

---

# TRAFFIC ENGINEERING EVALUATION

**15 GRAND AVENUE  
BOROUGH OF PALISADES PARK  
BERGEN COUNTY, NEW JERSEY**

---

PREPARED FOR:

FAN ASSOCIATES, LLC  
P.O. Box 39  
Livingston, New Jersey 07039

December 27, 2021  
BCG File No. 081197-01-001

**Bowman**

**BOWMAN CONSULTING GROUP, LTD.**  
54 Horsehill Road  
Cedar Knolls, New Jersey 07927  
Phone: 973-359-8400

**TRAFFIC ENGINEERING EVALUATION  
15 GRAND AVENUE  
BOROUGH OF PALISADES PARK  
BERGEN COUNTY, NEW JERSEY**

December 27, 2021

PREPARED FOR:

FAN ASSOCIATES, LLC  
P.O. Box 39  
Livingston, New Jersey 07039

PREPARED BY:

BOWMAN CONSULTING GROUP, LTD.  
54 Horsehill Road, Suite 100  
Cedar Knolls, New Jersey 07927



---

Eric L. Keller, P.E., P.P., LEED AP  
Professional Engineer License No. 32054

**TRAFFIC ENGINEERING EVALUATION  
15 GRAND AVENUE  
BOROUGH OF PALISADES PARK  
BERGEN COUNTY, NEW JERSEY**

TABLE OF CONTENTS

INTRODUCTION .....	1
EXISTING CONDITIONS .....	2
Study Roadways .....	2
Studied Intersections.....	3
Traffic Volumes .....	4
Capacity Analyses.....	5
PROPOSED CONDITIONS.....	6
Year 2024 No-Build Conditions .....	6
Site Trip Generation and Distribution .....	7
Year 2024 Build Conditions.....	7
SITE PLAN EVALUATION.....	9
CONCLUSIONS .....	10

**TRAFFIC ENGINEERING EVALUATION  
15 GRAND AVENUE  
BOROUGH OF PALISADES PARK  
BERGEN COUNTY, NEW JERSEY**

LIST OF FIGURES

- Figure 1 – Location Map
- Figure 2 – Existing 2021 Traffic Volumes
- Figure 3 – 2024 No-Build Traffic Volumes
- Figure 4 – Site Trip Distribution
- Figure 5 – Site Generated Traffic Volumes
- Figure 6 – 2024 Build Traffic Volumes

LIST OF TABLES

- Table 1 – Level of Service / Average Delay Comparison – Existing vs. No Build
- Table 2 – Trip Generation Summary
- Table 3 – Level of Service / Average Delay Comparison – No Build vs. Build

APPENDICES

- I. Level of Service Definitions
- II. Capacity Analyses
- III. Traffic Counts
- IV. Signal Timing

# INTRODUCTION

This Traffic Engineering Evaluation was prepared to assess any traffic impacts that may occur from the proposed redevelopment of the subject site located on the west side of State Route 93 (Grand Avenue) just north of U.S. Route 46, in the Borough of Palisades Park, Bergen County. The project is proposed to contain 122 multi-family residential units in a three-story structure over two levels of structured parking, containing a total of 306 parking spaces. The location of the site is illustrated in Figure 1.

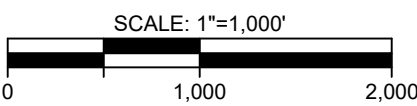
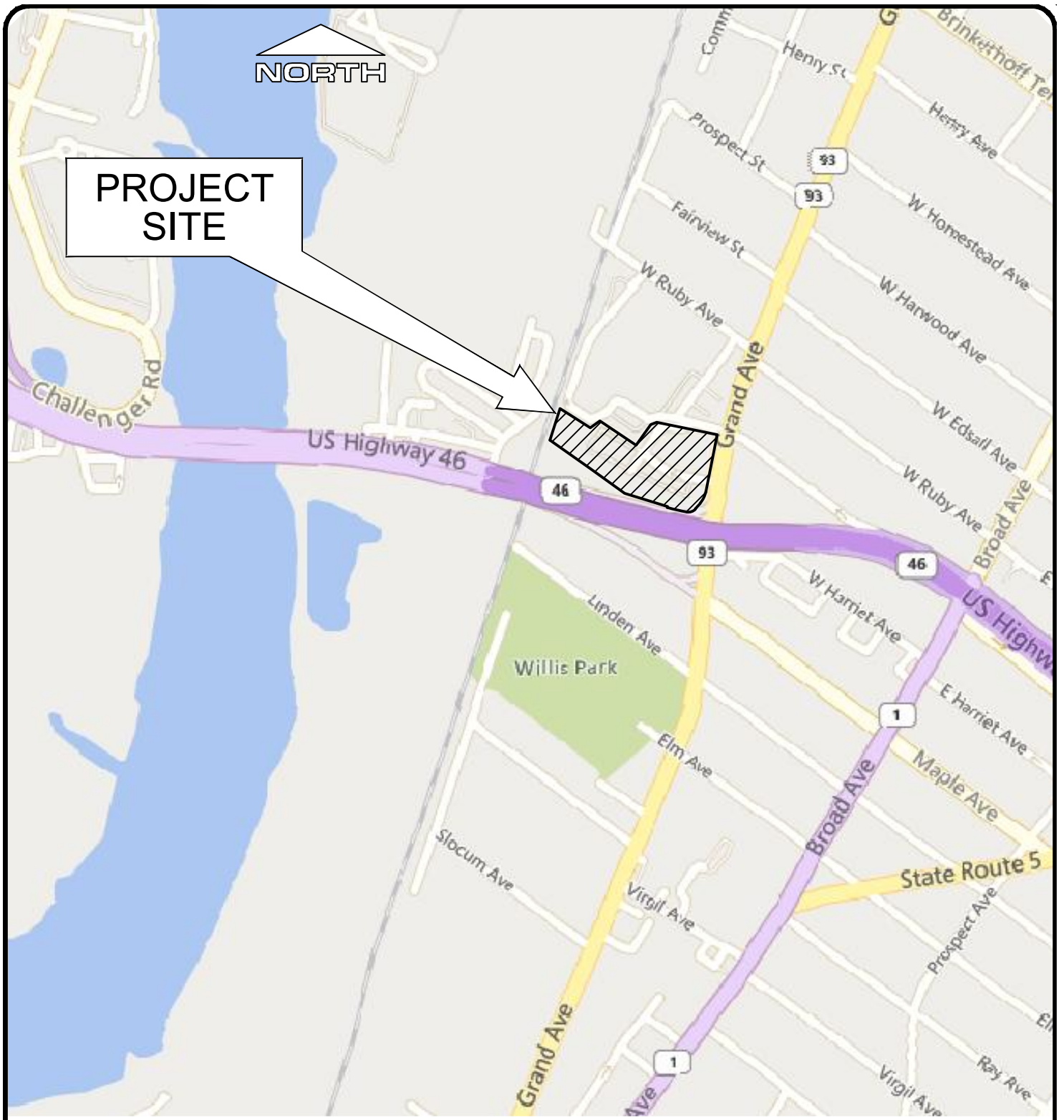
The subject property is known on the Borough of Palisades Park tax maps as Block 505, Lots 3 and 4 and contains approximately 2.9 acres with approximately 285 feet of frontage along the west side of State Route 93 (Grand Avenue) and approximately 242 feet along the ramp to U.S. Route 46 (although no access is permitted along the ramp). The site currently contains a commercial building ranging in height from one-story to five-stories with surface parking around wrapping around all sides of the building. There are also outdoor fenced areas containing a towing business and a landscape contractor's business.

The building contains a mix of commercial uses, including a liquor store, fitness center, office, restaurant and a night club/karaoke bar. The restaurant and night club/karaoke bar are to be demolished for the proposed multi-family residential use with the health/fitness center, liquor store and office space remaining. Access to the site is provided by a shared driveway (with Lot 1) and a driveway on the south side of the building, both to State Route 93.

Primary aspects of this study include the investigation of existing conditions adjacent to the site, the establishment of background traffic volumes for the surrounding streets, estimation of the development related trip generation utilizing known published sources, assignment of the development related volumes to the key intersections serving the proposed development site, and the assessment of intersection performance using established traffic engineering methodologies. The base year for anticipated build-out of the redevelopment is 2024.

The ensuing report will detail the existing and proposed conditions, summarize the traffic operations at key locations, and include our findings as to the effects of the proposed redevelopment on the existing street network.

P:\081197 - Fan - Palisades Park\081197-01-001 (ENG)\Engineering\Engineering Plans\PDF\2022-01-25\TRAFFIC VOLUME DESIGN.dwg, ROAD LOCATION MAP, 1/25/2022 9:47:00 AM, rmutakor, 1:1  
P:\081197 - Fan - Palisades Park\081197-01-001 (ENG)\Engineering\Engineering Plans\PDF\2022-01-25\TRAFFIC VOLUME DESIGN.dwg 01/25/22 09:47:00AM, rmutakor, LAYOUT:ROAD LOCATION MAP



CENTER OF PROJECT SITE:  
x: 516,353 (E)  
y: 663,557 (N)  
N.J. STATE PLANE  
COORDINATE SYSTEM

THIS DRAWING AND ALL INFORMATION CONTAINED HEREIN IS AUTHORIZED FOR USE ONLY BY THE PARTY FOR WHOM THE WORK WAS CONTRACTED OR TO WHOM IT IS CERTIFIED. THIS DRAWING MAY NOT BE COPIED, REUSED, DISCLOSED, DISTRIBUTED OR RELIED UPON FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN CONSENT OF BOWMAN CONSULTING GROUP LTD  
COPYRIGHT 2022 BOWMAN CONSULTING GROUP LTD ALL RIGHTS RESERVED

**Bowman Consulting Group Ltd**  
54 Horsehill Road, Suite 100 Phone: 973-359-8400  
Cedar Knolls, New Jersey 07927 FAX: 973-359-8455  
bowman.com NJ Certificate of Authorization  
E-mail: NJ@Bowman.com No. 24GA2822600

DATE: 11/20/21 SCALE: 1"=500' CHKD.:  
PROJ.: 081197-01-001

**FIGURE 1**  
**LOCATION MAP**  
**15 GRAND AVENUE**  
**BLOCK 505, LOT 3 & 4**  
BOROUGH OF PALISADES, BERGEN COUNTY, N.J.

## **EXISTING CONDITIONS**

The subject property currently contains a multi-use commercial building with an associated surface parking lot. The existing building on the subject site contains a health/fitness club, liquor store, restaurant and a night club/karaoke bar; there is also a towing company and landscape contractor using portions of the western parking area, adjacent to the railroad for their business operations. Access is currently provided from a shared driveway with the property to the north (21 Grand Avenue) and a driveway on the south side of the existing building. We note that the restaurant has been using a portion of the parking lot for outdoor seating. Adjacent land uses include a freight rail line, a hotel, golf driving range and other recreational facilities to the west, commercial/industrial buildings to the north and residential properties to the east (a mix of single family, duplexes and multi-family).

Our assessment of traffic conditions in this area included a study of the signalized intersections of Grand Avenue (State Route 93) with the off- and on-ramps to U.S. Route 46 and the unsignalized intersections of West Columbia Avenue/shared site driveway and West Ruby Avenue with Grand Avenue. Field observations were made of the existing traffic control devices at the studied intersections and the signal timings were obtained from the New Jersey Department of Transportation (NJDOT). The timing directive is contained in Appendix IV.

The following subsections include a brief description of key routes in the adjacent roadway system:

### **Study Roadways**

#### U.S. Route 46

U.S. Route 46 (United Spanish War Veterans Memorial Highway) is categorized as an urban principal arterial extending in an east-west direction. It begins to the west at Interstate 80 in Warren County near the Delaware River and extends across northern New Jersey, terminating at Interstate 95 in Fort Lee just west of the George Washington Bridge. Access to the New Jersey Turnpike is available a short distance to the west.

In the vicinity of the subject property, Route 46 is elevated with three (3) westbound lanes and two (2) eastbound lanes with a concrete median barrier. There is a partial interchange with Grand Avenue (State Route 93) providing access to and from the west along Route 46. Access to and from the east along Route 46 is provided via West Columbia Avenue (westbound off-ramp); and via Maple Avenue and Prospect Avenue (eastbound on-ramp). The posted speed limit is 50 MPH.

#### Grand Avenue (State Route 93)

Grand Avenue (State Route 93) serves as an urban principal arterial extending in a north-south direction. It begins at Broad Avenue (U.S. Route 1/9) to the south and terminates at Van Nostrand Avenue to the north, just north of its interchange with State

Route 4. Grand Avenue continues further north as County Route 501, into Tenafly, terminating at Hudson Avenue. Grand Avenue conveys traffic oriented to and from the adjacent land uses and also serves as a connector with the collector and arterial roadway network.

In the vicinity of the site, Grand Avenue provides one travel lane in each direction, with no stopping or standing permitted along either side of the street. The posted speed limit is 35 MPH. Sidewalks are provided along both sides of the street. There is a bus stop just north of the shared site driveway. Additional bus service is provided along Broad Avenue, one block to the east.

### West Columbia Avenue

West Columbia Avenue serves as an urban collector street extending in an east-west direction. It begins as an off-ramp from Route 46 westbound and terminates opposite the shared site driveway at Grand Avenue. West Columbia Avenue conveys local and regional traffic oriented to and from the adjacent land uses and provides a connection from U.S. Route 46 to Grand Avenue.

West Columbia Avenue operates as a one-way street in a westbound direction, providing a single travel lane. Parking is permitted along both sides of the street and sidewalk are provided along both sides of the street. The posted speed limit is 25 MPH.

### West Ruby Avenue

West Ruby Avenue serves as an urban local street extending in an east-west direction, one block north of West Columbia Avenue. It begins on the west at an at-grade railroad crossing, one block west of Grand Avenue; and extends easterly to Broad Avenue. It extends east of Broad Avenue as East Ruby Avenue terminating at Veterans Plaza adjacent to the Palisades Park Junior/Senior High School. West Ruby Avenue conveys local traffic oriented between the adjacent land uses to the collector and arterial roadway network.

West Ruby Avenue provides one travel lane in each direction. Parking is permitted along both sides of the street east of Grand Avenue; with no parking permitted on either side of the street between Grand Avenue and the railroad. Sidewalks are provided along both sides of the street east of Grand Avenue; and there is only a short segment of sidewalk from Grand Avenue to the driveway for 21 Grand Avenue west of Grand Avenue. There is no posted speed limit so by statute the speed limit is 25 MPH.

## **Studied Intersections**

### Route 46 Off-/On-Ramps/Maple Avenue with Grand Avenue (State Route 93)

The intersections of Grand Avenue (State Route 93) with the Route 46 off- and on-ramps are controlled by a coordinated three-phase, semi-actuated traffic signal operating on a 90 second cycle length. This signal operation provides for a force-off



operation which permits an extension of the green time for the Route 46 eastbound off-ramp. The signal timing and signal plan were obtained from the NJDOT Bureau of Traffic Engineering and the timing is included in Appendix IV.

The Route 46 eastbound off-ramp is provided with an exclusive left turn lane and a shared through/right turn lane; Grand Avenue has two lanes in each direction at the Route 46 off-ramp intersection; while Maple Avenue is provided with a single approach lane accommodating left and right turn movements. At the intersection of Grand Avenue with the westbound Route 46 on-ramp, northbound Grand Avenue has an exclusive left turn lane and an exclusive through lane. Southbound Grand Avenue has a shared through/right turn lane, with a channelized right turn onto the westbound on-ramp.

#### Grand Avenue (State Route 93) with West Columbia Avenue

The intersection of Grand Avenue with West Columbia Avenue is under 'STOP' controlled operations on the side street approaches. All approaches are provided with a single travel lane, accommodating all movements. A crosswalk is provided across the West Columbia Avenue approach.

#### Grand Avenue (State Route 93) with West Ruby Avenue

The intersection of Grand Avenue with West Ruby Avenue is under 'STOP' controlled operations on the side street approaches. The two side street approaches are slightly offset with the western leg approximately 40 feet further north. All approaches are provided with a single travel lane, accommodating all movements. A crosswalk is provided across both West Ruby Avenue approaches.

### **Traffic Volumes**

Manual intersection traffic turning movement counts were performed at the following intersections on Tuesday, September 28, 2021:

1. Grand Avenue with U.S. Route 46 Eastbound Off-Ramp/Maple Avenue
2. Grand Avenue with U.S. Route 46 Westbound On-Ramp
3. Grand Avenue with West Columbia Avenue/Site Driveway
4. Grand Avenue with West Ruby Avenue

These counts were performed during the morning peak period from 6:30 AM to 9:00 AM and during the evening peak period from 4:00 PM to 6:30 PM.

Based on the manual traffic turning movement counts, the AM weekday peak hour established for analysis purposes was determined to be generally between 8:00 AM and 9:00 AM, although the Route 46 eastbound off-ramp's peak hour was between 7:15 and 8:15 AM. To be conservative, we used the peak hour volumes at each intersection. The PM weekday peak hour was slightly more varied with one intersection having a peak from 5:00 PM to 6:00 PM, two intersections from 5:15 PM to 6:15 PM and one

from 5:30 PM to 6:30 PM. Again, we used the observed traffic volumes during the respective peak hours at each location. All existing traffic volumes during both peak hours were balanced among the various intersections, taking into consideration intervening streets and driveways.

Existing balanced traffic volumes at the studied locations for the weekday AM peak hour and PM peak hour are illustrated in Figure 2. These existing traffic volume data were used as the basis for this traffic engineering evaluation. Appendix III contains the AM and PM peak period traffic turning movement counts at the studied intersections.

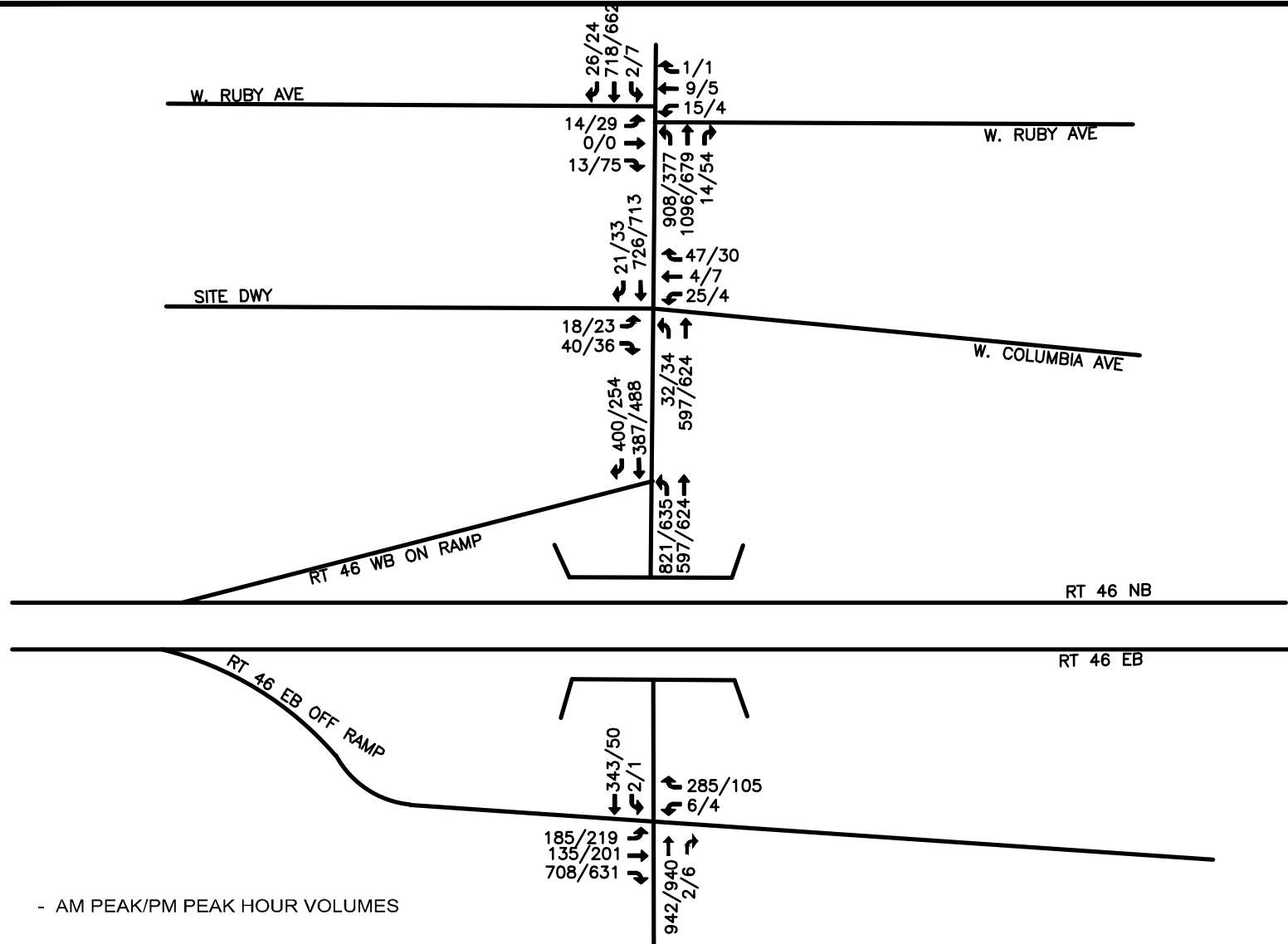
## **Capacity Analyses**

The existing AM and PM peak hour intersection traffic volumes were analyzed to evaluate the quality of operation at the studied intersections. The methodology presented in 2010 Highway Capacity Manual, Chapter 18 entitled “Signalized Intersections” and Chapter 19 entitled “Unsignalized Intersections”. Intersection capacity calculations were completed using the Highway Capacity Software, version 7.9.5. Definitions of Levels of Service for stop- and signal-controlled intersections are provided in Appendix I.

The methodology addresses two measurements of an intersection’s effectiveness in accommodating conflicting traffic movements; capacity and level of service (LOS). Capacity is defined for each approach as a maximum number of vehicles that may pass through the intersection given the prevailing roadway and traffic control conditions. The capacity is evaluated in terms of the ratio of actual traffic flow to capacity (v/c ratio). The second measure of effectiveness is average stopped delay per vehicle (seconds/vehicle), which determines the Level of Service.

Table 1 presents the levels of service for the AM and PM peak hours at the studied intersections. As shown in Table 1, under 2021 Existing Conditions, all movements at the studied signalized intersections operate at acceptable LOS C or better during both peak hours.

At the unsignalized intersections, the side street approaches currently operate during the AM and PM peak hours at LOS E or better, which is an acceptable operating condition for minor street approaches to a principal arterial (Grand Avenue) in an urban environment. We note that these levels of service do not account for gaps that are created by the signalized intersections at the Route 46 ramps. Further we note that the volume to capacity ratios are quite low (less than 0.5) which indicates that there is more than sufficient capacity on these approaches, but that the higher volumes along Grand Avenue result in higher average delays.



**KEY**

← 00/00 - AM PEAK/PM PEAK HOUR VOLUMES

**Bowman Consulting Group Ltd**

54 Horsehill Road, Suite 100  
 Cedar Knolls, New Jersey 07927  
 bowman.com  
 E-mail: NJ@Bowman.com

Phone: 973-359-8400  
 FAX: 973-359-8455  
 NJ Certificate of Authorization  
 No. 24GA28222600

DATE: 11/20/21

CHKD.:

PROJ.: 081197-01-001

**FIGURE 2  
 FAN - PALISADES PARK  
 EXISTING (2021) BALANCED  
 TRAFFIC VOLUMES**

BOROUGH OF PALISADES PARK, BERGEN COUNTY, NEW JERSEY

THIS DRAWING AND ALL INFORMATION CONTAINED HEREIN IS AUTHORIZED FOR USE ONLY BY THE PARTY FOR WHOM THE WORK WAS CONTRACTED OR TO WHOM IT IS CERTIFIED. THIS DRAWING MAY NOT BE COPIED, REUSED, DISCLOSED, DISTRIBUTED OR RELIED UPON FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN CONSENT OF BOWMAN CONSULTING GROUP LTD. COPYRIGHT 2021 BOWMAN CONSULTING GROUP LTD. ALL RIGHTS RESERVED.

## **PROPOSED CONDITIONS**

The proposed development program will contain 122 multi-family residential units on three floors over two levels of parking. The restaurant and night club/karaoke bar portions of the existing building are to be demolished with the health/fitness club and liquor store remaining. No credit has been taken for the elimination of the traffic generated by the existing restaurant/night club/karaoke bar uses that currently exist.

A total of 306 parking spaces are provided in the two levels of garage parking and in surface parking areas of which 262 spaces are located in the garage and the remaining 44 spaces will be located in surface lots. Of the parking spaces provided, 16 spaces will be provided with electric vehicle charging and an additional 32 spaces will be “Make-Ready” electric vehicle charging spaces. This total provided parking exceeds the required parking per Borough ordinance of 296 spaces.

The Year 2024 has been selected as the future analysis year for full occupancy of the proposed development. We have analyzed conditions for the Year 2024 without the project (No-Build) and with the project (Build).

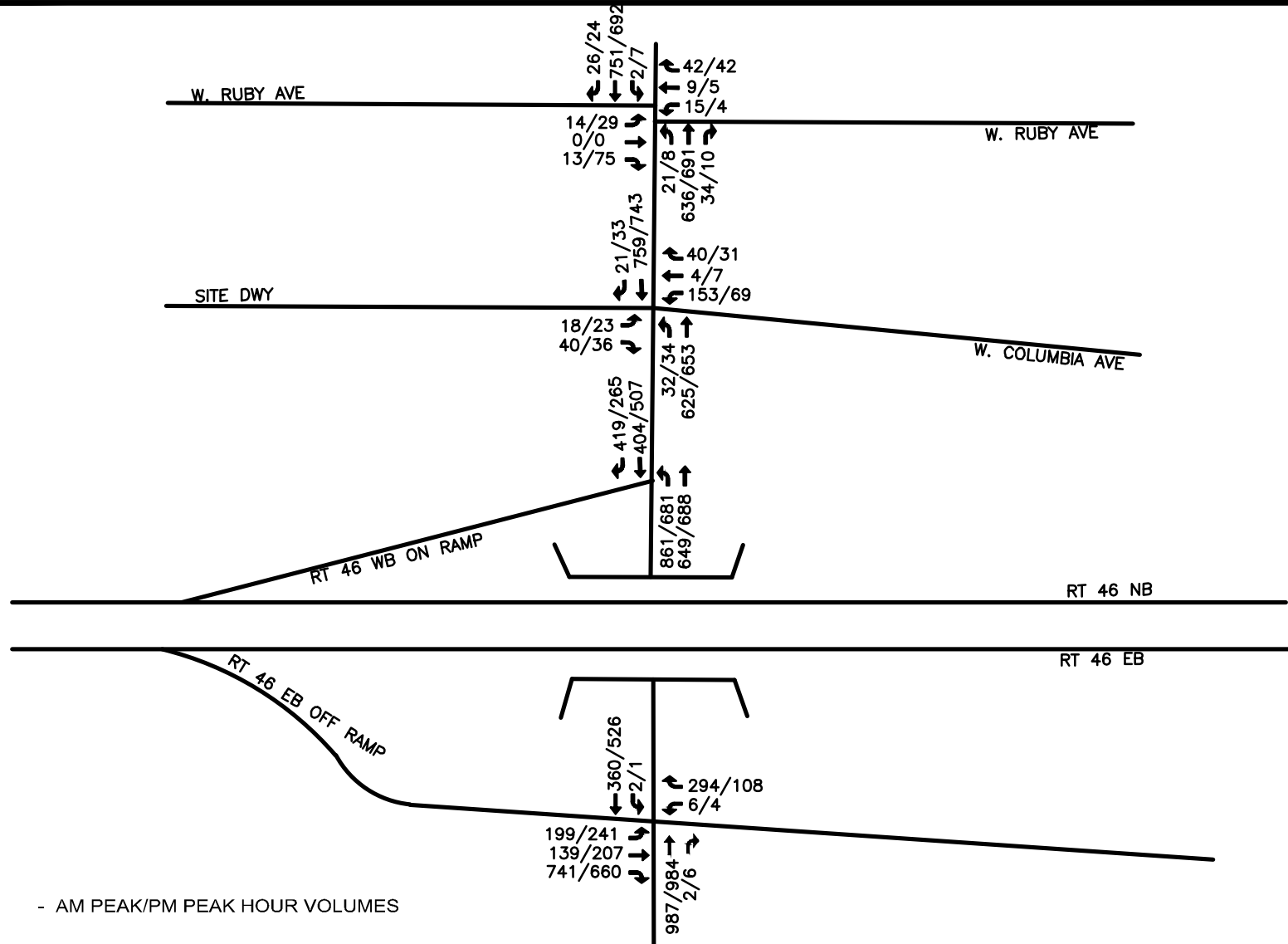
### **Year 2024 No-Build Conditions**

The proposed development is planned for construction and full occupancy in 2024. This year will be used as a basis for estimating background traffic growth on the surrounding street system. The annual growth rate published by the NJDOT in the April 2019 – April 2021 NJDOT Access Permit Table on Annual Background Growth Rates for urban principal arterials in Bergen County is 1.5 percent; for urban collectors the growth rates is one percent (1%); and for local roads it is one percent (1%).

We have examined the surrounding area and determined the only significant project that has been approved but not constructed which would impact traffic within the study area is a high-cube fulfillment warehouse proposed along Route 46 Eastbound between Overpeck Creek and Grand Avenue. The size of this proposed development was confirmed by obtaining a copy of the NJDOT Driveway Access permit, which is to contain 372,049 square feet.

Year 2024 No-Build traffic volumes are presented in Figure 3 for the AM and PM peak hours. These traffic volumes were used to evaluate future operations without the addition of the proposed redevelopment at the studied intersections.

The resulting levels of service for 2024 No-Build conditions at the studied intersections are summarized in Table 1. The results of the capacity analyses indicate that under future Year 2024 No-Build conditions, the levels of service for the studied intersections would remain generally the same as the Existing 2021 levels of service during the AM and PM peak hours on each approach with generally nominal increases in the average delay of less than one (1) second. The levels of service on these approaches at the signalized intersections will remain at acceptable LOS D or better for both peak hours.



**KEY**

← 00/00 - AM PEAK/PM PEAK HOUR VOLUMES

**Bowman Consulting Group Ltd**

54 Horsehill Road, Suite 100  
 Cedar Knolls, New Jersey 07927  
 bowman.com  
 E-mail: NJ@Bowman.com

Phone: 973-359-8400  
 FAX: 973-359-8455  
 NJ Certificate of Authorization  
 No. 24GA28222600

DATE: 11/20/21

CHKD.:

PROJ.: 081197-01-001

**FIGURE 3**  
**FAN - PALISADES PARK**  
**2024 NO BUILD**  
**TRAFFIC VOLUMES**  
 BOROUGH OF PALISADES PARK, BERGEN COUNTY, NEW JERSEY

THIS DRAWING AND ALL INFORMATION CONTAINED HEREIN IS AUTHORIZED FOR USE ONLY BY THE PARTY FOR WHOM THE WORK WAS CONTRACTED OR TO WHOM IT IS CERTIFIED. THIS DRAWING MAY NOT BE COPIED, REUSED, DISCLOSED, DISTRIBUTED OR RELIED UPON FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN CONSENT OF BOWMAN CONSULTING GROUP LTD. COPYRIGHT 2021 BOWMAN CONSULTING GROUP LTD. ALL RIGHTS RESERVED.

**TABLE 1 - LEVEL OF SERVICE / AVERAGE VEHICLE DELAY COMPARISON - EXISTING & NO BUILD CONDITIONS  
15 GRAND AVENUE, BOROUGH OF PALISADES PARK, BERGEN COUNTY**

Intersection	2021 Existing Condition							2024 No Build Condition						
	LANE GROUP	AM PEAK			PM PEAK			LANE GROUP	AM PEAK			PM PEAK		
		V/C Ratio	Delay (sec)	Levels of Service	V/C Ratio	Delay (sec)	Levels of Service		V/C Ratio	Delay (sec)	Levels of Service	V/C Ratio	Delay (sec)	Levels of Service
Grand Avenue & Rt. 46 EB Ramp & Maple Avenue (Signalized)	EB-L	0.81	35.6	D	0.30	8.2	A	EB-L	0.85	40.9	D	0.80	46.9	D
	EB TR	0.96	27.7	C	0.86	19.6	B	EB TR	0.96	27.7	C	0.88	20.3	C
	WB-LR	0.41	9.0	A	0.13	6.2	A	WB-LR	0.41	8.0	A	0.13	5.7	A
	NB-TR	0.74	26.3	C	0.79	32.2	C	NB-TR	0.82	32.6	C	0.86	38.4	D
	SB-LT	0.28	16.6	B	0.45	21.7	C	SB-LT	0.31	18.3	B	0.48	23.2	C
	OVERALL	/	24.2	C	/	23.0	C	OVERALL	/	27.0	C	/	29.1	C
Grand Avenue & Rt. 46 WB Ramp (Signalized)	NB-L	0.88	16.0	B	0.68	7.6	A	NB-L	0.93	22.9	C	0.74	9.8	A
	NB-T	0.38	0.6	A	0.38	0.6	A	NB-T	0.40	0.7	A	0.40	0.7	A
	SB-T	0.37	10.2	B	0.44	11.0	B	SB-T	0.39	10.4	B	0.46	11.3	B
	SB-R	0.45	11.4	B	0.27	9.3	A	SB-R	0.47	11.7	B	0.28	9.4	A
	OVERALL	/	9.9	A	/	6.4	A	OVERALL	/	12.5	B	/	7.2	A
Grand Avenue & W. Columbia Avenue (Unsignalized)	EB-LR	0.34	33.6	D	0.34	35.1	E	EB-LR	0.37	38.0	E	0.38	39.7	E
	WB-LTR	0.44	38.0	E	0.17	22.2	C	WB-LTR	0.50	45.1	E	0.19	23.7	C
	NB-L	0.04	9.6	A	0.04	9.6	A	NB-L	0.04	9.7	A	0.05	9.7	A
Grand Avenue & W. Ruby Avenue (Unsignalized)	EB-LTR	0.25	45.4	E	0.50	37.0	E	EB-LTR	0.28	52.1	F	0.54	42.8	E
	WB-LTR	0.39	36.8	E	0.18	20.6	C	WB-LTR	0.43	41.7	E	0.20	21.9	C
	NB-L	0.03	9.6	A	0.01	9.1	A	NB-L	0.03	9.8	A	0.01	9.2	A
	SB-L	0.00	9.0	A	0.01	9.0	A	SB-L	0.00	9.1	A	0.01	9.1	A

At the unsignalized intersections, the side street approaches continue to operate during the AM and PM peak hours at LOS E or better, except for the eastbound approach of West Ruby Avenue during the AM peak hour which is calculated to operate at LOS F. The increase in average delay from existing conditions is a result of background traffic growth along Grand Avenue which will occur regardless of the redevelopment of the subject site. We again note that these levels of service do not account for gaps that are created by the signalized intersections at the Route 46 ramps. Further we note that the volume to capacity ratios are quite low (less than 0.54) which indicates that there is more than sufficient capacity on these approaches, but that the higher volumes along Grand Avenue result in higher average delays.

### **Site Trip Generation and Distribution**

The trip generation for the proposed 122 multi-family, mid-rise residential apartments is based upon data published by the NJDOT in the Highway Access Permit System (HAPS) using Land Use Code (LUC) 221 for multi-family mid-rise residential. We have used the average rates instead of the equation as it yields higher trip generation values. Table 2 illustrates the trip generation calculations for the proposed redevelopment.

As shown in Table 2, the proposed residential use (without any credit for mass transit usage) will generate 44 AM peak hour trips (11 enter, 33 exit) and 54 PM peak hour trips (33 enter, 21 exit). These volumes represent a fairly low intensity of traffic with less than one (1) total trip per minute during the peak hours.

We note that our assessment of future build conditions did not remove the traffic generated by the existing restaurant and night club/karaoke bar uses. These uses will be eliminated as part of the redevelopment of the site and the traffic from these uses on the current roadway system will be replaced by the proposed residential traffic. As indicated in Table 2, when compared to the existing site generated traffic volumes for the two existing uses, there will be a net decrease in traffic during all peak hours and particularly during the PM peak hour resulting from the redevelopment of this site to include multi-family residential.

While we recognize that the health club is not a permitted use within the M-1 District, there is no anticipated change in the traffic generated by this use. Further, the traffic generated by all of the uses on this site with the proposed multi-family residential housing, will reduce the overall traffic generated by the site thereby having a positive traffic impact on the adjacent roadway system.

The peak hour trips from the proposed multi-family apartments are likely to coincide temporally with the peak hour commuter trips on the surrounding roadway system. The trip assignment for the proposed development is based on observed traffic patterns of the predominant traffic flows at the studied intersections. These travel patterns have been considered to be representative of the traffic distribution associated with the proposed redevelopment. The distribution also takes into consideration the accessibility to the regional highway network.

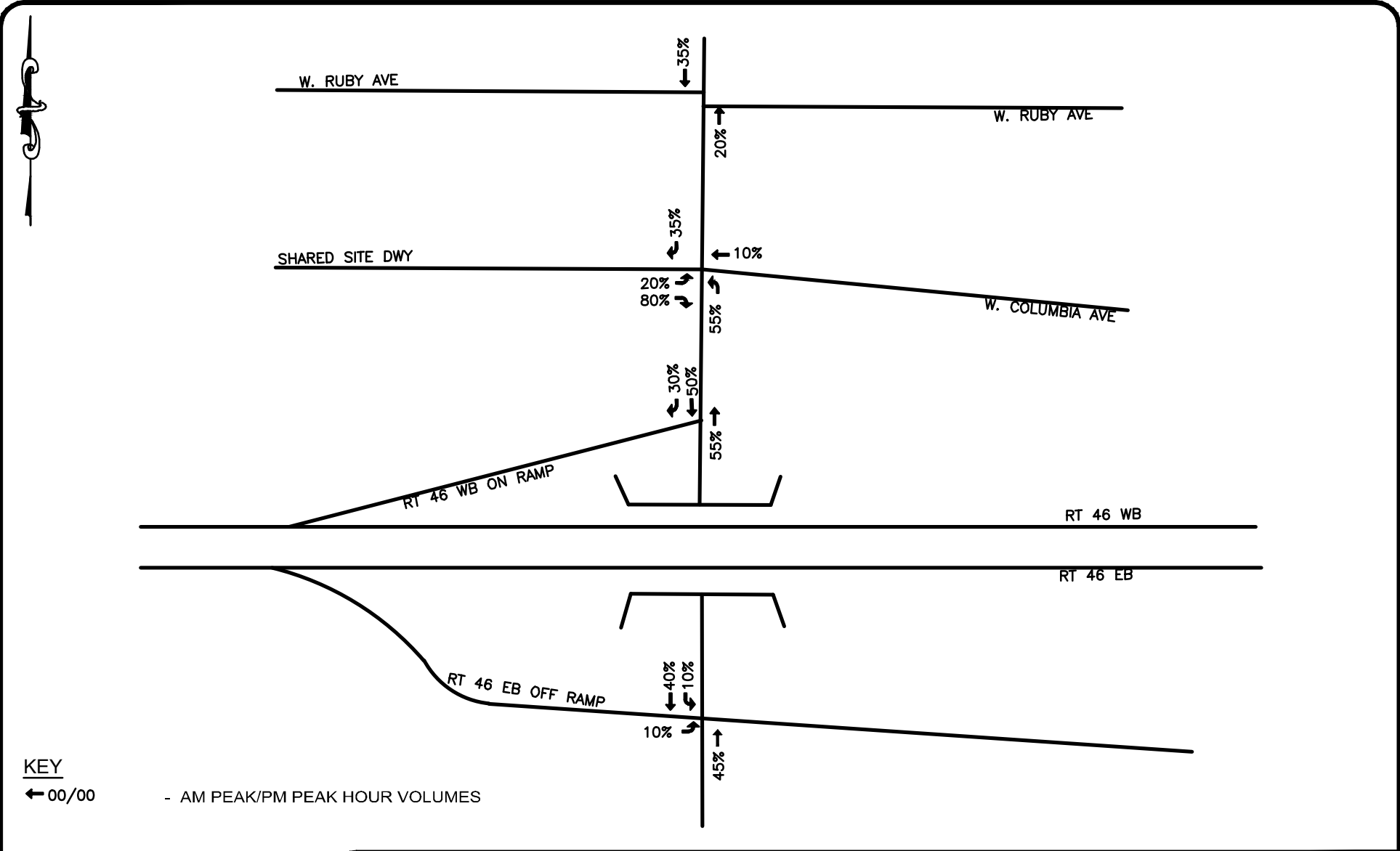
**TABLE 2 - TRIP GENERATION SUMMARY**

15 GRAND AVENUE, BOROUGH OF PALISADES PARK, BERGEN COUNTY

12/27/2021

CODE	LAND USE	AMOUNT	<u>WEEKDAY</u>					
			AM PEAK HOUR			PM PEAK HOUR		
			IN	OUT	TOTAL	IN	OUT	TOTAL
<b>EXISTING CONDITIONS</b>								
492	Health/Fitness Club	15,000 SF	9	12	21	34	25	59
899	Liquor Store	5,500 SF	12	12	25	47	47	94
931	Restaurant, Quality	17,825 SF	60	20	80	99	49	148
925	Drinking Place (Karaoke)	6,600 SF	0	0	0	37	37	75
	<b>TOTAL</b>		82	44	125	217	159	376
<b>PROPOSED CONDITIONS</b>								
492	Health/Fitness Club	15,000 SF	9	12	21	34	25	59
899	Liquor Store	5,500 SF	12	12	25	47	47	94
221	Multi-Family Housing - Mid-Rise (Average Rate)	122 units	11	33	44	33	21	54
	<b>TOTAL</b>		32	57	90	113	93	207
	<b>NET CHANGE</b>		(49)	13	(36)	(104)	(65)	(169)





**KEY**

← 00/00 - AM PEAK/PM PEAK HOUR VOLUMES

**Bowman Consulting Group Ltd**

54 Horsehill Road, Suite 100  
 Cedar Knolls, New Jersey 07927  
 bowman.com  
 E-mail: NJ@Bowman.com

Phone: 973-359-8400  
 FAX: 973-359-8455  
 NJ Certificate of Authorization  
 No. 24GA28222600

DATE: 11/20/21

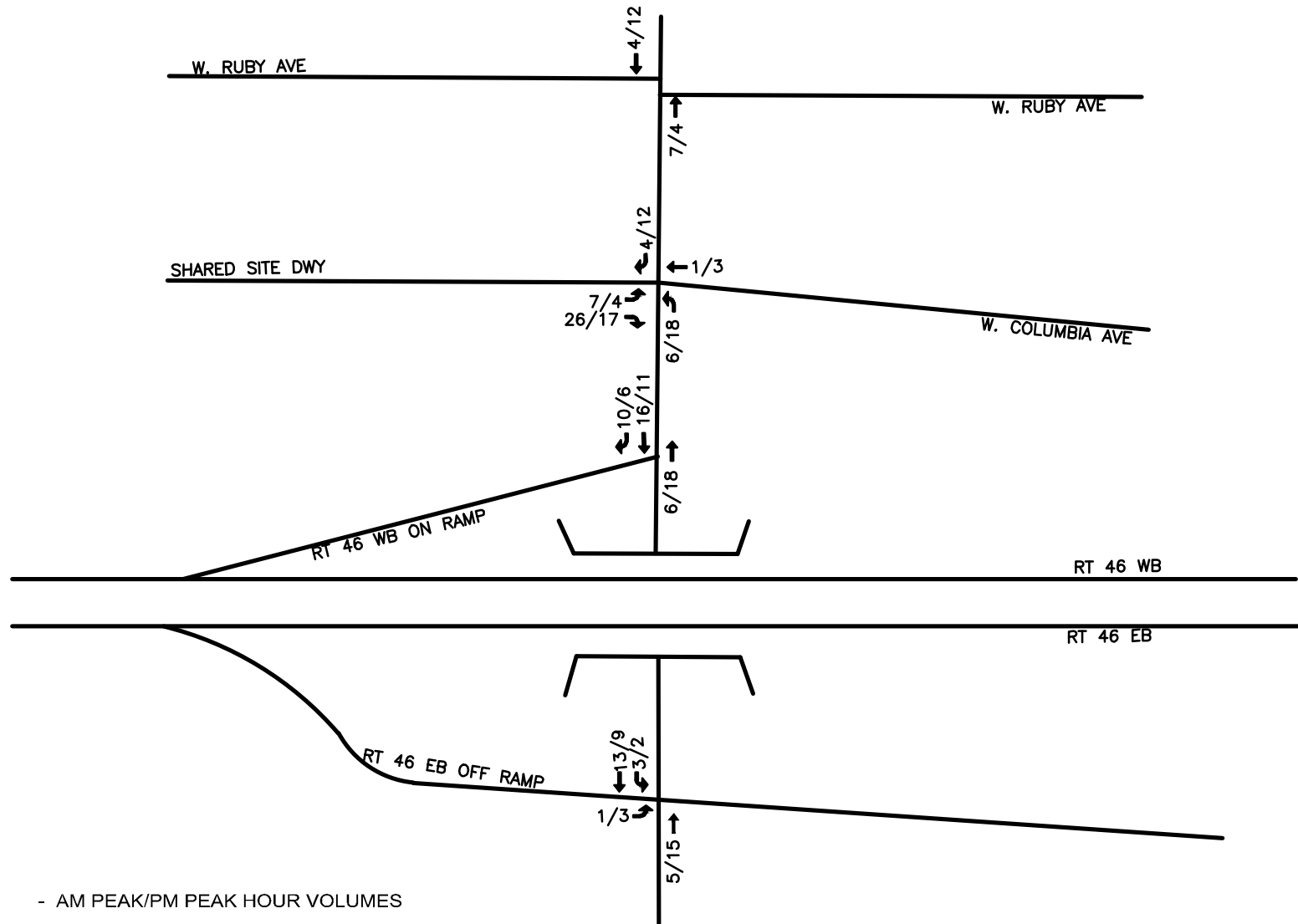
CHKD.:

PROJ.: 081197-01-001

**FIGURE 4**  
**15 GRAND AVENUE**  
**SITE TRIP DISTRIBUTION**

BOROUGH OF PALISADES PARK, CAMDEN COUNTY, NEW JERSEY

THIS DRAWING AND ALL INFORMATION CONTAINED HEREIN IS AUTHORIZED FOR USE ONLY BY THE PARTY FOR WHOM THE WORK WAS CONTRACTED OR TO WHOM IT IS CERTIFIED. THIS DRAWING MAY NOT BE COPIED, REUSED, DISCLOSED, DISTRIBUTED OR RELIED UPON FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN CONSENT OF BOWMAN CONSULTING GROUP LTD. COPYRIGHT 2022 BOWMAN CONSULTING GROUP LTD. ALL RIGHTS RESERVED.



**KEY**

← 00/00 - AM PEAK/PM PEAK HOUR VOLUMES

THIS DRAWING AND ALL INFORMATION CONTAINED HEREIN IS AUTHORIZED FOR USE ONLY BY THE PARTY FOR WHOM THE WORK WAS CONTRACTED OR TO WHOM IT IS CERTIFIED. THIS DRAWING MAY NOT BE COPIED, REUSED, DISCLOSED, DISTRIBUTED OR RELIED UPON FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN CONSENT OF BOWMAN CONSULTING GROUP LTD. COPYRIGHT 2022 BOWMAN CONSULTING GROUP LTD. ALL RIGHTS RESERVED.

**Bowman Consulting Group Ltd**

54 Horsehill Road, Suite 100  
Cedar Knolls, New Jersey 07927  
bowman.com  
E-mail: NJ@Bowman.com

Phone: 973-359-8400  
FAX: 973-359-8455  
NJ Certificate of Authorization  
No. 24GA28222600

DATE: 11/20/21

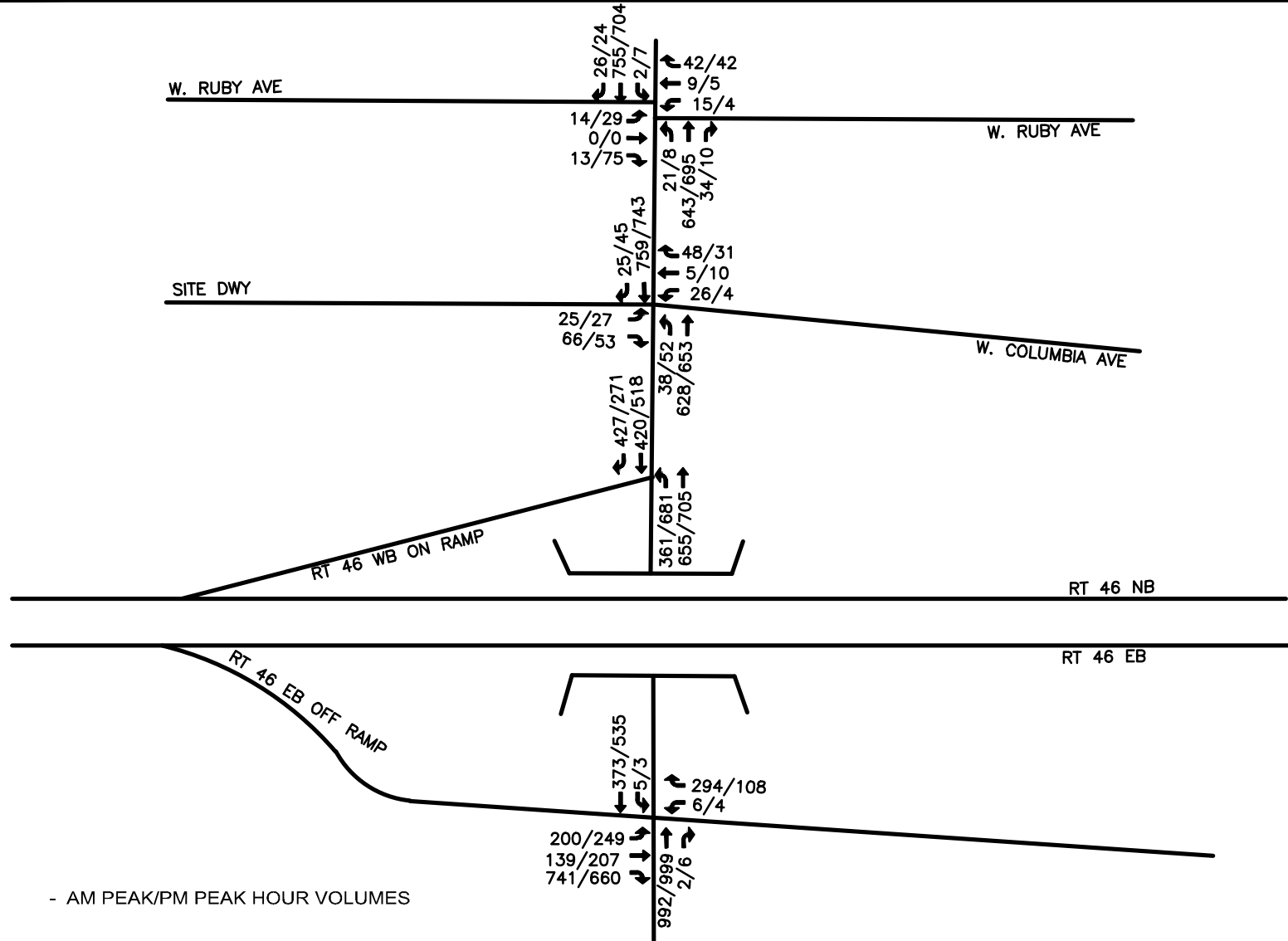
CHKD.:

PROJ.: 081197-01-001

**FIGURE 5  
15 GRAND AVENUE  
SITE GENERATED  
TRAFFIC VOLUMES**

BOROUGH OF PALISADES, BERGEN COUNTY, NEW JERSEY

C:\Users\mutakor\Desktop\Palisade Park Traffic Figures\TRAFFIC VOLUME DESIGN.dwg, BUILD TRAFFIC, 12/23/2021 6:17:58 PM, mutakor, 1:1



**KEY**

← 00/00 - AM PEAK/PM PEAK HOUR VOLUMES

**Bowman Consulting Group Ltd**

54 Horsehill Road, Suite 100  
 Cedar Knolls, New Jersey 07927  
 bowman.com  
 E-mail: NJ@Bowman.com

Phone: 973-359-8400  
 FAX: 973-359-8455  
 NJ Certificate of Authorization  
 No. 24GA28222600

DATE: 11/20/21

CHKD.:

PROJ.: 081197-01-001

**FIGURE 6  
 FAN PALISADES PARK  
 2024 BUILD  
 TRAFFIC VOLUMES**

BOROUGH OF PALISADES PARK, BERGEN COUNTY, NEW JERSEY

THIS DRAWING AND ALL INFORMATION CONTAINED HEREIN IS AUTHORIZED FOR USE ONLY BY THE PARTY FOR WHOM THE WORK WAS CONTRACTED OR TO WHOM IT IS CERTIFIED. THIS DRAWING MAY NOT BE COPIED, REUSED, DISCLOSED, DISTRIBUTED OR RELIED UPON FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN CONSENT OF BOWMAN CONSULTING GROUP LTD. COPYRIGHT 2021 BOWMAN CONSULTING GROUP LTD. ALL RIGHTS RESERVED.

The site trip distribution is graphically presented in Figure 4. Applying the site trip distribution to the trip generation values presented in Table 2 resulted in the site trip assignment for the AM and PM peak hours shown in Figure 5.

### **Year 2024 Build Conditions**

The site generated traffic volumes presented in Figure 5 were added to Year 2024 No-Build traffic volumes presented in Figure 3 to yield the AM and PM peak hour Year 2024 Build conditions, which are presented in Figure 6. These traffic volumes are used to analyze future operating conditions including the traffic from the proposed redevelopment.

The resulting levels of service for 2024 Build conditions at the studied intersections are summarized in Table 3. The results of the analyses indicate that under future Year 2024 Build conditions, the levels of service for the traffic movements at the studied signalized intersections would remain at LOS D or better during the AM and PM peak hours, with increases in average delay from 2024 No Build conditions of less than 1.3 seconds, a de minimis change.

At the unsignalized intersections, the side street approaches continue to operate during the AM and PM peak hours at the same levels of service as calculated for No Build conditions, except for the westbound West Columbia Avenue approach during the AM peak hour which is calculated to operate at LOS F. The increase in average delay from No Build conditions is a result of the site generated traffic from the proposed redevelopment. Again, this does not reflect the elimination of traffic currently being generated by the existing restaurant/night club/karaoke bar uses. We again note that these levels of service do not account for gaps that are created by the signalized intersections at the Route 46 ramps. Further we note that the volume to capacity ratios are quite low (less than 0.56) which indicates that there is more than sufficient capacity on these approaches, but that the higher volumes along Grand Avenue result in higher average delays.

In summary, the proposed redevelopment of the subject tract will have a negligible impact on the operations of the studied intersections and within the overall network during the weekday peak hours and other hours of the day. It is also likely that traffic volumes, as nominal as they are, will be less due to the availability of mass transit opportunities in the area.

**TABLE 3 - LEVEL OF SERVICE / AVERAGE VEHICLE DELAY COMPARISON - NO BUILD & BUILD CONDITIONS  
15 GRAND AVENUE, BOROUGH OF PALISADES PARK, BERGEN COUNTY**

Intersection	2024 No Build Condition							2024 Build Condition						
	LANE GROUP	AM PEAK			PM PEAK			LANE GROUP	AM PEAK			PM PEAK		
		V/C Ratio	Delay (sec)	Levels of Service	V/C Ratio	Delay (sec)	Levels of Service		V/C Ratio	Delay (sec)	Levels of Service	V/C Ratio	Delay (sec)	Levels of Service
Grand Avenue & Rt. 46 EB Ramp & Maple Avenue (Signalized)	EB-L	0.85	40.9	D	0.80	46.9	D	EB-L	0.86	41.3	D	0.81	47.9	D
	EB TR	0.96	27.7	C	0.88	20.3	C	EB TR	0.96	27.6	C	0.88	20.3	C
	WB-LR	0.41	8.0	A	0.13	5.7	A	WB-LR	0.41	8.0	A	0.13	5.7	A
	NB-TR	0.82	32.6	C	0.86	38.4	D	NB-TR	0.82	32.9	C	0.87	39.7	D
	SB-LT	0.31	18.3	B	0.48	23.2	C	SB-LT	0.32	18.5	B	0.49	23.3	C
	OVERALL	/	27.0	C	/	29.1	C	OVERALL	/	27.1	C	/	29.7	C
Grand Avenue & Rt. 46 WB Ramp (Signalized)	NB-L	0.93	22.9	C	0.74	9.8	A	NB-L	0.95	25.2	C	0.74	10.4	B
	NB-T	0.40	0.7	A	0.40	0.7	A	NB-T	0.40	0.7	A	0.41	0.7	A
	SB-T	0.39	10.4	B	0.46	11.3	B	SB-T	0.40	10.6	B	0.47	11.4	B
	SB-R	0.47	11.7	B	0.28	9.4	A	SB-R	0.48	11.9	B	0.29	9.5	A
	OVERALL	/	12.5	B	/	7.2	A	OVERALL	/	13.4	B	/	7.4	A
Grand Avenue & W. Columbia Avenue (Unsignalized)	EB-LR	0.37	38.0	E	0.38	39.7	E	EB-LR	0.55	47.1	E	0.52	49.0	E
	WB-LTR	0.50	45.1	E	0.19	23.7	C	WB-LTR	0.56	54.7	F	0.24	28.3	D
	NB-L	0.04	9.7	A	0.05	9.7	A	NB-L	0.05	9.8	A	0.07	9.9	A
Grand Avenue & W. Ruby Avenue (Unsignalized)	EB-LTR	0.28	52.1	F	0.54	42.8	E	EB-LTR	0.29	53.4	F	0.56	44.6	E
	WB-LTR	0.43	41.7	E	0.20	21.9	C	WB-LTR	0.44	42.8	E	0.20	22.2	C
	NB-L	0.03	9.8	A	0.01	9.2	A	NB-L	0.03	9.8	A	0.01	9.2	A
	SB-L	0.00	9.1	A	0.01	9.1	A	SB-L	0.00	9.1	A	0.01	9.1	A

## **SITE PLAN EVALUATION**

The existing curb cuts along Grand Avenue are being maintained, with both existing driveways providing for two-way traffic flows. The existing shared driveway will be striped for two exit lanes, an exclusive left turn lane and an exclusive right turn lane. This shared driveway will provide access to the lower level of the parking garage structure, 22 surface parking spaces and a loading area. The existing southern driveway will provide access to the upper level of the parking garage structure, 10 surface parking spaces and to the residential lobby. The seven (7) existing head-in spaces in front of the liquor store will remain, as will the five (5) angled spaces along the north side of the building. The internal sidewalk network provides connections among the residential building lobby, entries to the existing building to remain and the various surface parking spaces; which includes a stairway to the lower level of parking. There is also an exterior sidewalk westerly from the lower garage access; and a sidewalk at the southeasterly side of the residential building to the dog run at the western end of the subject site.

The site plan provides for safe and efficient traffic operations without affecting the quality of traffic flow along area roadways. The internal parking aisles are proposed at 24 feet wide with perpendicular parking. The proposed site plan conforms to applicable standards from a traffic engineering viewpoint. Circulation and access for all of the uses to and from the site, as well as within the property are adequate for residents, visitors, deliveries and emergency services.

The Borough code uses RSIS parking standards for the residential use, 1.8 spaces for a one-bedroom and 2.0 spaces for a two-bedroom. The proposed bedroom mix is 41 one-bedroom units and 81 two-bedroom units; a total of 122 dwelling units. In addition, the parking requirement for the existing health/fitness club is one space for every 3.5 occupants and the capacity is 194 occupants; and for the retail (liquor) and office uses it is one (1) space for every 200 square feet. The Borough code also permits up to a ten percent (10%) reduction for electric vehicle charging spaces or for this property, a reduction of 31 spaces. The parking requirement for the overall mixed-use redevelopment of the subject property is therefore 296 parking spaces and 306 parking spaces are proposed, thereby exceeding requirements. This also addresses the needs of visitors.

## CONCLUSIONS

The proposed redevelopment of the subject property for 122 multi-family, mid-rise residential apartments while maintaining the existing health/fitness club, liquor store and office uses will have a negligible impact on traffic operations at the studied intersections during the weekday AM and PM peak commuting hours.

The incremental impact of the additional site-generated traffic results in an increase in the average delay on the affected approach movements, particularly at the shared site driveway, but would not be noticeable to motorists, particularly at the signalized intersections or for through traffic along Grand Avenue. These increases in average vehicle delay would not materially impact the operations of the study intersections or change the levels of service.

It is our professional opinion that, based upon our traffic engineering evaluation, the proposed redevelopment will provide for safe and efficient traffic operations without affecting the quality of traffic flow along area roadways.

The proposed site plan conforms to applicable standards from a traffic engineering viewpoint. Circulation and access to and from the site, as well as within the property are adequate. Sufficient parking is provided for all of the uses in accordance with Borough ordinance requirements for the multi-family residential use and the other existing uses.

In conclusion, this redevelopment project would have a negligible impact on the traffic operations of the existing roadway system and at the studied intersections. The design of the development will adequately serve the needs of this project's residents and guests, as well as the employees, customers and delivery needs of the other existing uses.

## **APPENDIX I**

### **LEVEL OF SERVICE DEFINITIONS**







## TRAFFIC OPERATIONS

Capacity analysis, a procedure used to estimate the traffic-carrying ability of roadway facilities over a range of defined operating conditions, was performed using the 2010 Highway Capacity Manual (HCM) and 2010 Highway Capacity Software.

For a signalized intersection, Level of Service (LOS) A indicates operations with delay less than 10 seconds per vehicle, while LOS F describes operations with delay in excess of 80 seconds per vehicle.

For an unsignalized intersection, LOS A indicates operations with delay less than 10 seconds per vehicle, while LOS F describes operations with delay in excess of 50 seconds per vehicle.

### LEVEL OF SERVICE /AVERAGE DELAY CRITERIA\*

	Level Of Service (LOS)	Signalized Delay Range (average delay, sec/veh)	Unsignalized Delay Range (average delay in sec/veh)
	A	≤10	≤10
	B	>10 and ≤20	>10 and ≤15
	C	>20 and ≤35	>15 and ≤25
	D	>35 and ≤55	>25 and ≤35
	E	>55 and ≤80	>35 and ≤50
	F	>80	>50

\* Sources: *Highway Capacity Manual (2010 Edition)* & *SimTraffic Version 5.0*

## **APPENDIX II**

### **CAPACITY ANALYSES**

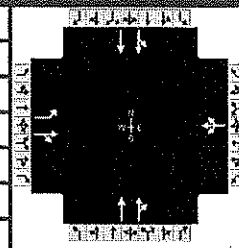
- IIA – 2021 EXISTING CONDITIONS**
- IIB – 2024 NO-BUILD CONDITIONS**
- IIC – 2024 BUILD CONDITIONS**

## **APPENDIX IIA**

### **2021 EXISTING CONDITIONS**

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bowman			Duration, h	0.250
Analyst	LDK	Analysis Date	Nov 28, 2021	Area Type	Other
Jurisdiction	NJDOT	Time Period	AM Peak	PHF	0.96
Urban Street	Rt. 93 (Grand Ave)	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Rt. 093/Rt. 46/Maple Av	File Name	EX-AM-93-46EB-Maple.xus		
Project Description	15 Grand Av, BCG 081197-01-001				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	185	135	708	6	0	285		942	2	2	343	

Signal Information				Signal Phases								
Cycle, s	90.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
		Green	31.2	47.8	0.0	0.0	0.0	0.0				
		Yellow	4.0	3.0	0.0	0.0	0.0	0.0				
		Red	2.0	2.0	0.0	0.0	0.0	0.0				

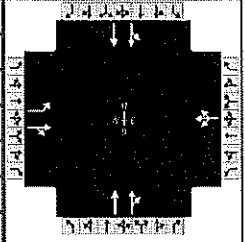
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		6.0		8.0		8.0		8.0
Phase Duration, s		52.8		52.8		37.2		37.2
Change Period, (Y+R <sub>c</sub> ), s		5.0		5.0		6.0		6.0
Max Allow Headway (MAH), s		3.3		3.3		0.0		0.0
Queue Clearance Time (g <sub>s</sub> ), s		47.3		42.7				
Green Extension Time (g <sub>e</sub> ), s		3.0		3.4		0.0		0.0
Phase Call Probability		1.00		1.00				
Max Out Probability		0.30		0.12				

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	14	3	8	18		2	12	1	6	
Adjusted Flow Rate (v), veh/h	193	878		303				492	491	188	171	
Adjusted Saturation Flow Rate (s), veh/h/ln	954	1824		1396				1781	1780	1819	1662	
Queue Service Time (g <sub>s</sub> ), s	13.7	39.7		2.1				25.9	19.7	0.0	7.5	
Cycle Queue Clearance Time (g <sub>c</sub> ), s	45.3	39.7		40.7				25.9	19.7	5.4	7.5	
Green Ratio (g/C)	0.53	0.53		0.53				0.35	0.35	0.35	0.35	
Capacity (c), veh/h	238	919		744				666	666	720	621	
Volume-to-Capacity Ratio (X)	0.809	0.955		0.407				0.738	0.738	0.261	0.276	
Back of Queue (Q), ft/ln (95 th percentile)	218.4	491.6		97				331.6	311.5	100.5	96.7	
Back of Queue (Q), veh/ln (95 th percentile)	7.7	19.5		3.9				12.5	12.5	4.0	3.7	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00				0.00	0.00	0.00	0.00	
Uniform Delay (d <sub>1</sub> ), s/veh	31.3	13.8		8.9				19.1	19.1	15.5	15.5	
Incremental Delay (d <sub>2</sub> ), s/veh	4.3	13.9		0.1				7.2	7.2	0.9	1.1	
Initial Queue Delay (d <sub>3</sub> ), s/veh	0.0	0.0		0.0				0.0	0.0	0.0	0.0	
Control Delay (d), s/veh	35.6	27.7		9.0				26.3	26.3	16.4	16.6	
Level of Service (LOS)	D	C		A				C	C	B	B	
Approach Delay, s/veh / LOS	29.1	C		9.0	A			26.3	C	16.5	B	
Intersection Delay, s/veh / LOS	24.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.08	B	2.08	B	1.69	B	1.92	B
Bicycle LOS Score / LOS	2.25	B	0.99	A	1.30	A	0.78	A

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bowman			Duration, h	0.250
Analyst	LDK	Analysis Date	Nov 28, 2021	Area Type	Other
Jurisdiction	NJDOT	Time Period	PM Peak	PHF	0.96
Urban Street	Rt. 93 (Grand Ave)	Analysis Year	2021	Analysis Period	1> 5:00
Intersection	Rt. 093/Rt. 46/Maple Av	File Name	EX-PM-93-46EB-Maple.xus		
Project Description	15 Grand Av, BCG 081197-01-001				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	218	201	631	4	0	105		940	6		1	507

Signal Information				Signal Timing									
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On										
Force Mode	Fixed	Simult. Gap N/S	On										
		Green		30.0	49.0	0.0	0.0	0.0	0.0				
		Yellow		4.0	3.0	0.0	0.0	0.0	0.0				
		Red		2.0	2.0	0.0	0.0	0.0	0.0				

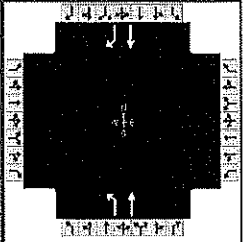
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		6.0		8.0		8.0		8.0
Phase Duration, s		54.0		54.0		36.0		36.0
Change Period, (Y+Rc), s		5.0		5.0		6.0		6.0
Max Allow Headway (MAH), s		3.2		3.2		0.0		0.0
Queue Clearance Time (gs), s		33.0		3.9				
Green Extension Time (ge), s		2.8		3.0		0.0		0.0
Phase Call Probability		1.00		1.00				
Max Out Probability		0.04		0.00				

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	14	3	8	18		2	12	1	6	
Adjusted Flow Rate (v), veh/h	227	867			114			493	492	277	252	
Adjusted Saturation Flow Rate (s), veh/h/ln	1284	1844			1586			1870	1866	1868	1702	
Queue Service Time (gs), s	6.0	31.0			0.0			21.5	20.3	0.0	9.9	
Cycle Queue Clearance Time (gc), s	8.2	31.0			1.9			21.5	20.3	9.2	9.9	
Green Ratio (g/C)	0.54	0.54			0.54			0.33	0.33	0.33	0.33	
Capacity (c), veh/h	752	1004			905			623	622	663	567	
Volume-to-Capacity Ratio (X)	0.302	0.863			0.125			0.791	0.791	0.418	0.445	
Back of Queue (Q), ft/ln (95 th percentile)	71.5	347.4			29.8			357.2	351	176.4	166.5	
Back of Queue (Q), veh/ln (95 th percentile)	2.8	13.9			1.2			14.1	14.0	7.1	6.6	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00			0.00			0.00	0.00	0.00	0.00	
Uniform Delay (d1), s/veh	7.1	9.9			5.9			22.3	22.3	19.2	19.2	
Incremental Delay (d2), s/veh	1.0	9.8			0.3			9.9	9.9	1.9	2.5	
Initial Queue Delay (d3), s/veh	0.0	0.0			0.0			0.0	0.0	0.0	0.0	
Control Delay (d), s/veh	8.2	19.6			6.2			32.2	32.2	21.2	21.7	
Level of Service (LOS)	A	B			A			C	C	C	C	
Approach Delay, s/veh / LOS	17.3	B		6.2	A		32.2	C		21.4	C	
Intersection Delay, s/veh / LOS	23.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.08	B	2.08	B	1.69	B	1.92	B
Bicycle LOS Score / LOS	2.29	B	0.67	A	1.30	A	0.92	A

# HCS7 Signalized Intersection Results Summary

General Information					Intersection Information	
Agency	Bowman			Duration, h	0.250	
Analyst	LDK	Analysis Date	Nov 28, 2021		Area Type	Other
Jurisdiction	NJDOT	Time Period	AM Peak		PHF	0.95
Urban Street	Rt. 93 (Grand Ave)		Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Rt. 93/Rt. 46 WB Ramp		File Name	EX-AM-93-46WB.xus		
Project Description	15 Grand Ave BCG 081197-01-001					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h							821	621			387	400

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	24.0	54.0	0.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	0.0	0.0	0.0	0.0			
				Red	2.0	2.0	0.0	0.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase					5	2		6
Case Number					1.0	4.0		7.3
Phase Duration, s					30.0	90.0		60.0
Change Period, (Y+Rc), s					6.0	6.0		6.0
Max Allow Headway (MAH), s					3.1	0.0		0.0
Queue Clearance Time (gs), s					16.0			
Green Extension Time (ge), s					1.6	0.0		0.0
Phase Call Probability					1.00			
Max Out Probability					0.18			

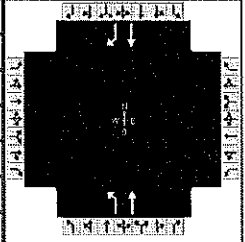
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement							5	2		6	16	
Adjusted Flow Rate (v), veh/h							864	654		407	421	
Adjusted Saturation Flow Rate (s), veh/h/ln							1697	1841		1826	1560	
Queue Service Time (gs), s							14.0	0.0		10.3	13.3	
Cycle Queue Clearance Time (gc), s							14.0	0.0		10.3	13.3	
Green Ratio (g/C)							0.89	0.93		0.60	0.60	
Capacity (c), veh/h							984	1718		1096	936	
Volume-to-Capacity Ratio (X)							0.878	0.380		0.372	0.450	
Back of Queue (Q), ft/ln (95 th percentile)							206.6	14.2		182.7	201.2	
Back of Queue (Q), veh/ln (95 th percentile)							7.8	0.6		7.0	7.8	
Queue Storage Ratio (RQ) (95 th percentile)							0.00	0.00		0.00	0.00	
Uniform Delay (d1), s/veh							5.1	0.0		9.3	9.9	
Incremental Delay (d2), s/veh							11.0	0.6		1.0	1.6	
Initial Queue Delay (d3), s/veh							0.0	0.0		0.0	0.0	
Control Delay (d), s/veh							16.0	0.6		10.2	11.4	
Level of Service (LOS)							B	A		B	B	
Approach Delay, s/veh / LOS	0.0			0.0			9.4	A	10.8	B		
Intersection Delay, s/veh / LOS	9.9						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.95	B	1.95	B	0.54	A	1.36	A
Bicycle LOS Score / LOS					2.99	C	1.85	B



# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bowman			Duration, h	0.250
Analyst	LDK	Analysis Date	Nov 28, 2021	Area Type	Other
Jurisdiction	NJDOT	Time Period	PM Peak	PHF	0.98
Urban Street	Rt. 93 (Grand Ave)	Analysis Year	2021	Analysis Period	1> 5:00
Intersection	Rt. 93/Rt. 46 WB Ramp	File Name	EX-PM-93-46WB.xus		
Project Description	15 Grand Ave BCG 081197-01-001				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h							635	659			488	254

Signal Information				Signal Timing (s)													
Cycle, s	90.0	Reference Phase	2	Green	24.0	54.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncoordinated	No	Simult. Gap E/W	On	Red	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On														

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase					5	2		6
Case Number					1.0	4.0		7.3
Phase Duration, s					30.0	90.0		60.0
Change Period, (Y+Rc), s					6.0	6.0		6.0
Max Allow Headway (MAH), s					3.1	0.0		0.0
Queue Clearance Time (gs), s					8.3			
Green Extension Time (ge), s					1.3	0.0		0.0
Phase Call Probability					1.00			
Max Out Probability					0.00			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement							5	2		6	16	
Adjusted Flow Rate (v), veh/h							648	672		498	259	
Adjusted Saturation Flow Rate (s), veh/h/ln							1767	1885		1885	1585	
Queue Service Time (gs), s							6.3	0.0		12.9	7.0	
Cycle Queue Clearance Time (gc), s							6.3	0.0		12.9	7.0	
Green Ratio (g/C)							0.89	0.93		0.60	0.60	
Capacity (c), veh/h							959	1760		1131	951	
Volume-to-Capacity Ratio (X)							0.676	0.382		0.440	0.273	
Back of Queue (Q), ft/ln (95 th percentile)							122.6	14		220.2	106	
Back of Queue (Q), veh/ln (95 th percentile)							4.8	0.6		8.7	4.2	
Queue Storage Ratio (RQ) (95 th percentile)							0.00	0.00		0.00	0.00	
Uniform Delay (d1), s/veh							3.8	0.0		9.8	8.6	
Incremental Delay (d2), s/veh							3.8	0.6		1.2	0.7	
Initial Queue Delay (d3), s/veh							0.0	0.0		0.0	0.0	
Control Delay (d), s/veh							7.6	0.6		11.0	9.3	
Level of Service (LOS)							A	A		B	A	
Approach Delay, s/veh / LOS	0.0			0.0			4.1	A	10.4			B
Intersection Delay, s/veh / LOS	6.4						A					

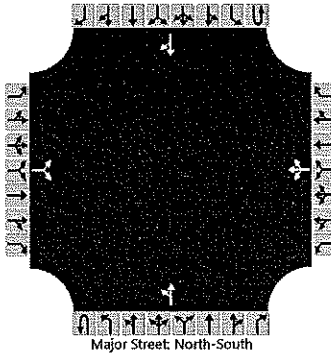
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.95	B	1.95	B	0.54	A	1.36	A
Bicycle LOS Score / LOS					2.67	C	1.74	B

IIA-4

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	LDK	Intersection	Rt. 93/W. Columbia/Dwy
Agency/Co.	Bowman	Jurisdiction	NJDOT
Date Performed	11/28/2021	East/West Street	W. Columbia Ave/Site Dwy
Analysis Year	2021	North/South Street	Rt. 93 (Grand Ave)
Time Analyzed	Existing - AM Peak	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	15 Grand Ave BCG 081197-01-001		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LR				LTR			LT						TR
Volume (veh/h)		18		40		25	4	47		32	597				726	21
Percent Heavy Vehicles (%)		6		5		0	0	4		0						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		6.9		6.0		6.9	6.3	6.0		4.1						
Critical Headway (sec)		6.96		6.05		6.90	6.30	6.04		4.10						
Base Follow-Up Headway (sec)		3.3		3.1		3.3	3.8	3.1		2.2						
Follow-Up Headway (sec)		3.35		3.15		3.30	3.80	3.14		2.20						

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			63				83			35						
Capacity, c (veh/h)			188				189			823						
v/c Ratio			0.34				0.44			0.04						
95% Queue Length, Q <sub>95</sub> (veh)			1.4				2.0			0.1						
Control Delay (s/veh)			33.6				38.0			9.6						
Level of Service (LOS)			D				E			A						
Approach Delay (s/veh)	33.6				38.0				1.1							
Approach LOS	D				E											

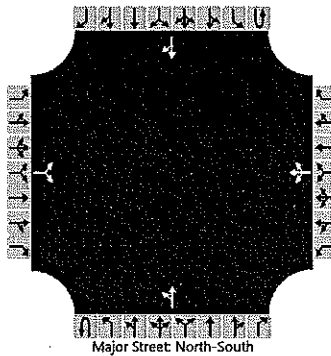
IIA-5



# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LDK			Intersection	Rt. 93/W. Columbia/Dwy		
Agency/Co.	Bowman			Jurisdiction	NJDOT		
Date Performed	11/28/2021			East/West Street	W. Columbia Ave/Site Dwy		
Analysis Year	2021			North/South Street	Rt. 93 (Grand Ave)		
Time Analyzed	Existing - PM Peak			Peak Hour Factor	0.95		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	15 Grand Ave BCG 081197-01-001						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0	
Configuration			LR				LTR			LT							TR
Volume (veh/h)		23		36		4	7	30		34	624				713	33	
Percent Heavy Vehicles (%)		0		3		25	0	0		6							
Proportion Time Blocked																	
Percent Grade (%)	0				0												
Right Turn Channelized																	
Median Type   Storage	Undivided																

## Critical and Follow-up Headways

Base Critical Headway (sec)		6.9		6.0		6.9	6.3	6.0		4.1							
Critical Headway (sec)		6.90		6.03		7.15	6.30	6.00		4.16							
Base Follow-Up Headway (sec)		3.3		3.1		3.3	3.8	3.1		2.2							
Follow-Up Headway (sec)		3.30		3.13		3.53	3.80	3.10		2.25							

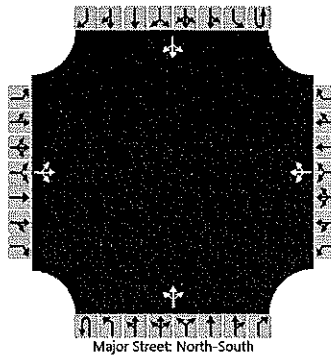
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			62				43				36						
Capacity, c (veh/h)			180				252				816						
v/c Ratio			0.34				0.17				0.04						
95% Queue Length, Q <sub>95</sub> (veh)			1.4				0.6				0.1						
Control Delay (s/veh)			35.1				22.2				9.6						
Level of Service (LOS)			E				C				A						
Approach Delay (s/veh)	35.1				22.2				1.1								
Approach LOS	E				C				A								

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LDK			Intersection	Rt. 93/W. Ruby		
Agency/Co.	Bowman			Jurisdiction	NJDOT		
Date Performed	11/28/2021			East/West Street	W. Ruby		
Analysis Year	2021			North/South Street	Rt. 93 (Grand Ave)		
Time Analyzed	Existing - AM Peak			Peak Hour Factor	0.91		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	15 Grand Ave BCG 081197-01-001						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		14	0	13		15	9	41		21	608	33		2	718	26
Percent Heavy Vehicles (%)		0	0	23		7	0	5		5				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.43		7.17	6.50	6.25		4.15				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.51		3.56	4.00	3.35		2.25				2.20		

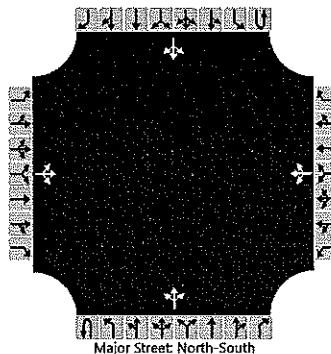
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			30				71				23				2	
Capacity, c (veh/h)			118				183				798				903	
v/c Ratio			0.25				0.39				0.03				0.00	
95% Queue Length, Q <sub>95</sub> (veh)			0.9				1.7				0.1				0.0	
Control Delay (s/veh)			45.4				36.8				9.6				9.0	
Level of Service (LOS)			E				E				A				A	
Approach Delay (s/veh)	45.4				36.8				0.8				0.1			
Approach LOS	E				E											

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LDK			Intersection	Rt. 93/W. Ruby		
Agency/Co.	Bowman			Jurisdiction	NJDOT		
Date Performed	11/28/2021			East/West Street	W. Ruby		
Analysis Year	2021			North/South Street	Rt. 93 (Grand Ave)		
Time Analyzed	Existing - PM Peak			Peak Hour Factor	0.96		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	15 Grand Ave BCG 081197-01-001						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		29	0	75		4	5	41		8	661	10		7	662	24
Percent Heavy Vehicles (%)		0	0	1		0	0	0		0				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.21		7.10	6.50	6.20		4.10				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.31		3.50	4.00	3.30		2.20				2.20		

## Delay, Queue Length, and Level of Service

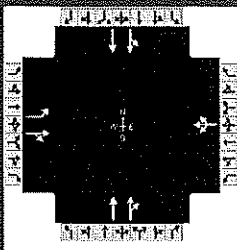
Flow Rate, v (veh/h)			108				52			8				7		
Capacity, c (veh/h)			217				283			895				907		
v/c Ratio			0.50				0.18			0.01				0.01		
95% Queue Length, Q <sub>95</sub> (veh)			2.5				0.7			0.0				0.0		
Control Delay (s/veh)			37.0				20.6			9.1				9.0		
Level of Service (LOS)			E				C			A				A		
Approach Delay (s/veh)	37.0				20.6				0.2				0.2			
Approach LOS	E				C											

IIA-B

**APPENDIX IIB**  
**2024 NO-BUILD CONDITIONS**

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bowman			Duration, h	0.250
Analyst	LDK	Analysis Date	Dec 20, 2021	Area Type	Other
Jurisdiction	NJDOT	Time Period	AM Peak	PHF	0.96
Urban Street	Rt. 93 (Grand Ave)	Analysis Year	2024 No Build	Analysis Period	1> 7:00
Intersection	Rt. 093/Rt. 46/Maple Av	File Name	NB-AM-93-46EB-Maple.xus		
Project Description	15 Grand Av, BCG 081197-01-001				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	199	139	741	6	0	294		987	2	2	360	

Signal Information				Signal Phases								
Cycle, s	90.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
		Green	29.4	49.6	0.0	0.0	0.0	0.0				
		Yellow	4.0	3.0	0.0	0.0	0.0	0.0				
		Red	2.0	2.0	0.0	0.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		6.0		8.0		8.0		8.0
Phase Duration, s		54.6		54.6		35.4		35.4
Change Period, (Y+R <sub>c</sub> ), s		5.0		5.0		6.0		6.0
Max Allow Headway (MAH), s		3.3		3.3		0.0		0.0
Queue Clearance Time (g <sub>s</sub> ), s		49.2		44.7				
Green Extension Time (g <sub>e</sub> ), s		2.8		3.5		0.0		0.0
Phase Call Probability		1.00		1.00				
Max Out Probability		0.45		0.20				

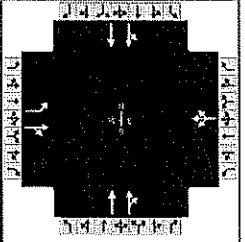
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	14	3	8	18		2	12	1	6	
Adjusted Flow Rate (v), veh/h	207	917		313				515	515	196	181	
Adjusted Saturation Flow Rate (s), veh/h/ln	946	1824		1393				1781	1780	1754	1662	
Queue Service Time (g <sub>s</sub> ), s	14.6	41.3		2.3				27.7	22.4	0.2	7.9	
Cycle Queue Clearance Time (g <sub>c</sub> ), s	47.2	41.3		42.7				27.7	22.4	28.0	7.9	
Green Ratio (g/C)	0.55	0.55		0.55				0.33	0.33	0.33	0.33	
Capacity (c), veh/h	243	956		771				630	629	660	587	
Volume-to-Capacity Ratio (X)	0.854	0.959		0.405				0.818	0.818	0.297	0.308	
Back of Queue (Q), ft/ln (95 th percentile)	245.3	489.2		90.4				389.6	366	112.6	109.5	
Back of Queue (Q), veh/ln (95 th percentile)	8.6	19.4		3.6				14.6	14.6	4.5	4.2	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00				0.00	0.00	0.00	0.00	
Uniform Delay (d <sub>1</sub> ), s/veh	31.1	12.7		7.9				21.3	21.3	17.0	17.0	
Incremental Delay (d <sub>2</sub> ), s/veh	9.9	15.0		0.1				11.3	11.3	1.1	1.4	
Initial Queue Delay (d <sub>3</sub> ), s/veh	0.0	0.0		0.0				0.0	0.0	0.0	0.0	
Control Delay (d), s/veh	40.9	27.7		8.0				32.6	32.6	18.1	18.3	
Level of Service (LOS)	D	C		A				C	C	B	B	
Approach Delay, s/veh / LOS	30.1	C		8.0	A			32.6	C	18.2	B	
Intersection Delay, s/veh / LOS	27.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.08	B	2.08	B	1.69	B	1.92	B
Bicycle LOS Score / LOS	2.34	B	1.00	A	1.34	A	0.80	A



# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bowman			Duration, h	0.250
Analyst	LDK	Analysis Date	Dec 20, 2021	Area Type	Other
Jurisdiction	NJDOT	Time Period	PM Peak	PHF	0.96
Urban Street	Rt. 93 (Grand Ave)	Analysis Year	2024 No Build	Analysis Period	1> 5:00
Intersection	Rt. 093/Rt. 46/Maple Av	File Name	NB-PM-93-46EB-Maple.xus		
Project Description	15 Grand Av, BCG 081197-01-001				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	246	207	660	4	0	108		984	6	1	526	

Signal Information				Phase Diagram								
Cycle, s	90.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
		Green	29.0	50.0	0.0	0.0	0.0	0.0				
		Yellow	4.0	3.0	0.0	0.0	0.0	0.0				
		Red	2.0	2.0	0.0	0.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		6.0		8.0		8.0		8.0
Phase Duration, s		55.0		55.0		35.0		35.0
Change Period, (Y+Rc), s		5.0		5.0		6.0		6.0
Max Allow Headway (MAH), s		3.2		3.2		0.0		0.0
Queue Clearance Time (gs), s		52.0		35.0				
Green Extension Time (ge), s		0.0		3.0		0.0		0.0
Phase Call Probability		1.00		1.00				
Max Out Probability		1.00		0.07				

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	14	3	8	18		2	12	1	6	
Adjusted Flow Rate (v), veh/h	256	903			117			516	515	287	262	
Adjusted Saturation Flow Rate (s), veh/h/ln	1280	1844			1564			1870	1866	1868	1702	
Queue Service Time (gs), s	11.6	32.9			0.1			23.3	22.4	0.0	10.5	
Cycle Queue Clearance Time (gc), s	50.0	32.9			33.0			23.3	22.4	9.9	10.5	
Green Ratio (g/C)	0.56	0.56			0.56			0.32	0.32	0.32	0.32	
Capacity (c), veh/h	322	1024			910			603	601	642	548	
Volume-to-Capacity Ratio (X)	0.797	0.882			0.128			0.856	0.856	0.447	0.477	
Back of Queue (Q), ft/ln (95 th percentile)	279	352.7			28.8			407.3	400.3	190.3	180.3	
Back of Queue (Q), veh/ln (95 th percentile)	11.0	14.1			1.2			16.0	16.0	7.6	7.1	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00			0.00			0.00	0.00	0.00	0.00	
Uniform Delay (d1), s/veh	28.7	9.5			5.4			23.8	23.8	20.2	20.2	
Incremental Delay (d2), s/veh	18.3	10.9			0.3			14.5	14.6	2.2	3.0	
Initial Queue Delay (d3), s/veh	0.0	0.0			0.0			0.0	0.0	0.0	0.0	
Control Delay (d), s/veh	46.9	20.3			5.7			38.3	38.4	22.5	23.2	
Level of Service (LOS)	D	C			A			D	D	C	C	
Approach Delay, s/veh / LOS	26.2	C		5.7	A		38.4	D		22.8	C	
Intersection Delay, s/veh / LOS	29.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.08	B	2.08	B	1.69	B	1.92	B
Bicycle LOS Score / LOS	2.40	B	0.68	A	1.34	A	0.94	A

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	Bowman			Duration, h	0.250	
Analyst	LDK	Analysis Date	Dec 20, 2021	Area Type	Other	
Jurisdiction	NJDOT	Time Period	AM Peak	PHF	0.95	
Urban Street	Rt. 93 (Grand Ave)	Analysis Year	2024 No Build	Analysis Period	1> 7:00	
Intersection	Rt. 93/Rt. 46 WB Ramp	File Name	NB-AM-93-46WB.xus			
Project Description	15 Grand Ave BCG 081197-01-001					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h							861	649			404	417

Signal Information												
Cycle, s	90.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	24.0	54.0	0.0	0.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	0.0	0.0	0.0	0.0		
				Red	2.0	2.0	0.0	0.0	0.0	0.0		

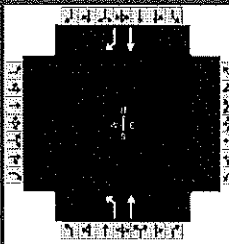
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase					5	2		6
Case Number					1.0	4.0		7.3
Phase Duration, s					30.0	90.0		60.0
Change Period, (Y+R <sub>c</sub> ), s					6.0	6.0		6.0
Max Allow Headway (MAH), s					3.1	0.0		0.0
Queue Clearance Time (g <sub>s</sub> ), s					18.3			
Green Extension Time (g <sub>e</sub> ), s					1.4	0.0		0.0
Phase Call Probability					1.00			
Max Out Probability					0.43			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement							5	2		6	16	
Adjusted Flow Rate (v), veh/h							906	683		425	439	
Adjusted Saturation Flow Rate (s), veh/h/ln							1697	1841		1826	1560	
Queue Service Time (g <sub>s</sub> ), s							16.3	0.0		10.9	14.1	
Cycle Queue Clearance Time (g <sub>c</sub> ), s							16.3	0.0		10.9	14.1	
Green Ratio (g/C)							0.89	0.93		0.60	0.60	
Capacity (c), veh/h							971	1718		1096	936	
Volume-to-Capacity Ratio (X)							0.933	0.398		0.388	0.469	
Back of Queue (Q), ft/ln (95 th percentile)							320.1	15.3		193.4	211	
Back of Queue (Q), veh/ln (95 th percentile)							12.0	0.6		7.4	8.2	
Queue Storage Ratio (RQ) (95 th percentile)							0.00	0.00		0.00	0.00	
Uniform Delay (d <sub>1</sub> ), s/veh							6.2	0.0		9.4	10.0	
Incremental Delay (d <sub>2</sub> ), s/veh							16.7	0.7		1.0	1.7	
Initial Queue Delay (d <sub>3</sub> ), s/veh							0.0	0.0		0.0	0.0	
Control Delay (d), s/veh							22.9	0.7		10.4	11.7	
Level of Service (LOS)							C	A		B	B	
Approach Delay, s/veh / LOS	0.0			0.0			13.3	B	11.1	B		
Intersection Delay, s/veh / LOS	12.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.95	B	1.95	B	0.54	A	1.36	A
Bicycle LOS Score / LOS					3.11	C	1.91	B

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bowman			Duration, h	0.250
Analyst	LDK	Analysis Date	Dec 20, 2021	Area Type	Other
Jurisdiction	NJDOT	Time Period	PM Peak	PHF	0.98
Urban Street	Rt. 93 (Grand Ave)	Analysis Year	2024 No Build	Analysis Period	1> 5:00
Intersection	Rt. 93/Rt. 46 WB Ramp	File Name	NB-PM-93-46WB.xus		
Project Description	15 Grand Ave BCG 081197-01-001				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h							681	688			507	265

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	24.0	54.0	0.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	0.0	0.0	0.0	0.0			
				Red	2.0	2.0	0.0	0.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase					5	2		6
Case Number					1.0	4.0		7.3
Phase Duration, s					30.0	90.0		60.0
Change Period, (Y+R <sub>c</sub> ), s					6.0	6.0		6.0
Max Allow Headway (MAH), s					3.1	0.0		0.0
Queue Clearance Time (g <sub>s</sub> ), s					9.3			
Green Extension Time (g <sub>e</sub> ), s					1.4	0.0		0.0
Phase Call Probability					1.00			
Max Out Probability					0.01			

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement							5	2		6	16	
Adjusted Flow Rate (v), veh/h							695	702		517	270	
Adjusted Saturation Flow Rate (s), veh/h/ln							1767	1885		1885	1585	
Queue Service Time (g <sub>s</sub> ), s							7.3	0.0		13.6	7.4	
Cycle Queue Clearance Time (g <sub>c</sub> ), s							7.3	0.0		13.6	7.4	
Green Ratio (g/C)							0.89	0.93		0.60	0.60	
Capacity (c), veh/h							945	1760		1131	951	
Volume-to-Capacity Ratio (X)							0.736	0.399		0.457	0.284	
Back of Queue (Q), ft/ln (95 th percentile)							177.2	15		229.4	111.7	
Back of Queue (Q), veh/ln (95 th percentile)							6.9	0.6		9.1	4.4	
Queue Storage Ratio (RQ) (95 th percentile)							0.00	0.00		0.00	0.00	
Uniform Delay (d <sub>1</sub> ), s/veh							4.8	0.0		9.9	8.7	
Incremental Delay (d <sub>2</sub> ), s/veh							5.1	0.7		1.3	0.8	
Initial Queue Delay (d <sub>3</sub> ), s/veh							0.0	0.0		0.0	0.0	
Control Delay (d), s/veh							9.8	0.7		11.3	9.4	
Level of Service (LOS)							A	A		B	A	
Approach Delay, s/veh / LOS	0.0			0.0			5.2	A		10.6	B	
Intersection Delay, s/veh / LOS	7.2						A					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.95	B		1.95	B		0.54	A		1.36	A	
Bicycle LOS Score / LOS							2.79	C		1.79	B	

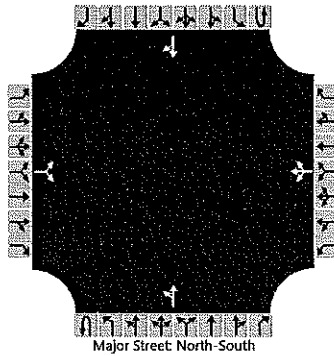
IB-4



# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LDK			Intersection	Rt. 93/W. Columbia/Dwy		
Agency/Co.	Bowman			Jurisdiction	NJDOT		
Date Performed	12/20/21			East/West Street	W. Columbia Ave/Site Dwy		
Analysis Year	2024			North/South Street	Rt. 93 (Grand Ave)		
Time Analyzed	No Build - AM Peak			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	15 Grand Ave BCG 081197-01-001						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LR				LTR			LT						TR
Volume (veh/h)		18		40		26	4	48		32	625				759	21
Percent Heavy Vehicles (%)		6		5		0	0	4		0						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		6.9		6.0		6.9	6.3	6.0		4.1						
Critical Headway (sec)		6.96		6.05		6.90	6.30	6.04		4.10						
Base Follow-Up Headway (sec)		3.3		3.1		3.3	3.8	3.1		2.2						
Follow-Up Headway (sec)		3.35		3.15		3.30	3.80	3.14		2.20						

## Delay, Queue Length, and Level of Service

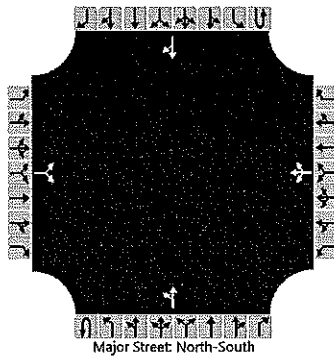
Flow Rate, v (veh/h)			63				85				35					
Capacity, c (veh/h)			171				171				798					
v/c Ratio			0.37				0.50				0.04					
95% Queue Length, Q <sub>95</sub> (veh)			1.6				2.4				0.1					
Control Delay (s/veh)			38.0				45.1				9.7					
Level of Service (LOS)			E				E				A					
Approach Delay (s/veh)	38.0				45.1				1.1							
Approach LOS	E				E				A							

IB-5

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LDK			Intersection	Rt. 93/W. Columbia/Dwy		
Agency/Co.	Bowman			Jurisdiction	NJDOT		
Date Performed	12/20/21			East/West Street	W. Columbia Ave/Site Dwy		
Analysis Year	2024			North/South Street	Rt. 93 (Grand Ave)		
Time Analyzed	No Build - PM Peak			Peak Hour Factor	0.95		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	15 Grand Ave BCG 081197-01-001						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LR				LTR			LT						TR
Volume (veh/h)		23		36		4	7	31		34	653				743	33
Percent Heavy Vehicles (%)		0		3		25	0	0		6						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		6.9		6.0		6.9	6.3	6.0		4.1						
Critical Headway (sec)		6.90		6.03		7.15	6.30	6.00		4.16						
Base Follow-Up Headway (sec)		3.3		3.1		3.3	3.8	3.1		2.2						
Follow-Up Headway (sec)		3.30		3.13		3.53	3.80	3.10		2.25						

## Delay, Queue Length, and Level of Service

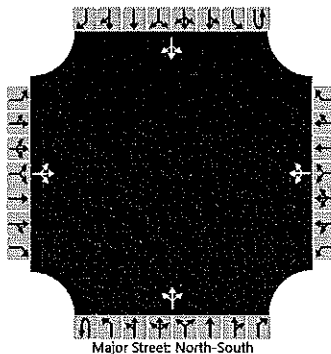
Flow Rate, v (veh/h)			62				44				36					
Capacity, c (veh/h)			164				236				794					
v/c Ratio			0.38				0.19				0.05					
95% Queue Length, Q <sub>95</sub> (veh)			1.6				0.7				0.1					
Control Delay (s/veh)			39.7				23.7				9.7					
Level of Service (LOS)			E				C				A					
Approach Delay (s/veh)	39.7				23.7				1.1							
Approach LOS	E				C											

II B-6

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LDK			Intersection	Rt. 93/W. Ruby		
Agency/Co.	Bowman			Jurisdiction	NJDOT		
Date Performed	12/20/2021			East/West Street	W. Ruby		
Analysis Year	2024			North/South Street	Rt. 93 (Grand Ave)		
Time Analyzed	No Build - AM Peak			Peak Hour Factor	0.91		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	15 Grand Ave BCG 081197-01-001						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		14	0	13		15	9	42		21	636	34		2	751	26
Percent Heavy Vehicles (%)		0	0	23		7	0	5		5				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.43		7.17	6.50	6.25		4.15				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.51		3.56	4.00	3.35		2.25				2.20		

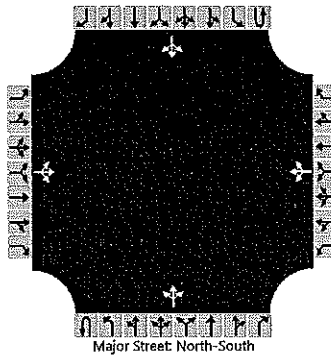
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			30				73				23				2	
Capacity, c (veh/h)			105				168				773				879	
v/c Ratio			0.28				0.43				0.03				0.00	
95% Queue Length, Q <sub>95</sub> (veh)			1.1				2.0				0.1				0.0	
Control Delay (s/veh)			52.1				41.7				9.8				9.1	
Level of Service (LOS)			F				E				A				A	
Approach Delay (s/veh)	52.1				41.7				0.8				0.1			
Approach LOS	F				E											

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LDK			Intersection	Rt. 93/W. Ruby		
Agency/Co.	Bowman			Jurisdiction	NJDOT		
Date Performed	12/20/2021			East/West Street	W. Ruby		
Analysis Year	2024			North/South Street	Rt. 93 (Grand Ave)		
Time Analyzed	No Build - PM Peak			Peak Hour Factor	0.96		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	15 Grand Ave BCG 081197-01-001						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		29	0	75		4	5	42		8	691	10		7	692	24
Percent Heavy Vehicles (%)		0	0	1		0	0	0		0				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.21		7.10	6.50	6.20		4.10				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.31		3.50	4.00	3.30		2.20				2.20		

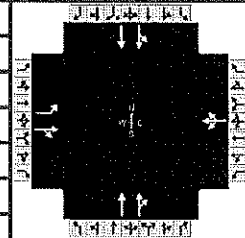
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			108				53				8				7	
Capacity, c (veh/h)			199				266				871				883	
v/c Ratio			0.54				0.20				0.01				0.01	
95% Queue Length, Q <sub>95</sub> (veh)			2.9				0.7				0.0				0.0	
Control Delay (s/veh)			42.8				21.9				9.2				9.1	
Level of Service (LOS)			E				C				A				A	
Approach Delay (s/veh)	42.8				21.9				0.2				0.2			
Approach LOS	E				C				A				A			

**APPENDIX IIC**  
**2024 BUILD CONDITIONS**

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bowman			Duration, h	0.250
Analyst	LDK	Analysis Date	Dec 20, 2021	Area Type	Other
Jurisdiction	NJDOT	Time Period	AM Peak	PHF	0.96
Urban Street	Rt. 93 (Grand Ave)	Analysis Year	2024 Build	Analysis Period	1> 7:00
Intersection	Rt. 093/Rt. 46/Maple Av	File Name	B-AM-93-46EB-Maple.xus		
Project Description	15 Grand Av, BCG 081197-01-001				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	200	139	741	6	0	294		992	2	2	373	

Signal Information				Signal Phases								
Cycle, s	90.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
		Green	29.4	49.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Yellow	4.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Red	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		6.0		8.0		8.0		8.0
Phase Duration, s		54.6		54.6		35.4		35.4
Change Period, (Y+R <sub>c</sub> ), s		5.0		5.0		6.0		6.0
Max Allow Headway (MAH), s		3.3		3.3		0.0		0.0
Queue Clearance Time (g <sub>s</sub> ), s		49.2		44.7				
Green Extension Time (g <sub>e</sub> ), s		2.8		3.5		0.0		0.0
Phase Call Probability		1.00		1.00				
Max Out Probability		0.45		0.20				

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	14	3	8	18		2	12	1	6	
Adjusted Flow Rate (v), veh/h	208	917			313			518	518	203	188	
Adjusted Saturation Flow Rate (s), veh/h/ln	946	1824			1393			1781	1780	1743	1662	
Queue Service Time (g <sub>s</sub> ), s	14.7	41.3			2.3			27.9	22.6	0.2	8.3	
Cycle Queue Clearance Time (g <sub>c</sub> ), s	47.2	41.3			42.7			27.9	22.6	28.2	8.3	
Green Ratio (g/C)	0.55	0.55			0.55			0.33	0.33	0.33	0.33	
Capacity (c), veh/h	243	956			771			630	629	657	587	
Volume-to-Capacity Ratio (X)	0.857	0.959			0.405			0.822	0.822	0.309	0.320	
Back of Queue (Q), ft/ln (95 th percentile)	247.1	489.1			90.4			393.7	369.9	117	114.1	
Back of Queue (Q), veh/ln (95 th percentile)	8.7	19.4			3.6			14.8	14.8	4.7	4.4	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00			0.00			0.00	0.00	0.00	0.00	
Uniform Delay (d <sub>1</sub> ), s/veh	31.1	12.7			7.9			21.4	21.4	17.0	17.1	
Incremental Delay (d <sub>2</sub> ), s/veh	10.2	15.0			0.1			11.6	11.6	1.2	1.4	
Initial Queue Delay (d <sub>3</sub> ), s/veh	0.0	0.0			0.0			0.0	0.0	0.0	0.0	
Control Delay (d), s/veh	41.3	27.6			8.0			32.9	32.9	18.3	18.5	
Level of Service (LOS)	D	C			A			C	C	B	B	
Approach Delay, s/veh / LOS	30.2		C	8.0		A	32.9		C	18.4		B
Intersection Delay, s/veh / LOS	27.1						C					

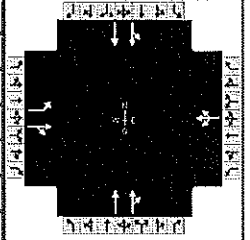
Multimodal Results	EB		WB		NB		SB	
	Pedestrian LOS Score / LOS	2.08	B	2.08	B	1.69	B	1.92
Bicycle LOS Score / LOS	2.34	B	1.00	A	1.34	A	0.81	A

JIC-1



# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Bowman			Duration, h	0.250		
Analyst	LDK	Analysis Date	Dec 20, 2021	Area Type	Other		
Jurisdiction	NJDOT	Time Period	PM Peak	PHF	0.96		
Urban Street	Rt. 93 (Grand Ave)		Analysis Year	2024 Build	Analysis Period	1> 5:00	
Intersection	Rt. 093/Rt. 46/Maple Av		File Name	B-PM-93-46EB-Maple.xus			
Project Description	15 Grand Av, BCG 081197-01-001						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	249	207	660	4	0	108			999	6	1	535

Signal Information				Signal Phases								
Cycle, s	90.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
		Green	29.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Yellow	4.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Red	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		6.0		8.0		8.0		8.0
Phase Duration, s		55.0		55.0		35.0		35.0
Change Period, (Y+R <sub>c</sub> ), s		5.0		5.0		6.0		6.0
Max Allow Headway (MAH), s		3.2		3.2		0.0		0.0
Queue Clearance Time (g <sub>s</sub> ), s		52.0		35.0				
Green Extension Time (g <sub>e</sub> ), s		0.0		3.0		0.0		0.0
Phase Call Probability		1.00		1.00				
Max Out Probability		1.00		0.07				

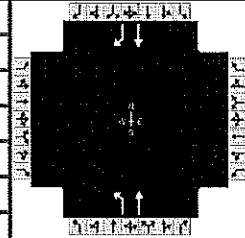
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	14	3	8	18		2	12	1	6	
Adjusted Flow Rate (v), veh/h	259	903			117			524	523	292	266	
Adjusted Saturation Flow Rate (s), veh/h/ln	1280	1844			1564			1870	1866	1868	1702	
Queue Service Time (g <sub>s</sub> ), s	11.8	32.9			0.1			23.7	23.0	0.0	10.8	
Cycle Queue Clearance Time (g <sub>c</sub> ), s	50.0	32.9			33.0			23.7	23.0	10.1	10.8	
Green Ratio (g/C)	0.56	0.56			0.56			0.32	0.32	0.32	0.32	
Capacity (c), veh/h	322	1024			910			603	601	642	548	
Volume-to-Capacity Ratio (X)	0.806	0.882			0.128			0.869	0.869	0.455	0.485	
Back of Queue (Q), ft/ln (95 th percentile)	284.2	352.7			28.8			419.8	412.6	193.5	184.2	
Back of Queue (Q), veh/ln (95 th percentile)	11.2	14.1			1.2			16.5	16.5	7.7	7.3	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00			0.00			0.00	0.00	0.00	0.00	
Uniform Delay (d <sub>1</sub> ), s/veh	28.8	9.5			5.4			23.9	23.9	20.3	20.3	
Incremental Delay (d <sub>2</sub> ), s/veh	19.1	10.9			0.3			15.7	15.7	2.3	3.1	
Initial Queue Delay (d <sub>3</sub> ), s/veh	0.0	0.0			0.0			0.0	0.0	0.0	0.0	
Control Delay (d), s/veh	47.9	20.3			5.7			39.6	39.7	22.6	23.3	
Level of Service (LOS)	D	C			A			D	D	C	C	
Approach Delay, s/veh / LOS	26.5	C		5.7	A		39.7	D		23.0	C	
Intersection Delay, s/veh / LOS	29.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.08	B	2.08	B	1.69	B	1.92	B
Bicycle LOS Score / LOS	2.41	B	0.68	A	1.35	A	0.95	A

III C-2

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bowman			Duration, h	0.250
Analyst	LDK	Analysis Date	Dec 20, 2021	Area Type	Other
Jurisdiction	NJDOT	Time Period	AM Peak	PHF	0.95
Urban Street	Rt. 93 (Grand Ave)	Analysis Year	2024 Build	Analysis Period	1> 7:00
Intersection	Rt. 93/Rt. 46 WB Ramp	File Name	B-AM-93-46WB.xus		
Project Description	15 Grand Ave BCG 081197-01-001				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h							861	655			420	427

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	24.0	54.0	0.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	0.0	0.0	0.0	0.0			
				Red	2.0	2.0	0.0	0.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase					5	2		6
Case Number					1.0	4.0		7.3
Phase Duration, s					30.0	90.0		60.0
Change Period, (Y+R <sub>c</sub> ), s					6.0	6.0		6.0
Max Allow Headway (MAH), s					3.1	0.0		0.0
Queue Clearance Time (g <sub>s</sub> ), s					18.3			
Green Extension Time (g <sub>e</sub> ), s					1.4	0.0		0.0
Phase Call Probability					1.00			
Max Out Probability					0.43			

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement							5	2			6	16
Adjusted Flow Rate (v), veh/h							906	689			442	449
Adjusted Saturation Flow Rate (s), veh/h/ln							1697	1841			1826	1560
Queue Service Time (g <sub>s</sub> ), s							16.3	0.0			11.5	14.6
Cycle Queue Clearance Time (g <sub>c</sub> ), s							16.3	0.0			11.5	14.6
Green Ratio (g/C)							0.89	0.93			0.60	0.60
Capacity (c), veh/h							958	1718			1096	936
Volume-to-Capacity Ratio (X)							0.946	0.401			0.404	0.480
Back of Queue (Q), ft/ln (95 th percentile)							385.6	15.5			202.1	216.7
Back of Queue (Q), veh/ln (95 th percentile)							14.5	0.6			7.8	8.4
Queue Storage Ratio (RQ) (95 th percentile)							0.00	0.00			0.00	0.00
Uniform Delay (d <sub>1</sub> ), s/veh							6.6	0.0			9.5	10.1
Incremental Delay (d <sub>2</sub> ), s/veh							18.6	0.7			1.1	1.8
Initial Queue Delay (d <sub>3</sub> ), s/veh							0.0	0.0			0.0	0.0
Control Delay (d), s/veh							25.2	0.7			10.6	11.9
Level of Service (LOS)							C	A			B	B
Approach Delay, s/veh / LOS	0.0			0.0			14.6	B		11.2	B	
Intersection Delay, s/veh / LOS	13.4						B					

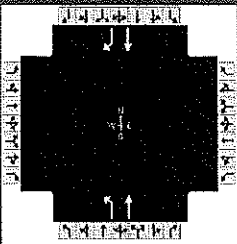
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.95	B	1.95	B	0.54	A	1.36	A
Bicycle LOS Score / LOS					3.12	C	1.96	B

IIc-3



# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bowman			Duration, h	0.250
Analyst	LDK	Analysis Date	Dec 20, 2021	Area Type	Other
Jurisdiction	NJDOT	Time Period	PM Peak	PHF	0.98
Urban Street	Rt. 93 (Grand Ave)	Analysis Year	2024 Build	Analysis Period	1> 5:00
Intersection	Rt. 93/Rt. 46 WB Ramp	File Name	B-PM-93-46WB.xus		
Project Description	15 Grand Ave BCG 081197-01-001				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h							681	706			518	271

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	24.0	54.0	0.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	0.0	0.0	0.0	0.0			
				Red	2.0	2.0	0.0	0.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase					5	2		6
Case Number					1.0	4.0		7.3
Phase Duration, s					30.0	90.0		60.0
Change Period, (Y+R <sub>c</sub> ), s					6.0	6.0		6.0
Max Allow Headway (MAH), s					3.1	0.0		0.0
Queue Clearance Time (g <sub>s</sub> ), s					9.3			
Green Extension Time (g <sub>e</sub> ), s					1.4	0.0		0.0
Phase Call Probability					1.00			
Max Out Probability					0.01			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement							5	2		6	16	
Adjusted Flow Rate (v), veh/h							695	720		529	277	
Adjusted Saturation Flow Rate (s), veh/h/ln							1767	1885		1885	1585	
Queue Service Time (g <sub>s</sub> ), s							7.3	0.0		14.0	7.6	
Cycle Queue Clearance Time (g <sub>c</sub> ), s							7.3	0.0		14.0	7.6	
Green Ratio (g/C)							0.89	0.93		0.60	0.60	
Capacity (c), veh/h							937	1760		1131	951	
Volume-to-Capacity Ratio (X)							0.742	0.409		0.467	0.291	
Back of Queue (Q), ft/ln (95 th percentile)							192.3	15.7		235.1	114.7	
Back of Queue (Q), veh/ln (95 th percentile)							7.5	0.6		9.3	4.5	
Queue Storage Ratio (RQ) (95 th percentile)							0.00	0.00		0.00	0.00	
Uniform Delay (d <sub>1</sub> ), s/veh							5.1	0.0		10.0	8.7	
Incremental Delay (d <sub>2</sub> ), s/veh							5.3	0.7		1.4	0.8	
Initial Queue Delay (d <sub>3</sub> ), s/veh							0.0	0.0		0.0	0.0	
Control Delay (d), s/veh							10.4	0.7		11.4	9.5	
Level of Service (LOS)							B	A		B	A	
Approach Delay, s/veh / LOS	0.0			0.0			5.4	A	10.7	B		
Intersection Delay, s/veh / LOS	7.4						A					

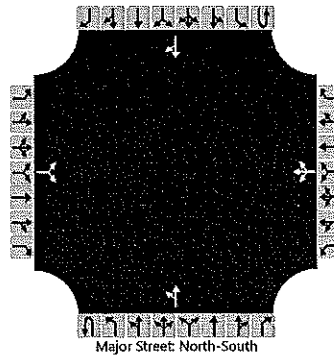
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.95	B	1.95	B	0.54	A	1.36	A
Bicycle LOS Score / LOS					2.82	C	1.82	B

ICC-4

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LDK			Intersection	Rt. 93/W. Columbia/Dwy		
Agency/Co.	Bowman			Jurisdiction	NJDOT		
Date Performed	12/20/21			East/West Street	W. Columbia Ave/Site Dwy		
Analysis Year	2024			North/South Street	Rt. 93 (Grand Ave)		
Time Analyzed	Build - AM Peak			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	15 Grand Ave BCG 081197-01-001						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LR				LTR			LT						TR
Volume (veh/h)		25		66		26	5	48		38	625				759	25
Percent Heavy Vehicles (%)		3		2		0	0	4		0						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		6.9		6.0		6.9	6.3	6.0		4.1						
Critical Headway (sec)		6.93		6.02		6.90	6.30	6.04		4.10						
Base Follow-Up Headway (sec)		3.3		3.1		3.3	3.8	3.1		2.2						
Follow-Up Headway (sec)		3.33		3.12		3.30	3.80	3.14		2.20						

## Delay, Queue Length, and Level of Service

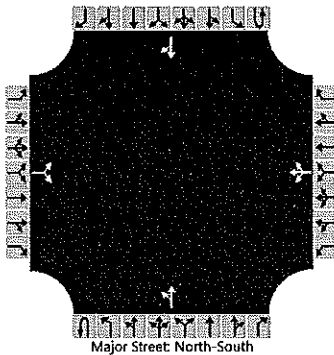
Flow Rate, v (veh/h)			99				86			41						
Capacity, c (veh/h)			180				154			795						
v/c Ratio			0.55				0.56			0.05						
95% Queue Length, Q <sub>95</sub> (veh)			2.9				2.8			0.2						
Control Delay (s/veh)			47.1				54.7			9.8						
Level of Service (LOS)			E				F			A						
Approach Delay (s/veh)	47.1				54.7				1.3							
Approach LOS	E				F				A							

*IC-5*

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LDK	Intersection	Rt. 93/W. Columbia/Dwy				
Agency/Co.	Bowman	Jurisdiction	NJDOT				
Date Performed	12/20/21	East/West Street	W. Columbia Ave/Site Dwy				
Analysis Year	2024	North/South Street	Rt. 93 (Grand Ave)				
Time Analyzed	Build - PM Peak	Peak Hour Factor	0.95				
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25				
Project Description	15 Grand Ave BCG 081197-01-001						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LR				LTR			LT						TR
Volume (veh/h)		27		53		4	10	31		52	653					743 45
Percent Heavy Vehicles (%)		0		2		25	0	0		4						
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		6.9		6.0		6.9	6.3	6.0		4.1						
Critical Headway (sec)		6.90		6.02		7.15	6.30	6.00		4.14						
Base Follow-Up Headway (sec)		3.3		3.1		3.3	3.8	3.1		2.2						
Follow-Up Headway (sec)		3.30		3.12		3.53	3.80	3.10		2.24						

## Delay, Queue Length, and Level of Service

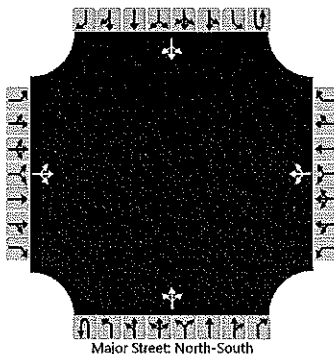
Flow Rate, v (veh/h)			84				47			55						
Capacity, c (veh/h)			162				201			794						
v/c Ratio			0.52				0.24			0.07						
95% Queue Length, Q <sub>95</sub> (veh)			2.6				0.9			0.2						
Control Delay (s/veh)			49.0				28.3			9.9						
Level of Service (LOS)			E				D			A						
Approach Delay (s/veh)	49.0				28.3				1.7							
Approach LOS	E				D				A							

II C-6

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LDK			Intersection	Rt. 93/W. Ruby		
Agency/Co.	Bowman			Jurisdiction	NJDOT		
Date Performed	12/20/2021			East/West Street	W. Ruby		
Analysis Year	2024			North/South Street	Rt. 93 (Grand Ave)		
Time Analyzed	Build - AM Peak			Peak Hour Factor	0.91		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	15 Grand Ave BCG 081197-01-001						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		14	0	13		15	9	42		21	643	34		2	755	26
Percent Heavy Vehicles (%)		0	0	23		7	0	5		5				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.43		7.17	6.50	6.25		4.15				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.51		3.56	4.00	3.35		2.25				2.20		

## Delay, Queue Length, and Level of Service

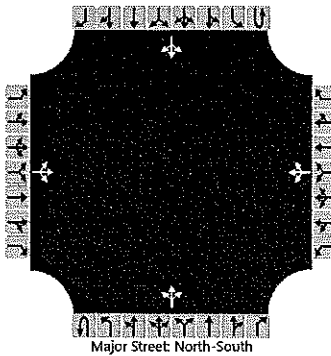
Flow Rate, v (veh/h)			30				73				23				2	
Capacity, c (veh/h)			103				165				770				873	
v/c Ratio			0.29				0.44				0.03				0.00	
95% Queue Length, Q <sub>95</sub> (veh)			1.1				2.0				0.1				0.0	
Control Delay (s/veh)			53.4				42.8				9.8				9.1	
Level of Service (LOS)			F				E				A				A	
Approach Delay (s/veh)	53.4				42.8				0.8				0.1			
Approach LOS	F				E				A				A			

IIc-7

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LDK			Intersection	Rt. 93/W. Ruby		
Agency/Co.	Bowman			Jurisdiction	NJDOT		
Date Performed	12/20/21			East/West Street	W. Ruby		
Analysis Year	2024			North/South Street	Rt. 93 (Grand Ave)		
Time Analyzed	Build - PM Peak			Peak Hour Factor	0.96		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	15 Grand Ave BCG 081197-01-001						

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		29	0	75		4	5	42		8	695	10		7	704	24
Percent Heavy Vehicles (%)		0	0	1		0	0	0		0				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.21		7.10	6.50	6.20		4.10				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.31		3.50	4.00	3.30		2.20				2.20		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			108				53				8				7	
Capacity, c (veh/h)			194				262				862				880	
v/c Ratio			0.56				0.20				0.01				0.01	
95% Queue Length, Q <sub>95</sub> (veh)			3.0				0.7				0.0				0.0	
Control Delay (s/veh)			44.6				22.2				9.2				9.1	
Level of Service (LOS)			E				C				A				A	
Approach Delay (s/veh)	44.6				22.2				0.3				0.2			
Approach LOS	E				C											

IC-B

**APPENDIX III**  
**TRAFFIC COUNTS**

**Study Name** 93&Maple  
**Start Date** Tuesday, September 28, 2021 6:30 AM  
**End Date** Tuesday, September 28, 2021 6:30 PM  
**Site Code**

## Report Summary

Time Period	Class.	Southbound						Westbound						Northbound						Eastbound						Crosswalk				
		R	T	L	U	I	O	R	T	L	U	I	O	R	T	L	U	I	O	R	T	L	U	I	O	Total	s	on	Cr	estria
<b>Peak 1</b>	Lights	0	326	2	0	328	1267	270	0	6	0	276	134	2	847	0	0	849	961	629	130	150	0	909	0	2362	SB	0	0	0
Specified Period	%	0%	95%	100%	0%	95%	92%	97%	0%	100%	0%	97%	96%	100%	92%	0%	0%	92%	91%	89%	96%	83%	0%	89%	0%	92%		0%	0%	
6:30 AM - 9:00 AM	Buses	0	0	0	0	0	7	6	0	0	0	6	3	0	1	0	0	1	2	2	3	0	0	5	0	12	WB	1	0	1
One Hour Peak	%	0%	0%	0%	0%	0%	1%	2%	0%	0%	0%	2%	2%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%		100%	0%	
7:15 AM - 8:15 AM	Trucks	0	17	0	0	17	104	2	0	0	0	2	2	0	71	0	0	71	94	77	2	31	0	110	0	200	NB	0	0	0
	%	0%	5%	0%	0%	5%	8%	1%	0%	0%	0%	1%	1%	0%	8%	0%	0%	8%	9%	11%	1%	17%	0%	11%	0%	8%		0%	0%	
	<b>Total</b>	<b>0</b>	<b>343</b>	<b>2</b>	<b>0</b>	<b>345</b>	<b>1378</b>	<b>278</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>284</b>	<b>139</b>	<b>2</b>	<b>919</b>	<b>0</b>	<b>0</b>	<b>921</b>	<b>1057</b>	<b>708</b>	<b>135</b>	<b>181</b>	<b>0</b>	<b>1024</b>	<b>0</b>	<b>2574</b>	EB	0	0	0
	PHF	0	0.9	0.5	0	0.91	0.94	0.83	0	0.38	0	0.81	0.91	0.5	0.98	0	0	0.98	0.93	0.91	0.89	0.84	0	0.9	0	0.96		0%	0%	
	Approach %					13%	54%				11%	5%					36%	41%					40%	0%			1	0	1	
<b>Peak 2</b>	Lights	0	493	1	0	494	1168	99	0	4	0	103	207	6	870	0	0	876	1100	603	200	199	0	1002	0	2475	SB	0	3	3
Specified Period	%	0%	97%	100%	0%	97%	97%	99%	0%	100%	0%	99%	100%	100%	97%	0%	0%	97%	96%	96%	100%	96%	0%	96%	0%	97%		0%	100%	
4:00 PM - 6:30 PM	Buses	0	1	0	0	1	6	0	0	0	0	0	0	0	3	0	0	3	1	0	0	3	0	3	0	7	WB	2	1	3
One Hour Peak	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%		67%	33%	
5:00 PM - 6:00 PM	Trucks	0	12	0	0	12	27	1	0	0	0	1	1	0	21	0	0	21	40	28	1	5	0	34	0	68	NB	0	2	2
	%	0%	2%	0%	0%	2%	2%	1%	0%	0%	0%	1%	0%	0%	2%	0%	0%	2%	4%	4%	0%	2%	0%	3%	0%	3%		0%	100%	
	<b>Total</b>	<b>0</b>	<b>506</b>	<b>1</b>	<b>0</b>	<b>507</b>	<b>1201</b>	<b>100</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>104</b>	<b>208</b>	<b>6</b>	<b>894</b>	<b>0</b>	<b>0</b>	<b>900</b>	<b>1141</b>	<b>631</b>	<b>201</b>	<b>207</b>	<b>0</b>	<b>1039</b>	<b>0</b>	<b>2550</b>	EB	0	0	0
	PHF	0	0.95	0.25	0	0.95	0.97	0.78	0	0.5	0	0.76	0.88	0.5	0.95	0	0	0.95	0.95	0.94	0.9	0.83	0	0.93	0	0.96		0%	0%	
	Approach %					20%	47%				4%	8%					35%	45%					41%	0%			2	6	8	



**Study Name** 93&46WBRamp  
**Start Date** Tuesday, September 28, 2021 6:30 AM  
**End Date** Tuesday, September 28, 2021 6:30 PM  
**Site Code**

## Report Summary

Time Period	Class.	Southbound					Westbound					Northbound					Eastbound					Crosswalk					
		R	T	U	I	O	T	L	I	O	R	T	L	U	I	O	R	T	L	U	I	O	Total	s on Credestria	Total		
<b>Peak 1</b>	Lights	381	365	0	746	596	0	1	1	1	1	596	751	0	1348	366	0	0	0	0	0	1132	2095	SB	0	0	0
Specified Period	%	95%	94%	0%	95%	96%	0%	100%	100%	100%	100%	96%	91%	0%	93%	94%	0%	0%	0%	0%	0%	93%	94%	0%	0%	0%	
6:30 AM - 9:00 AM	Buses	4	4	0	8	2	0	0	0	0	0	2	6	0	8	4	0	0	0	0	0	10	16	WB	1	4	5
One Hour Peak	%	1%	1%	0%	1%	0%	0%	0%	0%	0%	0%	1%	1%	0%	1%	1%	0%	0%	0%	0%	0%	1%	1%	20%	80%		
8:00 AM - 9:00 AM	Trucks	15	18	0	33	23	0	0	0	0	0	23	64	0	87	18	0	0	0	0	0	79	120	NB	0	0	0
	%	4%	5%	0%	4%	4%	0%	0%	0%	0%	4%	8%	0%	6%	5%	0%	0%	0%	0%	0%	6%	5%	0%	0%	0%	0%	
	<b>Total</b>	<b>400</b>	<b>387</b>	<b>0</b>	<b>787</b>	<b>621</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>621</b>	<b>821</b>	<b>0</b>	<b>1443</b>	<b>388</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1221</b>	<b>2231</b>	EB	0	0	0	
	PHF	0.76	0.93	0	0.86	0.89	0	0.25	0.25	0.25	0.25	0.89	0.93	0	0.92	0.93	0	0	0	0	0	0.91	0.95		0%	0%	
	Approach %				35%	28%			0%	0%				65%	17%					0%	55%			1	4	5	
<b>Peak 2</b>	Lights	246	479	0	725	646	0	0	0	1	1	646	613	0	1260	479	0	0	0	0	0	859	1985	SB	0	0	0
Specified Period	%	97%	98%	0%	98%	98%	0%	0%	0%	100%	100%	98%	97%	0%	97%	98%	0%	0%	0%	0%	0%	97%	97%	0%	0%	0%	
4:00 PM - 6:30 PM	Buses	3	2	0	5	5	0	0	0	0	0	5	1	0	6	2	0	0	0	0	0	4	11	WB	3	22	25
One Hour Peak	%	1%	0%	0%	1%	1%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	12%	88%		
5:15 PM - 6:15 PM	Trucks	5	7	0	12	8	0	0	0	0	0	8	21	0	29	7	0	0	0	0	0	26	41	NB	0	0	0
	%	2%	1%	0%	2%	1%	0%	0%	0%	0%	1%	3%	0%	2%	1%	0%	0%	0%	0%	0%	3%	2%	0%	0%	0%	0%	
	<b>Total</b>	<b>254</b>	<b>488</b>	<b>0</b>	<b>742</b>	<b>659</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>659</b>	<b>635</b>	<b>0</b>	<b>1295</b>	<b>488</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>889</b>	<b>2037</b>	EB	0	2	2
	PHF	0.92	0.95	0	0.98	0.91	0	0	0	0.25	0.25	0.91	0.9	0	0.98	0.95	0	0	0	0	0	0.95	0.98		0%	100%	
	Approach %				36%	32%			0%	0%				64%	24%					0%	44%			3	24	27	



**Study Name** 93&Columbia  
**Start Date** Tuesday, September 28, 2021 6:30 AM  
**End Date** Tuesday, September 28, 2021 6:30 PM  
**Site Code**

## Report Summary

Time Period	Class.	Southbound				Westbound				Northbound				Eastbound				Crosswalk												
		R	T	L	U	I	O	R	T	L	U	I	O	R	T	L	U	I	O	Total	s	on	Cre	stria	Total					
<b>Peak 1</b>	Lights	21	683	2	0	706	617	45	4	25	0	74	8	5	555	31	1	592	747	38	1	17	0	56	56	1428	SB	0	2	2
Specified Period	%	100%	94%	100%	0%	94%	96%	96%	100%	100%	0%	97%	100%	100%	96%	100%	100%	97%	94%	95%	100%	94%	0%	95%	100%	95%		0%	100%	
6:30 AM - 9:00 AM	Buses	0	9	0	0	9	2	0	0	0	0	0	0	0	2	0	0	2	9	0	0	0	0	0	0	11	WB	2	5	7
One Hour Peak	%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	1%		29%	71%		
8:00 AM - 9:00 AM	Trucks	0	34	0	0	34	22	2	0	0	0	2	0	0	19	0	0	19	36	2	0	1	0	3	0	58	NB	0	5	5
	%	0%	5%	0%	0%	5%	3%	4%	0%	0%	0%	3%	0%	0%	3%	0%	0%	3%	5%	5%	0%	6%	0%	5%	0%	4%		0%	100%	
	<b>Total</b>	<b>21</b>	<b>726</b>	<b>2</b>	<b>0</b>	<b>749</b>	<b>641</b>	<b>47</b>	<b>4</b>	<b>25</b>	<b>0</b>	<b>76</b>	<b>8</b>	<b>5</b>	<b>576</b>	<b>31</b>	<b>1</b>	<b>613</b>	<b>792</b>	<b>40</b>	<b>1</b>	<b>18</b>	<b>0</b>	<b>59</b>	<b>56</b>	<b>1497</b>	EB	0	6	6
	PHF	0.88	0.88	0.25	0	0.88	0.92	0.73	0.5	0.69	0	0.7	0.5	0.62	0.9	0.78	0.25	0.93	0.89	0.67	0.25	0.64	0	0.67	0.82	0.92		0%	100%	
	Approach %					50%	43%					5%	1%					41%	53%					4%	4%		2	18	20	
<b>Peak 2</b>	Lights	33	688	1	0	722	665	30	7	3	0	40	6	3	612	32	0	647	726	35	2	23	0	60	72	1469	SB	0	3	3
Specified Period	%	100%	96%	50%	0%	97%	98%	100%	100%	75%	0%	98%	86%	100%	98%	94%	0%	98%	96%	97%	100%	100%	0%	98%	97%	97%		0%	100%	
4:00 PM - 6:30 PM	Buses	0	9	0	0	9	5	0	0	0	0	0	0	0	5	0	0	5	9	0	0	0	0	0	0	14	WB	2	10	12
One Hour Peak	%	0%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	1%		17%	83%		
5:30 PM - 6:30 PM	Trucks	0	16	1	0	17	7	0	0	1	0	1	1	0	7	2	0	9	18	1	0	0	0	1	2	28	NB	0	13	13
	%	0%	2%	50%	0%	2%	1%	0%	0%	25%	0%	2%	14%	0%	1%	6%	0%	1%	2%	3%	0%	0%	0%	2%	3%	2%		0%	100%	
	<b>Total</b>	<b>33</b>	<b>713</b>	<b>2</b>	<b>0</b>	<b>748</b>	<b>677</b>	<b>30</b>	<b>7</b>	<b>4</b>	<b>0</b>	<b>41</b>	<b>7</b>	<b>3</b>	<b>624</b>	<b>34</b>	<b>0</b>	<b>661</b>	<b>753</b>	<b>36</b>	<b>2</b>	<b>23</b>	<b>0</b>	<b>61</b>	<b>74</b>	<b>1511</b>	EB	3	22	25
	PHF	0.82	0.94	0.5	0	0.95	0.91	0.75	0.58	1	0	0.73	0.44	0.38	0.91	0.77	0	0.91	0.98	0.69	0.5	0.57	0	0.9	0.88	0.95		12%	88%	
	Approach %					50%	45%					3%	0%					44%	50%					4%	5%		5	48	53	

**Study Name** 93&Ruby  
**Start Date** Tuesday, September 28, 2021 6:30 AM  
**End Date** Tuesday, September 28, 2021 6:30 PM  
**Site Code**

## Report Summary

Time Period	Class.	Southbound					Westbound					Northbound					Eastbound					Crosswalk								
		R	T	L	U	I	O	R	T	L	U	I	O	R	T	L	U	I	O	R	T	L	U	I	O	Total	s	on	Cr	estria
<b>Peak 1</b>	Lights	26	665	2	0	693	659	39	9	13	1	62	36	33	606	20	0	659	688	10	0	14	0	24	55	1438	SB	0	1	1
Specified Period	%	100%	95%	100%	0%	96%	96%	95%	100%	93%	100%	95%	100%	100%	96%	95%	0%	96%	95%	77%	0%	100%	0%	89%	98%	96%		0%	100%	
6:30 AM - 9:00 AM	Buses	0	8	0	0	8	2	0	0	0	0	0	0	0	2	0	0	2	8	0	0	0	0	0	0	10	WB	2	7	9
One Hour Peak	%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	1%		22%	78%		
8:00 AM - 9:00 AM	Trucks	0	24	0	0	24	27	2	0	1	0	3	0	0	25	1	0	26	28	3	0	0	0	3	1	56	NB	0	3	3
	%	0%	3%	0%	0%	3%	4%	5%	0%	7%	0%	5%	0%	0%	4%	5%	0%	4%	4%	23%	0%	0%	0%	11%	2%	4%		0%	100%	
	<b>Total</b>	<b>26</b>	<b>697</b>	<b>2</b>	<b>0</b>	<b>725</b>	<b>688</b>	<b>41</b>	<b>9</b>	<b>14</b>	<b>1</b>	<b>65</b>	<b>36</b>	<b>33</b>	<b>633</b>	<b>21</b>	<b>0</b>	<b>687</b>	<b>724</b>	<b>13</b>	<b>0</b>	<b>14</b>	<b>0</b>	<b>27</b>	<b>56</b>	<b>1504</b>	EB	1	7	8
	PHF	0.65	0.84	0.5	0	0.84	0.91	0.73	0.45	0.58	0.25	0.65	0.82	0.82	0.9	0.66	0	0.92	0.85	0.65	0	0.88	0	0.75	0.61	0.91		13%	88%	
	Approach %					48%	46%					4%	2%					46%	48%				2%	4%			3	18	21	
<b>Peak 2</b>	Lights	23	648	7	0	678	718	40	5	3	1	49	18	10	649	8	0	667	723	72	0	29	0	101	36	1495	SB	0	1	1
Specified Period	%	96%	98%	100%	0%	98%	98%	98%	100%	100%	100%	98%	100%	100%	98%	98%	0%	98%	98%	96%	0%	100%	0%	97%	97%	98%		0%	100%	
4:00 PM - 6:30 PM	Buses	0	5	0	0	5	6	1	0	0	0	1	0	0	5	0	0	5	7	2	0	0	0	2	0	13	WB	1	14	15
One Hour Peak	%	0%	1%	0%	0%	1%	1%	2%	0%	0%	0%	2%	0%	0%	1%	0%	0%	1%	1%	3%	0%	0%	0%	2%	0%	1%		7%	93%	
5:15 PM - 6:15 PM	Trucks	1	9	0	0	10	7	0	0	0	0	0	0	0	7	0	0	7	10	1	0	0	0	1	1	18	NB	0	2	2
	%	4%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	1%	1%	0%	0%	0%	1%	3%	1%		0%	100%	
	<b>Total</b>	<b>24</b>	<b>662</b>	<b>7</b>	<b>0</b>	<b>693</b>	<b>731</b>	<b>41</b>	<b>5</b>	<b>3</b>	<b>1</b>	<b>50</b>	<b>18</b>	<b>10</b>	<b>661</b>	<b>8</b>	<b>0</b>	<b>679</b>	<b>740</b>	<b>75</b>	<b>0</b>	<b>29</b>	<b>0</b>	<b>104</b>	<b>37</b>	<b>1526</b>	EB	1	11	12
	PHF	0.67	0.97	0.58	0	0.97	0.92	0.79	0.42	0.38	0.25	0.83	0.64	0.62	0.93	0.67	0	0.93	0.97	0.89	0	0.81	0	0.87	0.84	0.96		8%	92%	
	Approach %					45%	48%					3%	1%					44%	48%				7%	2%			2	28	30	

**APPENDIX IV**  
**SIGNAL TIMING**

**90 – SECOND CYCLE**

<u>Phase</u>	<u>Signal Indications</u>								<u>Time (Sec.)</u>
	<u>1, 2</u>	<u>4, 5</u>	<u>6, 7</u>	<u>8</u>	<u>9, 10</u>	<u>3, 11-16</u>	<u>17-22</u>	<u>23-26</u>	
<b>WITHOUT PEDESTRIAN ACTUATION</b>									
1) Route NJ 93 ROW	G	G	G	⬆️ G ⬆️	G	R	W	DW	48 – 25
Pedestrian Clearance	G	G	G	⬆️ G ⬆️	G	R	FDW	DW	8
SB Outside Change	Y	G	G	⬆️ G ⬆️	G	R	FDW	DW	4*
SB Outside Clearance	R	G	G	⬆️ G ⬆️	G	R	DW	DW	2
2) Route NJ 93 NB Lag ROW	R	G	G	⬆️ G ⬆️	G/⬅️	R	DW	DW	10
Route NJ 93 NB Change	R	Y	Y	⬆️ G ⬆️	G/⬅️	R	DW	DW	4
Clearance	R	R	R	⬆️ G ⬆️	G/⬅️	R	DW	DW	2
3) Route US 46 Ramp / Maple Ave ROW	R	R	R	⬆️ G ⬆️	G/⬅️	G	DW	DW	7 – 30
Change	R	R	R	⬆️ G ⬆️	G/⬅️	Y	DW	DW	3
Clearance	R	R	R	⬆️ G ⬆️	G	R	DW	DW	2
<b>WITH PEDESTRIAN ACTUATION</b>									
1) Route NJ 93 ROW	G	G	G	⬆️ G ⬆️	G	R	W	DW	35 - 25
Pedestrian Clearance	G	G	G	⬆️ G ⬆️	G	R	FDW	DW	8
SB Outside Change	Y	G	G	⬆️ G ⬆️	G	R	FDW	DW	4*
SB Outside Clearance	R	G	G	⬆️ G ⬆️	G	R	DW	DW	2
2) Route NJ 93 NB Lag ROW	R	G	G	⬆️ G ⬆️	G/⬅️	R	DW	DW	10
Route NJ 93 NB Change	R	Y	Y	⬆️ G ⬆️	G/⬅️	R	DW	DW	4
Clearance	R	R	R	⬆️ G ⬆️	G/⬅️	R	DW	DW	2
3) Route US 46 Ramp / Maple Ave ROW	R	R	R	⬆️ G ⬆️	G/⬅️	G	DW	W	7
Pedestrian Clearance	R	R	R	⬆️ G ⬆️	G/⬅️	G	DW	FDW	13
Vehicle Extension	R	R	R	⬆️ G ⬆️	G/⬅️	G	DW	DW	0 - 10
Change	R	R	R	⬆️ G ⬆️	G/⬅️	Y	DW	DW	3
Clearance	R	R	R	⬆️ G ⬆️	G	R	DW	DW	2
Emergency Flash	Y	Y	Y	⬆️ G ⬆️	Y	R	DARK	DARK	-

Route NJ 93 & Maple Avenue / Route US 46 Ramps  
Palisades Park / Ridgefield Boros, Bergen County

NOTES:

\*An offset of seven (7) seconds is to be maintained from the beginning of yellow to Route 93 traffic at Fort Lee Road to the beginning of yellow to Route 93 traffic at this intersection.

The vehicle extension interval is to be two (2) seconds.

The manual control is to be disconnected.

A force-off operation is to be employed such that constant actuation of the force-off detector for a period of five (5) seconds shall cause Phase 1 to be terminated at the completion of its minimum green interval of seven (7) seconds, followed by Phase 2. All appropriate change and clearance intervals shall be maintained.

The Route 93 Phase 1 ROW (W) minimum green interval shall be set at seven (7) seconds.