | 25.9 | | |
| Queue Delay | 0.0 | | | 0.0 | 0.0 | | | 0.0 | 0.0 | | 0.0 | | |
| Total Delay | 22.5 | | | 7.4 | 5.9 | | | 25.0 | 10.8 | | 25.9 | | |
| LOS | C | | | A | A | | | C | B | | C | | |
| Approach Delay | 22.5 | | | | 6.9 | | | 12.8 | | | 25.9 | | |
| Approach LOS | C | | | A | | | | B | | | C | | |
| Queue Length 50th (ft) | | 51 | | 22 | 11 | | | 9 | 28 | | 4 | | |
| Queue Length 95th (ft) | | 173 | | 104 | 56 | | | 52 | 157 | | 27 | | |
| Internal Link Dist (ft) | | 1524 | | | 803 | | | 679 | | | 102 | | |
| Turn Bay Length (ft) | | | | 200 | | | | | 200 | | | | |
| Base Capacity (vph) | | 1179 | | 876 | 1738 | | | 283 | 1052 | | 315 | | |
| Starvation Cap Reductn | | 0 | | 0 | 0 | | | 0 | 0 | | 0 | | |
| Spillback Cap Reductn | | 0 | | 0 | 0 | | | 0 | 0 | | 0 | | |
| Storage Cap Reductn | | 0 | | 0 | 0 | | | 0 | 0 | | 0 | | |
| Reduced v/c Ratio | | 0.20 | | 0.29 | 0.07 | | | 0.15 | 0.25 | | 0.05 | | |

| Intersection Summary | |
|------------------------------------|------------------------|
| Area Type: | Other |
| Cycle Length: | 90 |
| Actuated Cycle Length: | 49.5 |
| Natural Cycle: | 60 |
| Control Type: | Actuated-Uncoordinated |
| Maximum v/c Ratio: | 0.51 |
| Intersection Signal Delay: | 13.1 |
| Intersection Capacity Utilization: | 42.4% |
| Analysis Period (min): | 15 |
| Intersection LOS: | B |
| ICU Level of Service: | A |

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street

| | | |
|------|------|------|
| Ø2 | Ø9 | Ø4 |
| 57 s | 20 s | 13 s |
| Ø5 | Ø6 | Ø3 |
| 23 s | 34 s | 13 s |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR | Ø9 |
|-------------------------|-------|-------|------|--------|-------|------|-------|-------|-------|-------|-------|------|------|
| Lane Configurations | | ↕ | | ↕ | ↕ | | | ↕ | ↕ | | ↕ | | |
| Traffic Volume (vph) | 1 | 520 | 55 | 240 | 135 | 5 | 5 | 1 | 370 | 10 | 5 | 0 | |
| Future Volume (vph) | 1 | 520 | 55 | 240 | 135 | 5 | 5 | 1 | 370 | 10 | 5 | 0 | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | |
| Storage Length (ft) | 0 | | 0 | 200 | | 0 | 0 | | 200 | 0 | | 0 | |
| Storage Lanes | 0 | | 0 | 1 | | 0 | 0 | | 1 | 0 | | 0 | |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | | |
| Satd. Flow (prot) | 0 | 1835 | 0 | 1752 | 1834 | 0 | 0 | 1788 | 1583 | 0 | 1717 | 0 | |
| Flt Permitted | | | | 0.253 | | | | 0.832 | | | | | |
| Satd. Flow (perm) | 0 | 1835 | 0 | 467 | 1834 | 0 | 0 | 1550 | 1583 | 0 | 1776 | 0 | |
| Right Turn on Red | | | No | | | No | | | No | | | No | |
| Satd. Flow (RTOR) | | | | | | | | | | | | | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | | 30 | |
| Link Distance (ft) | | 1604 | | | 920 | | | 838 | | | | 182 | |
| Travel Time (s) | | 36.5 | | | 20.9 | | | 19.0 | | | | 4.1 | |
| Confl. Peds. (#/hr) | 7 | | | | | 7 | | | | | | | |
| Confl. Bikes (#/hr) | | | 1 | | | 1 | | | | | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | |
| Heavy Vehicles (%) | 2% | 2% | 2% | 3% | 3% | 3% | 2% | 2% | 2% | 7% | 7% | 7% | |
| Shared Lane Traffic (%) | | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 626 | 0 | 261 | 152 | 0 | 0 | 6 | 402 | 0 | 16 | 0 | |
| Turn Type | Perm | NA | | pm-tpt | NA | | Perm | NA | pt+ov | Perm | NA | | |
| Protected Phases | | 6 | | 5 | 2 | | | 7 | 57 | | 3 | | 9 |
| Permitted Phases | 6 | | | 2 | | | 7 | | | 3 | | | |
| Detector Phase | 6 | 6 | | 5 | 2 | | 7 | 7 | 57 | 3 | 3 | | |
| Switch Phase | | | | | | | | | | | | | |
| Minimum Initial (s) | 10.0 | 10.0 | | 6.0 | 10.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 4.0 |
| Minimum Split (s) | 14.0 | 14.0 | | 10.0 | 14.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 20.0 |
| Total Split (s) | 34.0 | 34.0 | | 14.0 | 48.0 | | 12.0 | 12.0 | | 10.0 | 10.0 | | 20.0 |
| Total Split (%) | 37.8% | 37.8% | | 15.8% | 53.3% | | 13.3% | 13.3% | | 11.1% | 11.1% | | 22% |
| Yellow Time (s) | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 |
| All-Red Time (s) | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 |
| Lost Time Adjust (s) | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 |
| Total Lost Time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 |
| Lead/Lag | Lag | Lag | | Lead | | | Lag | Lag | | Lead | Lead | | |
| Lead-Lag Optimize? | | | | | | | | | | | | | |
| Recall Mode | Min | Min | | None | Min | | None | None | | None | None | | None |
| Act Effct Green (s) | 30.8 | 30.8 | | 45.2 | 45.2 | | 8.2 | 22.6 | | 8.2 | 6.2 | | 6.2 |
| Actuated g/C Ratio | 0.47 | 0.47 | | 0.68 | 0.68 | | 0.12 | 0.34 | | 0.12 | 0.09 | | 0.09 |
| v/c Ratio | 0.73 | 0.73 | | 0.50 | 0.12 | | 0.03 | 0.74 | | 0.03 | 0.10 | | 0.10 |
| Control Delay | 23.8 | 23.8 | | 11.0 | 6.4 | | 31.3 | 32.4 | | 31.3 | 33.6 | | 33.6 |
| Queue Delay | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 |
| Total Delay | 23.8 | 23.8 | | 11.0 | 6.4 | | 31.3 | 32.4 | | 31.3 | 33.6 | | 33.6 |
| LOS | C | C | | B | A | | C | C | | C | C | | C |
| Approach Delay | 23.8 | 23.8 | | | 9.3 | | 32.4 | | | 32.4 | 33.6 | | 33.6 |
| Approach LOS | C | C | | | A | | C | | | C | C | | C |
| Queue Length 50th (ft) | 158 | 158 | | 22 | 12 | | 2 | 120 | | 2 | 5 | | 5 |
| Queue Length 95th (ft) | #587 | #587 | | #148 | 81 | | 15 | #426 | | 29 | | | 29 |
| Internal Link Dist (ft) | 1524 | 1524 | | | 840 | | 758 | | | 102 | | | 102 |
| Turn Bay Length (ft) | | | | 200 | | | | 200 | | | | | |
| Base Capacity (vph) | 856 | 856 | | 519 | 1254 | | 192 | 541 | | 165 | | | 165 |
| Starvation Cap Reductn | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Spillback Cap Reductn | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Storage Cap Reductn | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Reduced v/c Ratio | 0.73 | 0.73 | | 0.50 | 0.12 | | 0.03 | 0.74 | | 0.10 | | | 0.10 |

Intersection Summary
 Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 66
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 22.2
 Intersection LOS: C
 Intersection Capacity Utilization 68.7%
 ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street

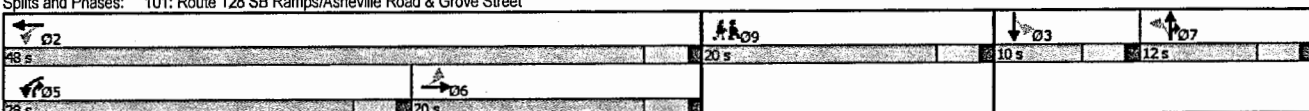
| | | | |
|------|------|------|------|
| Ø2 | Ø9 | Ø3 | Ø7 |
| 48 s | 20 s | 10 s | 12 s |
| Ø5 | Ø5 | | |
| 14 s | 34 s | | |



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR | Ø9 |
|-------------------------|-------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|------|------|
| Lane Configurations | ↕ | | | ↕ | ↕ | | | ↕ | ↕ | | ↕ | | |
| Traffic Volume (vph) | 1 | 215 | 45 | 445 | 275 | 10 | 40 | 5 | 145 | 5 | 2 | 1 | |
| Future Volume (vph) | 1 | 215 | 45 | 445 | 275 | 10 | 40 | 5 | 145 | 5 | 2 | 1 | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | |
| Storage Length (ft) | 0 | | 0 | 200 | | 0 | 0 | | 200 | 0 | | 0 | |
| Storage Lanes | 0 | | 0 | 1 | | 0 | 0 | | 1 | 0 | | 0 | |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | | |
| Satd. Flow (prot) | 0 | 1802 | 0 | 1770 | 1851 | 0 | 0 | 1732 | 1538 | 0 | 1812 | 0 | |
| Fit Permitted | | 0.999 | | 0.283 | | | | 0.743 | | | | | |
| Satd. Flow (perm) | 0 | 1800 | 0 | 527 | 1851 | 0 | 0 | 1344 | 1538 | 0 | 1868 | 0 | |
| Right Turn on Red | | | No | | | No | | | No | | | No | |
| Satd. Flow (RTOR) | | | | | | | | | | | | | |
| Link Speed (mph) | 30 | | | 30 | | | 30 | | | 30 | | | |
| Link Distance (ft) | 1604 | | | 883 | | | 838 | | | 182 | | | |
| Travel Time (s) | 36.5 | | | 20.1 | | | 19.0 | | | 4.1 | | | |
| Confl. Peds. (#/hr) | 16 | | | 16 | | | 16 | | | 16 | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | |
| Heavy Vehicles (%) | 3% | 3% | 3% | 2% | 2% | 2% | 5% | 5% | 5% | 0% | 0% | 0% | |
| Shared Lane Traffic (%) | | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 284 | 0 | 484 | 310 | 0 | 0 | 48 | 158 | 0 | 8 | 0 | |
| Turn Type | Perm | NA | | pm-pt | NA | | Perm | NA | pt+ov | Perm | NA | | |
| Protected Phases | | 6 | | 5 | 2 | | | 7 | 5.7 | | 3 | | 9 |
| Permitted Phases | 6 | | | 2 | | | 7 | | | 3 | | | |
| Detector Phase | 6 | 6 | | 5 | 2 | | 7 | 7 | 5.7 | 3 | 3 | | |
| Switch Phase | | | | | | | | | | | | | |
| Minimum Initial (s) | 10.0 | 10.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 4.0 |
| Minimum Split (s) | 14.0 | 14.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 20.0 |
| Total Split (s) | 20.0 | 20.0 | | 28.0 | 48.0 | | 12.0 | 12.0 | | 10.0 | 10.0 | | 20.0 |
| Total Split (%) | 22.2% | 22.2% | | 31.1% | 53.3% | | 13.3% | 13.3% | | 11.1% | 11.1% | | 22% |
| Yellow Time (s) | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 |
| All-Red Time (s) | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 |
| Lost Time Adjust (s) | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 |
| Total Lost Time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 |
| Lead/Lag | Lag | Lag | | Lead | | | Lag | Lag | | Lead | Lead | | |
| Lead-Lag Optimize? | | | | | | | | | | | | | |
| Recall Mode | Min | Min | | None | None | | None | None | | None | None | | None |
| Act Effct Green (s) | 15.2 | | | 40.9 | 40.9 | | 7.8 | 33.5 | | 6.3 | | | |
| Actuated g/C Ratio | 0.25 | | | 0.67 | 0.67 | | 0.13 | 0.55 | | 0.10 | | | |
| v/c Ratio | 0.64 | | | 0.61 | 0.25 | | 0.28 | 0.19 | | 0.04 | | | |
| Control Delay | 32.4 | | | 12.7 | 7.0 | | 34.4 | 10.8 | | 32.9 | | | |
| Queue Delay | 0.0 | | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | | | |
| Total Delay | 32.4 | | | 12.7 | 7.0 | | 34.4 | 10.8 | | 32.9 | | | |
| LOS | C | | | B | A | | C | B | | C | | | |
| Approach Delay | 32.4 | | | 10.5 | | | 16.3 | | | 32.9 | | | |
| Approach LOS | C | | | B | | | B | | | C | | | |
| Queue Length 50th (ft) | 86 | | | 47 | 26 | | 15 | 22 | | 3 | | | |
| Queue Length 95th (ft) | #302 | | | #344 | 162 | | 62 | 104 | | 18 | | | |
| Internal Link Dist (ft) | 1524 | | | 803 | | | 758 | | | 102 | | | |
| Turn Bay Length (ft) | | | | 200 | | | 200 | | | | | | |
| Base Capacity (vph) | 497 | | | 866 | 1405 | | 185 | 904 | | 193 | | | |
| Starvation Cap Reductn | 0 | | | 0 | 0 | | 0 | 0 | | 0 | | | |
| Spillback Cap Reductn | 0 | | | 0 | 0 | | 0 | 0 | | 0 | | | |
| Storage Cap Reductn | 0 | | | 0 | 0 | | 0 | 0 | | 0 | | | |
| Reduced v/c Ratio | 0.57 | | | 0.56 | 0.22 | | 0.26 | 0.17 | | 0.04 | | | |

Intersection Summary
 Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 61.2
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.64
 Intersection Signal Delay: 16.4
 Intersection LOS: B
 Intersection Capacity Utilization 53.8%
 ICU Level of Service A
 Analysis Period (min): 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street

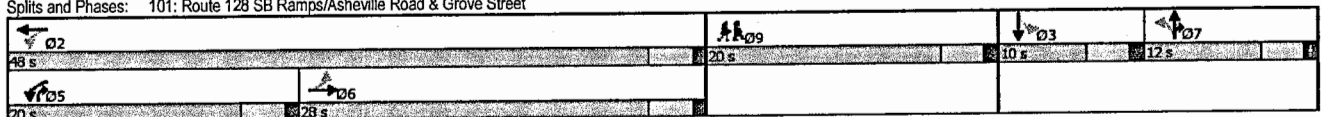


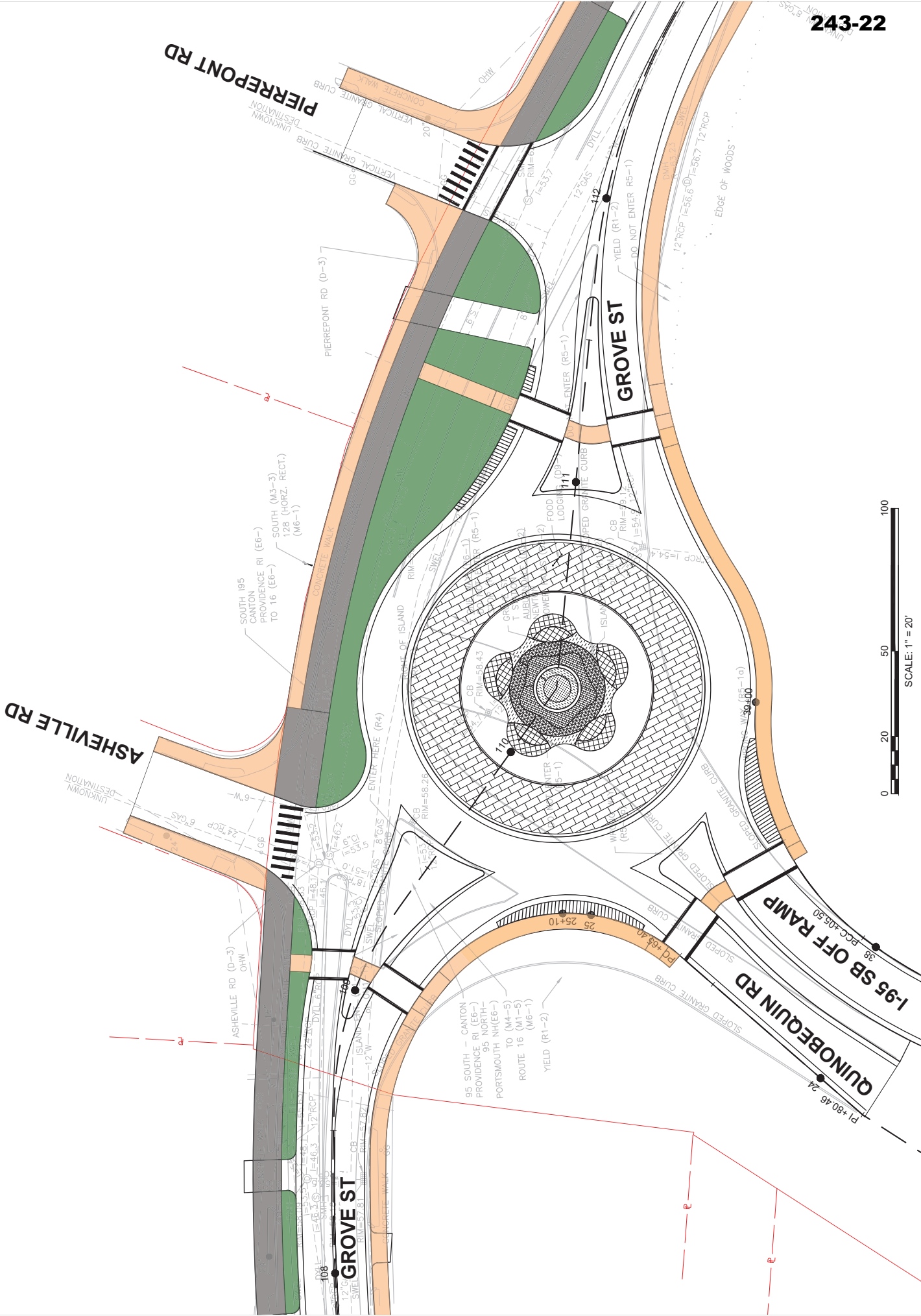


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR | 09 |
|-------------------------|-------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|------|------|
| Lane Configurations | ↔ | | | ↔ | ↔ | | | ↔ | ↔ | | ↔ | | |
| Traffic Volume (vph) | 5 | 150 | 65 | 230 | 115 | 5 | 35 | 5 | 240 | 10 | 5 | 1 | |
| Future Volume (vph) | 5 | 150 | 65 | 230 | 115 | 5 | 35 | 5 | 240 | 10 | 5 | 1 | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | |
| Storage Length (ft) | 0 | | 0 | 200 | | 0 | 0 | | 200 | 0 | | 0 | |
| Storage Lanes | 0 | | 0 | 1 | | 0 | 0 | | 1 | 0 | | 0 | |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | | |
| Satd. Flow (prot) | 0 | 1804 | 0 | 1787 | 1868 | 0 | 0 | 1802 | 1599 | 0 | 1826 | 0 | |
| Flt Permitted | | 0.995 | | 0.380 | | | | 0.756 | | | | | |
| Satd. Flow (perm) | 0 | 1797 | 0 | 715 | 1868 | 0 | 0 | 1422 | 1599 | 0 | 1885 | 0 | |
| Right Turn on Red | | | No | | | No | | | No | | | No | |
| Satd. Flow (RTOR) | | | | | | | | | | | | | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | | |
| Link Distance (ft) | | 1804 | | | 883 | | | 759 | | | 182 | | |
| Travel Time (s) | | 36.5 | | | 20.1 | | | 17.3 | | | 4.1 | | |
| Contl. Peds. (#/hr) | 4 | | | | | 4 | | | | | | | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | |
| Heavy Vehicles (%) | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 0% | 0% | 0% | |
| Shared Lane Traffic (%) | | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 239 | 0 | 250 | 130 | 0 | 0 | 43 | 261 | 0 | 17 | 0 | |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | pt+ov | Perm | NA | | |
| Protected Phases | | 6 | | 5 | 2 | | | 7 | 5.7 | | 3 | | 9 |
| Permitted Phases | 6 | | | 2 | | | 7 | | | 3 | | | |
| Detector Phase | 6 | 6 | | 5 | 2 | | 7 | 7 | 5.7 | 3 | 3 | | |
| Switch Phase | | | | | | | | | | | | | |
| Minimum Initial (s) | 10.0 | 10.0 | | 6.0 | 10.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 4.0 |
| Minimum Split (s) | 14.0 | 14.0 | | 10.0 | 14.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 20.0 |
| Total Split (s) | 28.0 | 28.0 | | 20.0 | 48.0 | | 12.0 | 12.0 | | 10.0 | 10.0 | | 20.0 |
| Total Split (%) | 31.1% | 31.1% | | 22.2% | 53.3% | | 13.3% | 13.3% | | 11.1% | 11.1% | | 22% |
| Yellow Time (s) | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 |
| All-Red Time (s) | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 |
| Lost Time Adjust (s) | | 0.0 | | 0.0 | 0.0 | | | 0.0 | | | 0.0 | | |
| Total Lost Time (s) | | 4.0 | | 4.0 | 4.0 | | | 4.0 | | | 4.0 | | |
| Lead/Lag | Lag | Lag | | Lead | | | Lag | Lag | | Lead | Lead | | |
| Lead-Lag Optimize? | | | | | | | | | | | | | |
| Recall Mode | Min | Min | | None | Min | | None | None | | None | None | | None |
| Act Effct Green (s) | | 13.7 | | 30.7 | 30.7 | | | 8.6 | 25.6 | | 6.6 | | |
| Actuated g/C Ratio | | 0.27 | | 0.59 | 0.59 | | | 0.17 | 0.50 | | 0.13 | | |
| v/c Ratio | | 0.50 | | 0.36 | 0.12 | | | 0.18 | 0.33 | | 0.07 | | |
| Control Delay | | 23.0 | | 8.6 | 7.1 | | | 28.4 | 13.6 | | 29.6 | | |
| Queue Delay | | 0.0 | | 0.0 | 0.0 | | | 0.0 | 0.0 | | 0.0 | | |
| Total Delay | | 23.0 | | 8.6 | 7.1 | | | 28.4 | 13.6 | | 29.6 | | |
| LOS | | C | | A | A | | | C | B | | C | | |
| Approach Delay | | 23.0 | | | 8.1 | | | 15.7 | | | 29.6 | | |
| Approach LOS | | C | | | A | | | B | | | C | | |
| Queue Length 50th (ft) | | 49 | | 20 | 10 | | | 9 | 28 | | 4 | | |
| Queue Length 95th (ft) | | 188 | | 131 | 71 | | | 56 | 194 | | 30 | | |
| Infernal Link Dist (ft) | | 1524 | | | 803 | | | 679 | | | 102 | | |
| Turn Bay Length (ft) | | | | 200 | | | | | 200 | | | | |
| Base Capacity (vph) | | 924 | | 793 | 1633 | | | 244 | 924 | | 242 | | |
| Starvation Cap Reductn | | 0 | | 0 | 0 | | | 0 | 0 | | 0 | | |
| Spillback Cap Reductn | | 0 | | 0 | 0 | | | 0 | 0 | | 0 | | |
| Storage Cap Reductn | | 0 | | 0 | 0 | | | 0 | 0 | | 0 | | |
| Reduced v/c Ratio | | 0.26 | | 0.32 | 0.08 | | | 0.18 | 0.28 | | 0.07 | | |

| Intersection Summary | |
|------------------------------------|------------------------|
| Area Type: | Other |
| Cycle Length: | 90 |
| Actuated Cycle Length: | 51.6 |
| Natural Cycle: | 65 |
| Control Type: | Actuated-Uncoordinated |
| Maximum v/c Ratio: | 0.50 |
| Intersection Signal Delay: | 14.7 |
| Intersection LOS: | B |
| Intersection Capacity Utilization: | 42.4% |
| ICU Level of Service: | A |
| Analysis Period (min): | 15 |

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street





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