

Cranston, Rhode Island  
Proposed Residential Development

June 2022

TRAFFIC IMPACT STUDY

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# Proposed Residential Development Cranston, Rhode Island

## TRAFFIC IMPACT STUDY

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Prepared by: BETA GROUP, INC.

Prepared for: Mr. Jason Kambitsis  
A.R. Building Company, Inc.  
12 High Street, Riverwalk Unit #1  
Westerly, Rhode Island 02891

June 2022





June 23, 2022

Mr. Jason Kambitsis  
A.R. Building Company, Inc.  
12 High Street, Riverwalk Unit #1  
Westerly, Rhode Island 02891

Re: Proposed Residential Development  
Independence Way Apartments  
Cranston, Rhode Island

Dear Mr. Kambitsis:

BETA Group, Inc., in accordance with our scope of services, has completed a traffic impact study for a proposed residential development project in the City of Cranston, Rhode Island. The site is situated on the southerly side of Plainfield Pike (Route 14), abutting the Interstate 295 northbound on/off ramps to the west. The parcel is defined by Assessor's Plat 37, Lot 14, which contains approximately eleven acres of partially developed land that contains a single-family home at the northern end of the property fronting Plainfield Pike.

Based upon our discussions with the site engineer and a review of the conceptual plans provided by DiPrete Engineering, it is our understanding that the primarily wooded property will be developed to include construction of two, multi-story buildings containing a total of 180 residential apartment units. Access/egress to the site is proposed from Independence Way at its intersection with the commercial plaza southern driveway that will be modified to create a four-way junction.

The study included herein, was conducted to determine the adequacy of the existing servicing roadways to accommodate anticipated traffic to be generated by the residential development project. An analysis of potential impacts to the roadway capacity and safety has been completed and is discussed in the following report.

Very truly yours,  
BETA Group, Inc.

A handwritten signature in black ink that reads 'H-C-P'.

Herman C. Peralta, PE  
Project Manager

A handwritten signature in black ink that reads 'Paul J. Bannon'.

Paul J. Bannon  
Associate

BETA GROUP, INC.

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## 1.0 INTRODUCTION

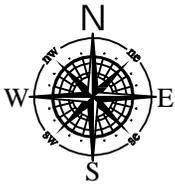
The objective of the following study is to assess the potential traffic impacts associated with a proposed residential development project in the City of Cranston, Rhode Island. The new residential apartments will be situated on a parcel of land on the southeast corner of the I-295 interchange with Plainfield Pike (Route 14), just west of Independence Way. Refer to the Figure 1, Project Vicinity Map, on the following page for the project location within the city.

The residential development proposal consists of construction of two, multi-story buildings containing a total of 180 residential apartment units. Parking will be available for 272 vehicles in multiple parking lot areas adjacent to the buildings. Access/egress to the site is proposed from Independence Way, which intersects with Plainfield Pike at a signalized junction for efficient and safe access to the local roadway network and interstate highway system.

The study summarized herein focused on both traffic flow efficiency and safety along Plainfield Pike (Route 14) and Independence Way in the immediate vicinity of the subject property, including at the proposed site driveway. The potential impacts associated with the site related traffic have been defined and evaluated in accordance with standard traffic engineering guidelines and procedures.

The traffic engineering study completed for this project included the following:

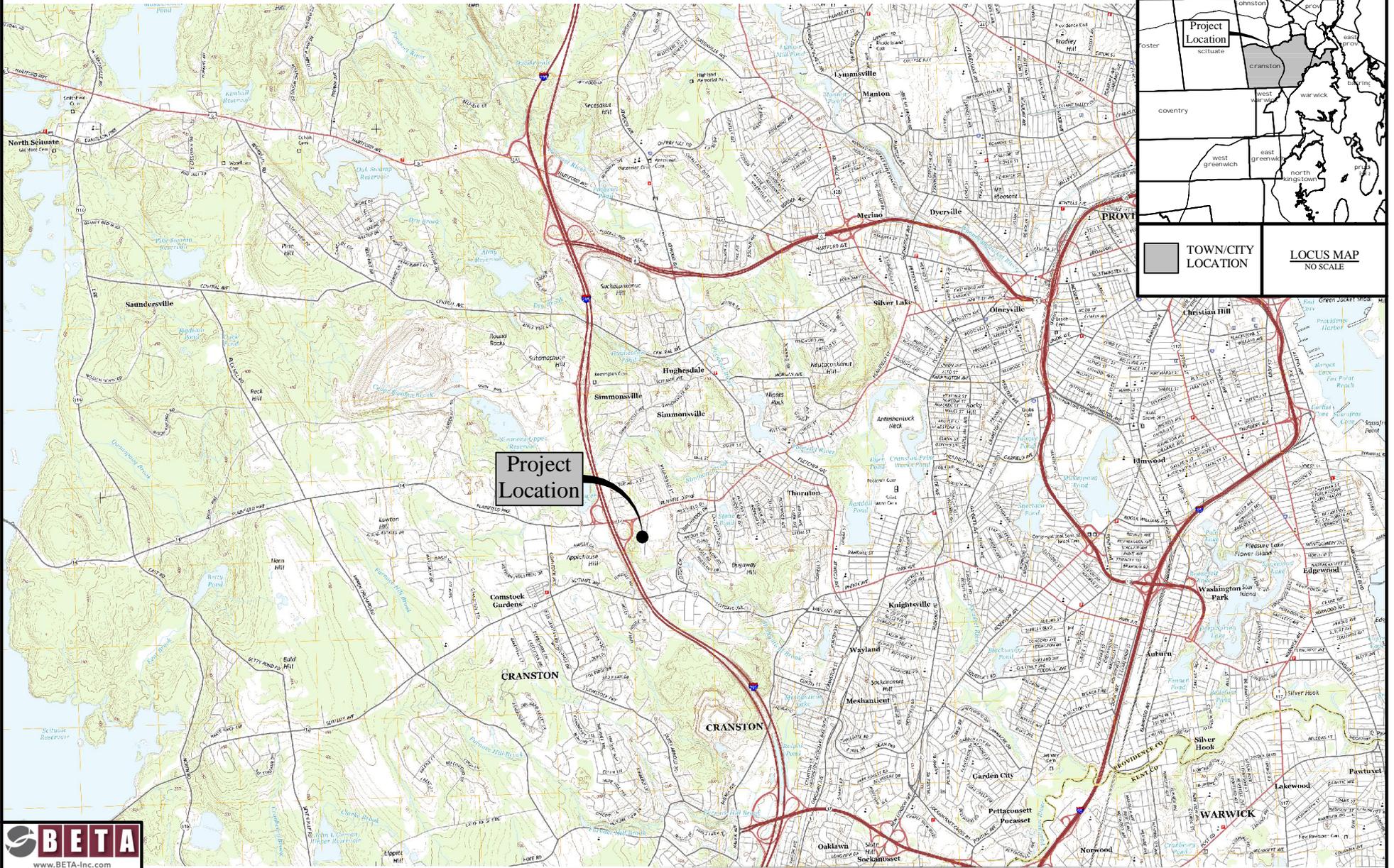
- A traffic counting program to define the existing traffic patterns and operational characteristics along the servicing roadways. The data collection included manual Turning Movement Counts (TMC) at the Independence Way intersections with Plainfield Pike (Route 14) and with the commercial plaza southern driveway.
- An inventory of the physical roadway characteristics of Plainfield Pike (Route 14) and Independence Way in the project area to determine the adequacy of the existing roadway geometric features in reference to safety and operations.
- An analysis of crash records obtained from the Cranston and Johnston Police Departments to determine if there are any safety concerns relative to the frequency, severity, or pattern of crashes in the project area.
- An estimate of future traffic volumes for the proposed residential development was calculated using data from the "Trip Generation" Manual, an informational report published by the Institute of Transportation Engineers (ITE).
- Evaluation and analysis of the traffic safety and operational issues for existing and future traffic conditions.
- Development of recommendations where necessary, that would be required to maintain safe and efficient traffic flow in the project area.



# Proposed Residential Development

CRANSTON, RHODE ISLAND

## Figure 1 - Project Vicinity Map



## 2.0 PROJECT AREA

As noted in the previous section, the proposed residential apartment project is situated on a parcel of land at the southeast corner of the I-295 interchange with Plainfield Pike (Route 14), just west of Independence Way. The 11-acre site is mostly undeveloped with a single-family on the northerly end of the property fronting Plainfield Pike (Route 14). Figure 2 on the following page depicts the general project area, and the boundary lines of the subject property.

Land use in the immediate area can be defined as predominantly commercial properties along Plainfield Pike (Route 14) in the vicinity of the I-295 interchange with medium density residential properties in neighborhoods off of intersecting side streets. Immediately abutting the subject site to the north across Plainfield Pike is a commercial greenhouse business. To the west are the I-295 northbound on/off ramps that intersect with Plainfield Pike (Route 14). To the south/east is undeveloped wooded land and Independence Way which services the Independence Way Luxury Apartments containing multiple, multi-story residential buildings and a commercial plaza containing a Walmart store, restaurants, and retail shops. Further east along Plainfield Pike are medium density residential properties.

Plainfield Pike (Route 14) will serve as the primary access route to the proposed development, with Independence Way providing immediate local access. Based upon the good operating characteristics along the servicing roadways, and the low estimated volume and type of traffic associated with the residential development, a study impact area was defined for the project. The limits of our analysis focused on Independence Way and Plainfield Pike (Route 14) immediately adjacent to the subject property and specifically the signalized junction of these two roadways.

## 3.0 EXISTING CONDITIONS

### 3.1 ROADWAYS

#### Plainfield Pike (Route 14)

Plainfield Pike (Route 14) is classified as a principal arterial road between East Road (Route 116) in Scituate to the west to Atwood Avenue (Route 5) to the east. Plainfield Pike is the community border between the City of Cranston and Town of Johnston, which is centered along the roadway with the City of Cranston to the south and the Town of Johnston on the north.

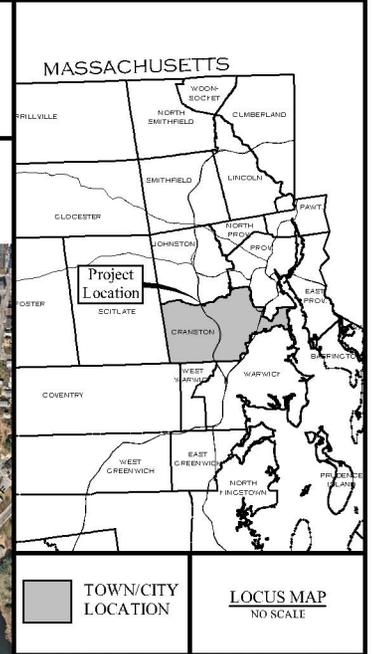
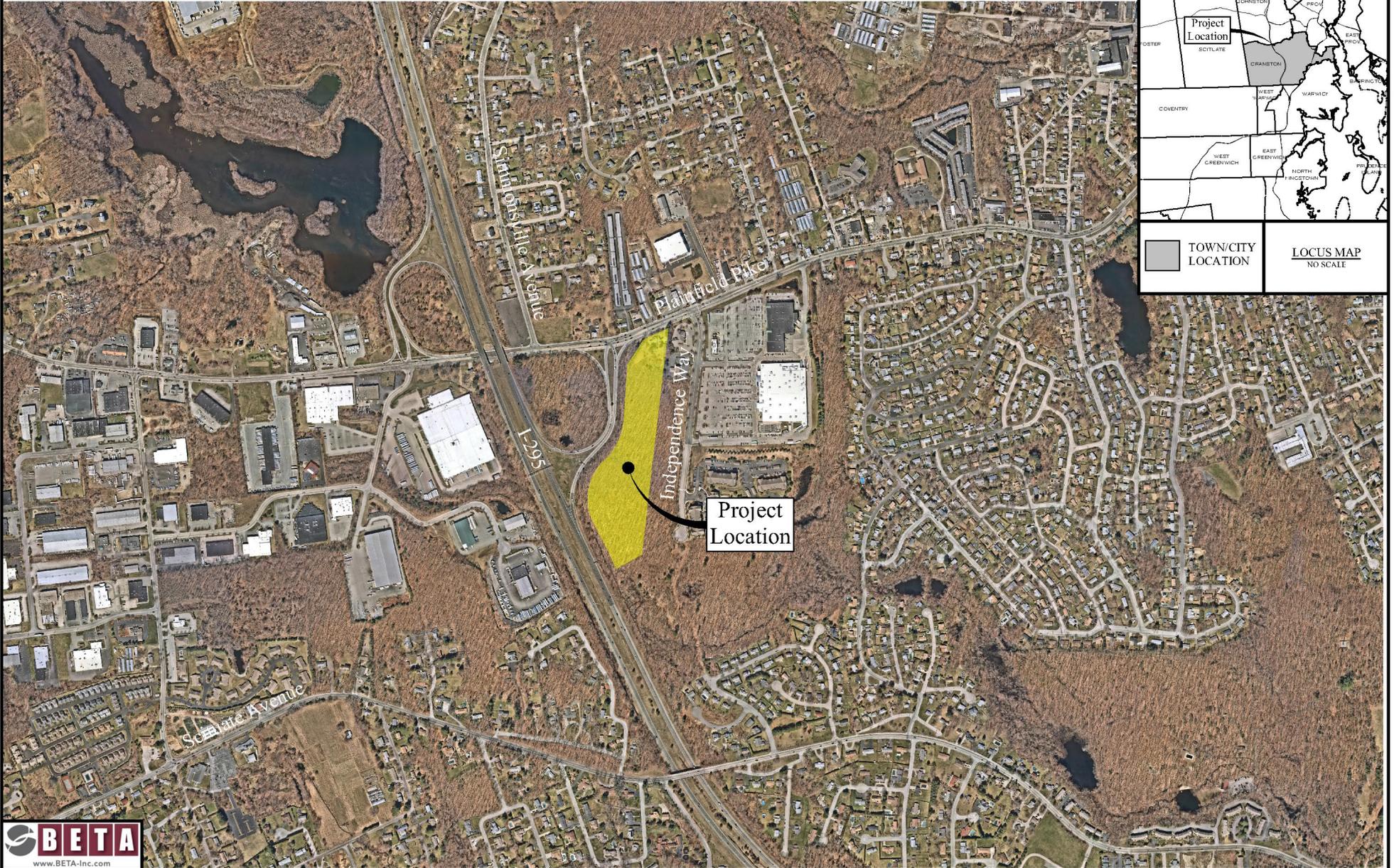


The roadway provides immediate local access to abutting properties but also links to higher order



# Proposed Residential Development CRANSTON, RHODE ISLAND

## Figure 2 - Project Area Map



facilities including, I-295 to the west. The roadway varies in section but typically provides one lane in each direction. Along the property frontage, Plainfield Pike is approximately 60 feet wide consisting of a 13-foot travel lane, a 9-foot right shoulder, and 2-foot left shoulder in each direction separated by 12-foot-wide flush cement concrete median. Cement concrete curbing with sidewalk is provided on both sides of the road. The aerial on the previous page depicts these features of Plainfield Pike along the frontage of the subject lot servicing the single-family home.

The pavement condition can be classified as being in fair to poor condition with visible block cracking and minor rutting. Sporadic Cobra-head light fixtures on utility poles are located along the corridor for nighttime illumination of the roadway. The speed limit is posted at 40 mph in the project area.

### Independence Way

Independence Way is a short, 1,600 foot long local, dead-end street that runs in a north/south direction between Plainfield Pike (Route 14) in the north to a cul-de-sac at its southern terminus. Along the property frontage, the roadway is generally forty (40) feet wide consisting of a 20-foot travel lane in each direction delineated by a double yellow centerline as depicted in the adjacent photograph looking north along Independence Way with the subject site on the left.

Cement concrete curbing with sidewalk separated by a grass strip is provided on both sides of roadway. The pavement can be classified as being in good condition with no visible major pavement distress as the roadway was recently resurfaced within the past three years between Plainfield Pike and the southern most driveway to the commercial plaza.



There was no observed posted speed limit and was assumed at 25 mph due to the urban and commercial nature of the area. In addition, parking along both sides of the roadway is prohibited with “No Parking” signs provided. There is no lighting available along Independence Way though light fixtures extend along the roadway within the parking lot area illuminating the sidewalk and adjacent roadway. Also, the Rhode Island Public Transit Authority (RIPTA) provides both inbound and outbound bus service along this section of Independence Way including within the commercial plaza designated as Bus Route 19.

### 3.2 INTERSECTIONS

#### Plainfield Pike (Route 14) at Independence Way

Independence Way intersects Plainfield Pike (Route 14) to form a 3-Way, signalized "T" type intersection. The Plainfield Pike eastbound approach to the intersection provides a through lane and a separate right turn lane. The Plainfield Pike westbound approach provides a separate left turn lane and a through lane. The Independence Way northbound approach provides separate left and right turn lanes.

The traffic signal system appears to be in good operating condition. The layout of the equipment consists of mast arm mounted vehicle signal heads with in-road vehicle loop detection. A combination of pedestal and bracket mounted pedestrian signal heads on mast arm poles with pedestrian push buttons including high visibility (continental) marked crosswalk with curb ramps are provided on the eastern leg of the intersection. Also, a marked crosswalk is provided on the south leg of the intersection, though no pedestrian signal is provided. It was also determined that the pushbuttons and curb ramps are ADA compliant. The adjacent aerial depicts the typical characteristics of the intersection.



The intersection was determined to operate in a fully actuated mode consisting of three phases and is coordinated with the adjacent traffic signals to the west.

Plainfield Pike movements are serviced in two phases including an advanced protected/permitted westbound left, followed by through/right concurrent movements. Independence Way is serviced under the third phase. Pedestrians are serviced concurrently in Phase 3 with the appropriate vehicle phase.

### 3.3 TRAFFIC DATA

Existing traffic flow characteristics for this area were developed from a traffic counting program conducted by BETA and review of record data available from RIDOT in the immediate area. The data collection included Manual Turning Movement Counts (TMC) at the Independence Way intersections with Plainfield Pike (Route 14) and with the commercial plaza's southernmost driveway during the weekday morning and afternoon peak periods between 7 and 9 AM and 4 to 6 PM, respectively in May 2022. Complete count information can be found in the Appendix.

It is important to note that COVID-19-related restrictions have been lifted in Rhode Island since the end of May 2021 with businesses and schools generally running under normal conditions. Rhode Island has

seen traffic volumes return to typical pre-pandemic conditions. Therefore, the traffic data collected in May 2022 specifically for this study was not adjusted for COVID. In addition, BETA reviewed the RIDOT seasonal adjustment factors and determined that urban arterials in the month of May typically experience lower than average daily traffic volumes. To be conservative in representing existing traffic volumes along Plainfield Pike (Route 14), the May 2022 traffic volumes were adjusted higher to reflect average traffic conditions.

Based upon the seasonally adjusted turning movement count data at the Independence Way intersections with Plainfield Pike (Route 14) and with the commercial plaza southern driveway, Plainfield Pike was found to service an estimated 1,080 vehicles during the weekday morning peak hour between 8:00 and 9:00 AM with approximately 460 vehicles eastbound and 620 vehicles westbound. During this same period, Independence Way, in the vicinity of the proposed site access driveway, services approximately 115 vehicles with approximately 65 vehicles northbound and 50 vehicles southbound. During the weekday afternoon peak hour between 4:30 and 5:30 PM, Plainfield Pike was found to service 1,470 vehicles with approximately 845 vehicles eastbound and 625 vehicles westbound. During this same period, Independence Way, in the vicinity of the proposed site access driveway, services approximately 170 vehicles with approximately 70 vehicles northbound and 100 vehicles southbound. Figure 3 on the following page depicts the daily peak hour turning movement volumes at the study intersections.

## 4.0 SAFETY ANALYSIS

To determine if there are any limiting factors affecting safety relating to access to the proposed residential project, the physical characteristics of Independence Way in the project area were investigated. These limiting factors would potentially include horizontal or vertical alignment changes or roadside obstructions that limit sight distances for vehicles traveling along the road or entering the road from a side street or driveway location. In this instance, the sight distance standard is necessary to permit turning vehicles to safely enter and exit the site driveway.

The horizontal and vertical alignment of Independence Way in the project area can be described as generally straight with an incline from the south to a minor vertical curve just north of the proposed site driveway location, with no limiting factors for sight distances. Based upon the existing roadway geometry as described, the available stopping sight distances at the proposed site driveway location on Independence Way are greater than 500 feet to the north and south. These values are in excess of AASHTO's recommended minimum sight distance of 155 feet based on the assumed speed limit of 25 mph and are sufficient for speeds up to 55 mph.

As a result of the preliminary evaluation of the existing roadway geometry and physical features, it does not appear that any significant physical roadway safety deficiencies exist within the defined study area. Also, as part of our analysis, a review of crash statistics was completed. Data was reviewed from the City of Cranston and Town of Johnston Police Departments for the latest three-year period available

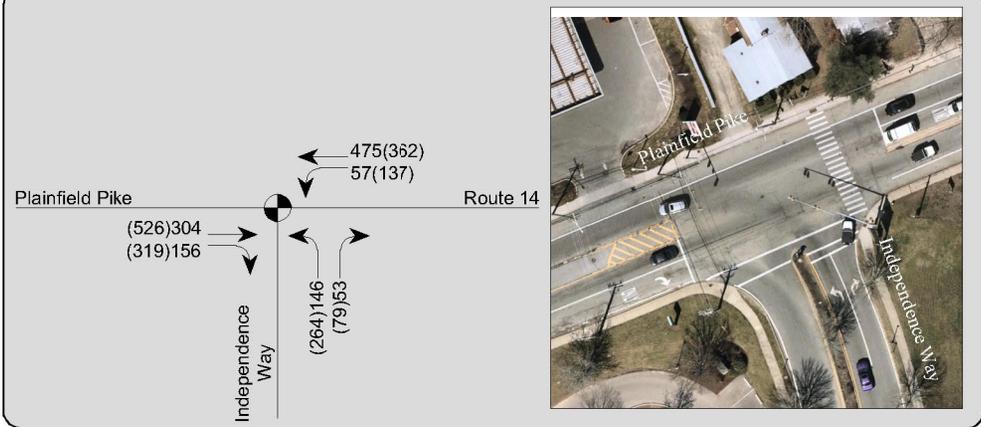


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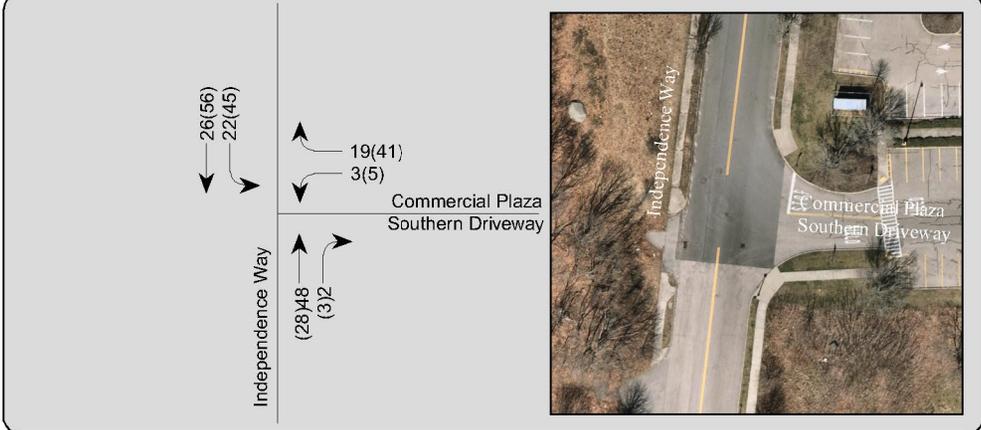
## Figure 3 - Existing Traffic Volumes



### 1 Plainfield Pike (Route 14)/Independence Way



### 2 Independence Way/Commercial Plaza Southern Driveway



#### LEGEND:

- TURN LANE
- XXX AM PEAK VOLUMES (8:00 TO 9:00)
- (XXX) PM PEAK VOLUMES (4:30 TO 5:30)
- ① STUDY INTERSECTION
- ⬤ TRAFFIC SIGNAL

from January 2017 to December 2019 that was not impacted by COVID, to determine if any location in the project area experienced a high frequency or pattern of crashes.

A total of 11 crashes (avg. 4 per year) occurred in the project area over the three-year study period, with two involving injuries. Summarizing the data, 8 of the crashes, with one reported injury, occurred at the signalized intersection of Plainfield Pike (Route 14) with Independence Way and 3 of the crashes, with one reported injury, occurred along the short section of Independence Way.

The predominant crash type at the signalized intersection of Plainfield Pike with Independence Way was rear end collisions, which is typical of signalized junctions due to the numerous starting and stopping movements required for the signal change intervals; three were angle crashes that can be attributed to drivers not yielding the right of way during the permitted left turn phase along Plainfield Pike westbound approach; and one way a sideswipe collision.

The three crashes that occurred along Independence Way included two angle collisions and one sideswipe collision. Both the angle collisions involved a vehicle exiting the commercial plaza northern driveway and the Citizens Bank driveway that can be attributed to drivers not yielding properly before entering the roadway.

Based upon the historical crash data obtained from the local police, and a review of existing roadway geometry and operations, roadway or traffic related safety enhancements could be investigated to improve safety within the immediate project area. The RIDOT could review the following safety enhancements at the signalized intersection of Plainfield Pike (Route 14) with Independence Way:

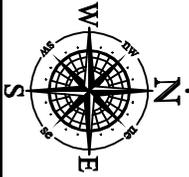
1. The clearance intervals to determine if they require adjustment in an effort to reduce the number of rear-end collisions.
2. Addition of signal head backplates with reflectorized yellow strips to enhance traffic signal head visibility.

## 5.0 IMPACT ANALYSIS

### 5.1 TRIP GENERATION

To determine the traffic impact of a proposed development, estimates of anticipated traffic to be generated by a particular land use must be calculated. As previously discussed, the development proposal consists of the construction of two, multi-story residential buildings with a total of 180 apartment units. Access to the site will be provided from a new driveway on Independence Way at its intersection with the commercial plaza southern driveway that will be modified to create a four-way junction. Figure 4 on the following page depicts the site layout and access plan provided by DiPrete Engineering.

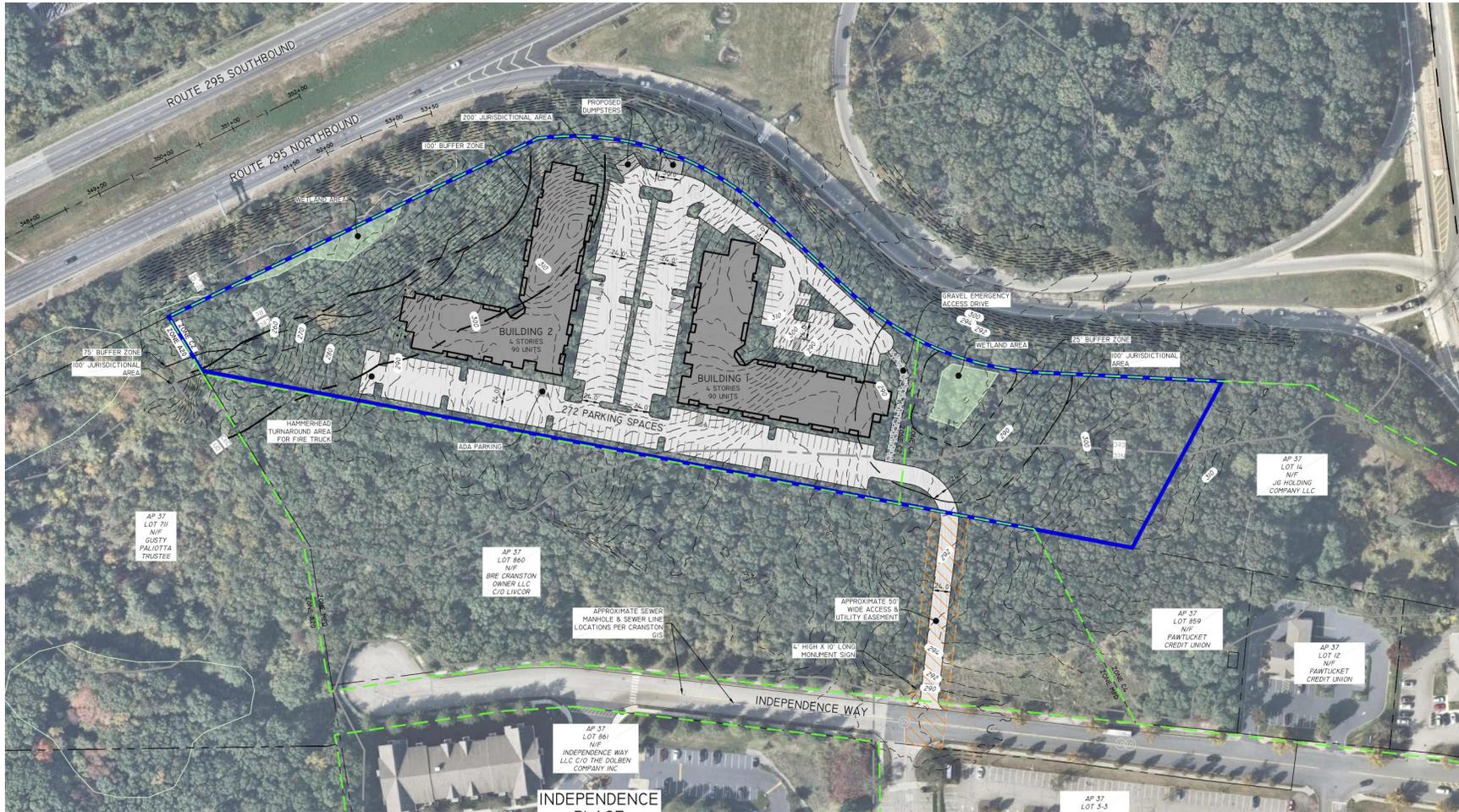
For this development, estimated traffic volumes for the residential apartment project were based on use of trip generation factors. These factors are taken from the "Trip Generation" manual, an informational report published by the Institute of Transportation Engineers (ITE), a national professional



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## Figure 4 - Site Layout



Site Plan provided by DiPrete Engineering

organization for traffic and transportation engineers. The data provided in the ITE report are based on extensive traffic studies for various types of land uses (residential, commercial, industrial, etc.). This data has been found to be very reliable and provides a sound basis for estimating future trips to new development projects.

For the proposed residential apartments project, Land Use Code (LUC) 221 Multifamily Housing (Mid-Rise) was reviewed for applicability in developing an estimate of site related vehicles trips. Table 1 below summarizes the peak hour site trips for the residential use that have been estimated utilizing the land use code data available from the ITE manual. The appropriate worksheets from the manual are included in the Appendix, along with the trip estimate calculations.

TABLE 1 – Trip Generation Estimate

Description		Enter	Exit	Total
<u>Weekday AM Peak Hour</u>				
ITE Land Use Code 221	Multifamily Housing (Mid-Rise)	15	52	67
<u>Weekday PM Peak Hour</u>				
ITE Land Use Code 221	Multifamily Housing (Mid-Rise)	43	28	71

## 5.2 FUTURE TRAFFIC CONDITIONS

In order to properly assess the impacts of a development, future traffic conditions of area roadways should be estimated for the period when the development is constructed and fully occupied. Typically, the expansion of base traffic is calculated when a project is to be constructed over an extended period (+3 to 5 years). In all instances, area growth that may affect capacity results should be considered. It is anticipated that this project would be constructed and occupied within a five-year period so for this project, a conservative annual growth rate 1.0 percent was utilized for the future background traffic growth, though the city has seen an annual population growth rate of less than 0.10% for the past decade and this area of the city is highly developed. The one percent rate was applied to the existing volumes to establish a Future 2027 No-Build condition on the servicing roadways. The proposed residential development was then added to the No-Build condition to establish the Future 2027 Build traffic condition.

In developing the intersection volumes to be analyzed under build conditions, a directional distribution of the site traffic was estimated. The distribution was based on current traffic patterns in the area including the proximity to Interstate 295. It is estimated that 70% of the site trips will arrive from and depart to the west along Plainfield Pike, 25% will arrive from and depart to the east along Plainfield Pike, and 5% will arrive from and depart to/from the Independence Way commercial plaza during both the morning and afternoon peak hours. Future site volume distribution figures are provided in the Appendix for reference.

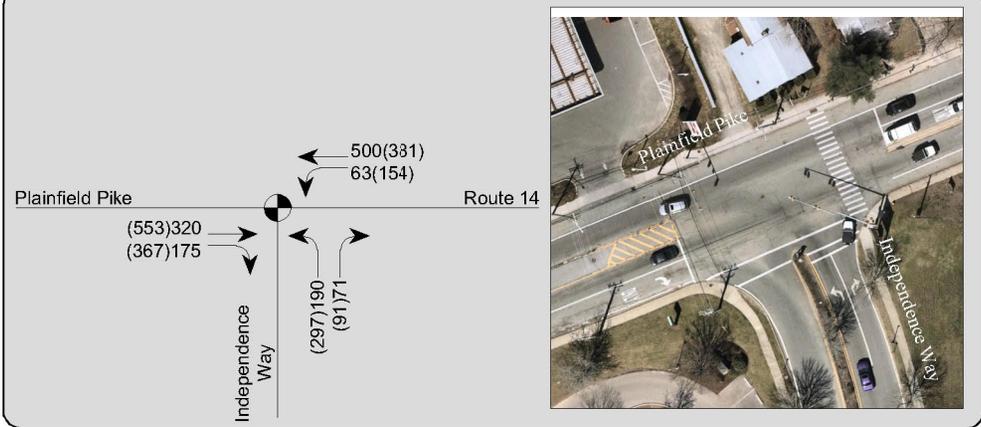


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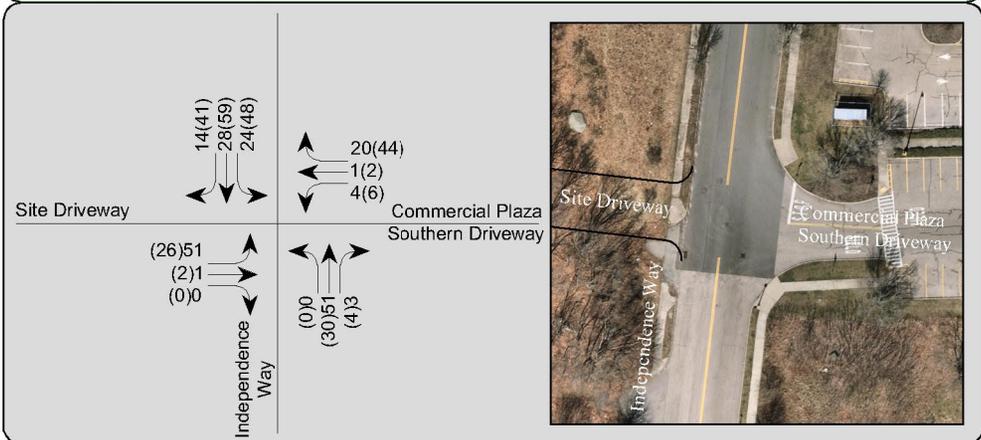
## Figure 5 - Future Traffic Volumes



### 1 Plainfield Pike (Route 14)/Independence Way



### 2 Independence Way/Commercial Plaza Southern Driveway/Site Driveway



#### LEGEND:

- TURN LANE
- XXX AM PEAK VOLUMES (8:00 TO 9:00)
- (XXX) PM PEAK VOLUMES (4:30 TO 5:30)
- 1 STUDY INTERSECTION
- TRAFFIC SIGNAL

### 5.3 OPERATIONAL ANALYSIS

The key to any traffic impact analysis is the evaluation of roadway operations during peak traffic periods on the servicing roadway system. This situation would occur when the site-generated traffic, combined with the traffic volumes on the main roadway, result in the highest one-hour volume serviced along a roadway segment, or through an intersection. Review of record traffic data found that the weekday morning and afternoon peak hours would represent this worst-case combination of site-generated traffic with the servicing roadway peak traffic period.

The Highway Capacity Manual methodology provides the most accurate means of evaluating traffic capacity and delays for roadways and intersections. The results of these procedures are expressed in terms of Level of Service (LOS). Level of Service is a qualitative measure of traffic flow efficiency based on anticipated vehicle delays. For example, LOS "A" represents the best condition with little or no delay, while LOS "F" indicates that the roadway/intersection is at full capacity resulting in extended vehicle delays and potential queuing. Table 2 outlines the Level of Service delay criteria presented in the Highway Capacity Manual for signalized and unsignalized intersections.

TABLE 2 – Highway Capacity Manual Criteria

Level of Service	Unsignalized Delay Per Vehicle (sec)	Signalized Delay Per Vehicle (sec)
A	<10	<10
B	>10 and <15	>10 and <20
C	>15 and <25	>20 and <35
D	>25 and <35	>35 and <55
E	>35 and <50	>55 and <80
F	>50	>80

The Independence Way intersections with Plainfield Pike (Route 4), the commercial plaza southern driveway, and with the new site driveway were analyzed for the weekday morning and afternoon peak hours. The capacity analysis worksheets are included in the Appendix and Tables 3 through 5 summarizes the results of the analyses.

Table 3 on the following page depicts the current conditions at the study intersections. As can be seen in the table, the signalized intersection of Plainfield Pike (Route 14) with Independence Way was determined to operate overall at an efficient LOS B during both the AM and PM peak hours with critical movements experiencing LOS D or better. The unsignalized intersection of Independence Way with the commercial plaza southern driveway found that all critical movements currently operate efficiently at LOS A.

TABLE 3 – Level of Service Summary (Existing Conditions)

Location / Movement	EXISTING CONDITIONS							
	AM Peak Hour				PM Peak Hour			
	LOS	Delay	95 <sup>th</sup> % Queue Length (veh.)	v/c	LOS	Delay	95 <sup>th</sup> % Queue Length (veh.)	v/c
Plainfield Pike (Route 14) at Independence Way (S)								
Plainfield Pike EB Thru	A	6.9	6	0.29	B	12.8	15	0.56
Plainfield Pike EB Right	A	6.1	1	0.16	B	10.9	4	0.35
Plainfield Pike WB Left	A	3.7	1	0.09	A	7.9	3	0.31
Plainfield Pike WB Thru	A	3.9	6	0.37	A	5.4	6	0.30
Independence Way NB Left	D	38.3	5	0.60	D	43.3	9	0.76
Independence Way NB Right	C	33.0	1	0.20	C	32.1	2	0.21
OVERALL	B	10.5	-	-	B	16.1	-	-
Independence Way at Commercial Plaza Southern Driveway (U)								
Independence Way SB Left	A	7.4	1	0.02	A	7.3	1	0.03
Plaza Driveway WB Left	A	8.8	1	0.03	A	8.7	1	0.05

(S) – Signalized

(U) – Unsignalized

Table 4 presents the future design period taking into consideration base traffic growth as noted earlier along the servicing roadways. The subject development is not included in this “No-Build” analysis scenario. As can be seen, the signalized intersection of Plainfield Pike (Route 14) with Independence Way continues to operate overall at a good LOS B during both the morning and afternoon peak traffic conditions similar to existing conditions. The unsignalized intersection of Independence Way with the commercial plaza southern driveway will also continue to operate efficiently with all critical movements experiencing LOS A.

Table 5 presents the future conditions post development where the analysis found that the signalized intersection of Plainfield Pike (Route 14) with Independence Way will operate overall in an efficient manner at LOS B during the daily peak hours of traffic with critical movements experiencing LOS D or better with a negligible increase in delays. Under the build condition, the unsignalized intersection of Independence Way with the commercial plaza southern driveway will be modified to include a new eastbound approach from the site, which will be Stop controlled. The unsignalized intersection will operate efficiently with the critical movements experiencing minor delays of fewer than 11 seconds, representing LOS B or better during the daily peak hours of traffic.

TABLE 4 – Level of Service Summary (Future No Build Conditions)

Location / Movement	FUTURE 2027 NO BUILD CONDITIONS							
	AM Peak Hour				PM Peak Hour			
	LOS	Delay	95 <sup>th</sup> % Queue Length (veh.)	v/c	LOS	Delay	95 <sup>th</sup> % Queue Length (veh.)	v/c
Plainfield Pike (Route 14) at Independence Way (S)								
Plainfield Pike EB Thru	A	7.2	7	0.31	B	13.8	16	0.60
Plainfield Pike EB Right	A	6.4	1	0.17	B	11.6	5	0.37
Plainfield Pike WB Left	A	3.9	1	0.09	A	8.7	3	0.35
Plainfield Pike WB Thru	A	4.2	7	0.40	A	5.8	7	0.32
Independence Way NB Left	D	38.0	6	0.61	D	44.3	10	0.77
Independence Way NB Right	C	32.7	1	0.20	C	31.6	2	0.22
OVERALL	B	10.7	-	-	B	16.9	-	-
Independence Way at Commercial Plaza Southern Driveway (U)								
Independence Way SB Left	A	7.4	1	0.02	A	7.3	1	0.03
Plaza Driveway WB Left	A	8.9	1	0.03	A	8.8	1	0.05

TABLE 5 – Level of Service Summary (Future Build Conditions)

Location / Movement	FUTURE 2027 BUILD CONDITIONS							
	AM Peak Hour				PM Peak Hour			
	LOS	Delay	95 <sup>th</sup> % Queue Length (veh.)	v/c	LOS	Delay	95 <sup>th</sup> % Queue Length (veh.)	v/c
Plainfield Pike (Route 14) at Independence Way (S)								
Plainfield Pike EB Thru	A	8.2	7	0.32	B	14.6	16	0.61
Plainfield Pike EB Right	A	7.4	2	0.19	B	12.7	5	0.41
Plainfield Pike WB Left	A	4.5	1	0.10	A	9.5	3	0.38
Plainfield Pike WB Thru	A	4.9	8	0.41	A	6.2	7	0.32
Independence Way NB Left	D	37.0	6	0.67	D	45.6	10	0.80
Independence Way NB Right	C	31.3	2	0.22	C	30.9	2	0.23
OVERALL	B	12.1	-	-	B	17.9	-	-
Independence Way at Commercial Plaza Southern Driveway (U)								
Independence Way NB Left	A	0.0	0	0.00	A	0.0	0	0.00
Independence Way SB Left	A	7.4	1	0.02	A	7.3	1	0.03
Site Driveway EB Left	B	10.2	1	0.08	B	10.6	1	0.05
Plaza Driveway WB Left	A	8.9	1	0.03	A	8.9	1	0.05

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

In summary, the study has shown that the proposed residential development project access and circulation plan has been designed to provide a level of traffic safety and efficiency on the servicing roadway system. The safety of the study intersection of Independence Way with the commercial plaza southern driveway was reviewed for geometry and sight distances. The study intersection was determined to provide sufficient sight distances in accordance with AASHTO criteria for visibility and decision making of drivers attempting to enter/exit main street traffic from the proposed site driveway.

In reference to safety, as previously noted, The RIDOT could review the following safety enhancements at the signalized intersection of Plainfield Pike (Route 14) with Independence Way as part of their general signal maintenance and optimization program:

1. The clearance intervals to determine if they require adjustment in an effort to reduce the number of rear-end collisions.
2. Addition of signal head backplates with reflectorized yellow strips to enhance traffic signal visibility.

The results of the operational analysis determined that the estimated increase in traffic during the peak periods resulting from the proposed residential development project will have a minor impact on overall traffic operations along Independence Way and Plainfield Pike (Route 14) in the project area, particularly during the weekday morning and afternoon peak hours when the site would service its greatest daily volumes.

Therefore, based upon the data collected on the servicing roadways, the analysis completed as part of this study, along with the access design and other recommendations proposed, the proposed residential apartments project was determined to have adequate and safe access to a public street, and will not have an adverse impact on public safety and welfare in the study area.

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<sup>1</sup>Aerial Images provided in this document were obtained from Nearmap.

# APPENDIX

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- A. Traffic Volume Data
  - B. Traffic Crash Data
  - C. Trip Generation
  - D. Operational Analysis

# APPENDIX A – Traffic Volume Data

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## Intersection Turning Movement Count

Plainfield Pike (Route 14) at Independence Way

Independence Way at Commercial Plaza Southern Driveway

# A

## Intersection Turning Movement Counts

Plainfield Pike (Route 14) at Independence Way  
Independence Way at Commercial Plaza Southern Driveway

Plainfield Pike (Route 14) at Independence Way

# BETA Group, Inc.

701 George Washington Highway  
Lincoln, Rhode Island 02865  
P: 401.333.2382 | W: www.BETA-inc.com

Project: Proposed Residential Development  
Town/City: Cranston, RI  
Location: Independence Way at Route 14  
Weather: 50s/Overcast

File Name : Independence Way at Plainfield Pike  
Site Code : 01044201  
Start Date : 5/19/2022  
Page No : 1

### Groups Printed- Cars - Heavy Vehicles

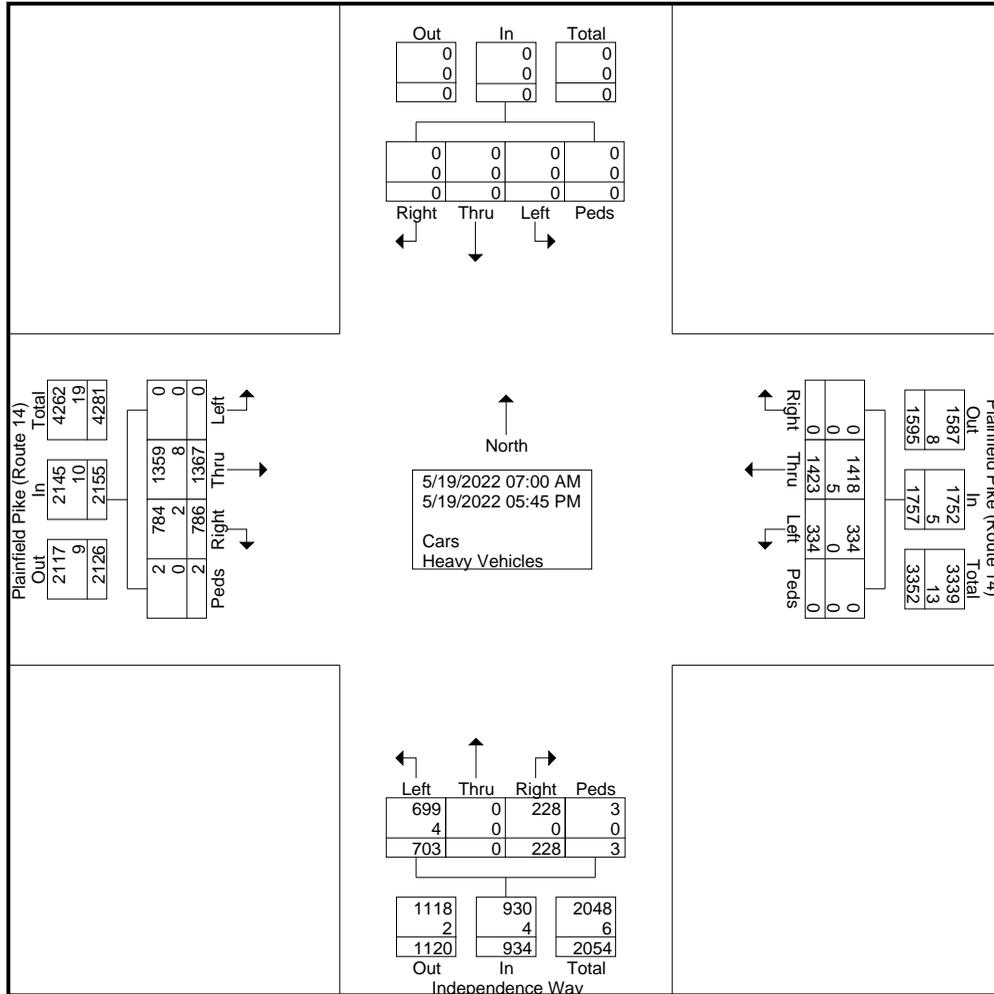
Start Time	Southbound					Plainfield Pike (Route 14) Westbound					Independence Way Northbound					Plainfield Pike (Route 14) Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
07:00 AM	0	0	0	0	0	0	84	12	0	96	12	0	28	0	40	28	66	0	0	94	230
07:15 AM	0	0	0	0	0	0	93	9	0	102	7	0	43	0	50	33	68	0	1	102	254
07:30 AM	0	0	0	0	0	0	113	9	0	122	10	0	37	0	47	39	65	0	0	104	273
07:45 AM	0	0	0	0	0	0	108	12	0	120	14	0	29	0	43	34	60	0	0	94	257
<b>Total</b>	0	0	0	0	0	0	398	42	0	440	43	0	137	0	180	134	259	0	1	394	1014
08:00 AM	0	0	0	0	0	0	119	14	0	133	12	0	35	0	47	37	86	0	0	123	303
08:15 AM	0	0	0	0	0	0	110	15	0	125	11	0	27	0	38	33	65	0	0	98	261
08:30 AM	0	0	0	0	0	0	106	12	0	118	12	0	45	0	57	41	73	0	0	114	289
08:45 AM	0	0	0	0	0	0	84	23	0	107	12	0	28	0	40	28	81	0	0	109	256
<b>Total</b>	0	0	0	0	0	0	419	64	0	483	47	0	135	0	182	139	305	0	0	444	1109
*** BREAK ***																					
04:00 PM	0	0	0	0	0	0	48	15	0	63	11	0	24	1	36	32	57	0	0	89	188
04:15 PM	0	0	0	0	0	0	70	27	0	97	7	0	50	0	57	44	56	0	0	100	254
04:30 PM	0	0	0	0	0	0	77	27	0	104	13	0	52	0	65	76	89	0	0	165	334
04:45 PM	0	0	0	0	0	0	80	31	0	111	17	0	67	2	86	71	112	0	0	183	380
<b>Total</b>	0	0	0	0	0	0	275	100	0	375	48	0	193	3	244	223	314	0	0	537	1156
05:00 PM	0	0	0	0	0	0	92	25	0	117	13	0	48	0	61	76	124	0	0	200	378
05:15 PM	0	0	0	0	0	0	85	45	0	130	20	0	74	0	94	74	128	0	0	202	426
05:30 PM	0	0	0	0	0	0	81	27	0	108	23	0	57	0	80	77	127	0	0	204	392
05:45 PM	0	0	0	0	0	0	73	31	0	104	34	0	59	0	93	63	110	0	1	174	371
<b>Total</b>	0	0	0	0	0	0	331	128	0	459	90	0	238	0	328	290	489	0	1	780	1567
<b>Grand Total</b>	0	0	0	0	0	0	1423	334	0	1757	228	0	703	3	934	786	1367	0	2	2155	4846
<b>Apprch %</b>	0	0	0	0		0	81	19	0		24.4	0	75.3	0.3		36.5	63.4	0	0.1		
<b>Total %</b>	0	0	0	0	0	0	29.4	6.9	0	36.3	4.7	0	14.5	0.1	19.3	16.2	28.2	0	0	44.5	
<b>Cars</b>	0	0	0	0	0	0	1418	334	0	1752	228	0	699	3	930	784	1359	0	2	2145	4827
<b>% Cars</b>	0	0	0	0	0	0	99.6	100	0	99.7	100	0	99.4	100	99.6	99.7	99.4	0	100	99.5	99.6
<b>Heavy Vehicles</b>	0	0	0	0	0	0	5	0	0	5	0	0	4	0	4	2	8	0	0	10	19
<b>% Heavy Vehicles</b>	0	0	0	0	0	0	0.4	0	0	0.3	0	0	0.6	0	0.4	0.3	0.6	0	0	0.5	0.4

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 Location: Independence Way at Route 14  
 Weather: 50s/Overcast

File Name : Independence Way at Plainfield Pike  
 Site Code : 01044201  
 Start Date : 5/19/2022  
 Page No : 2



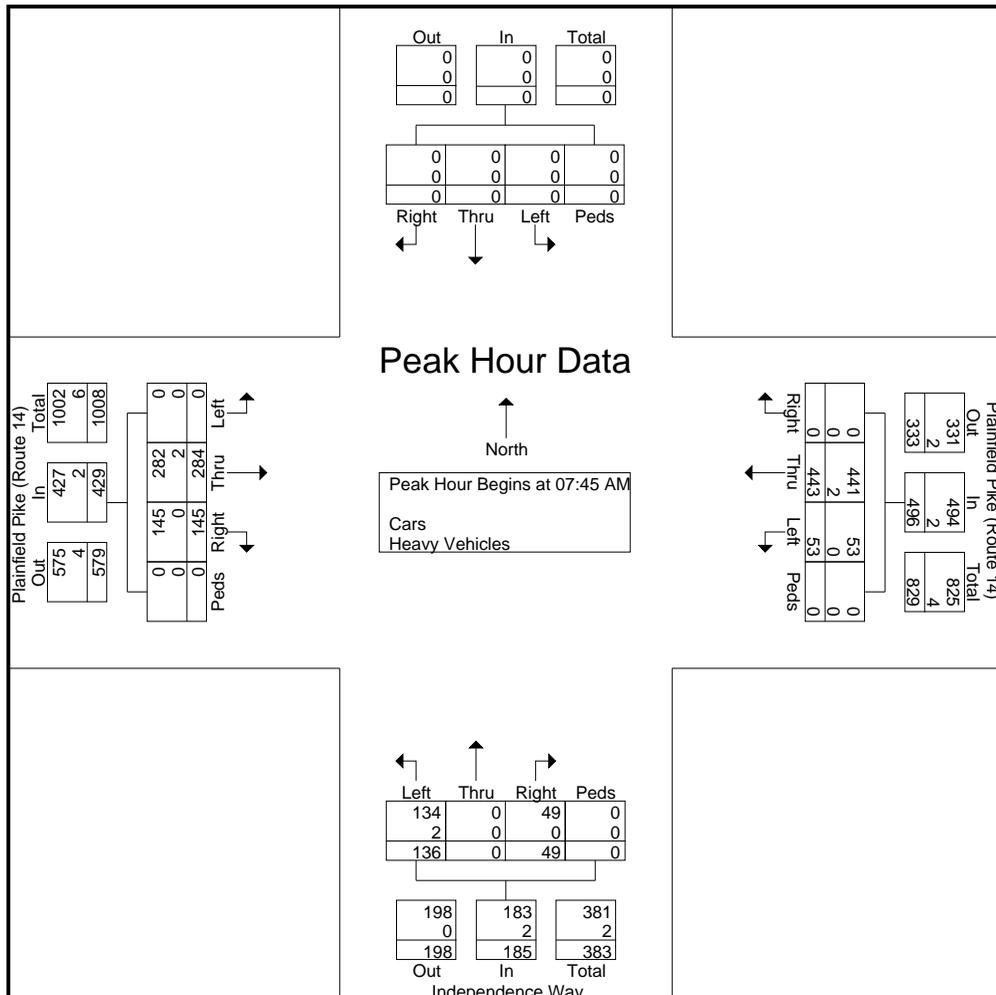
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Project: Proposed Residential Development  
Town/City: Cranston, RI  
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File Name : Independence Way at Plainfield Pike  
Site Code : 01044201  
Start Date : 5/19/2022  
Page No : 3

Start Time	Southbound					Plainfield Pike (Route 14) Westbound					Independence Way Northbound					Plainfield Pike (Route 14) Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	0	0	0	0	0	108	12	0	120	14	0	29	0	43	34	60	0	0	94	257
08:00 AM	0	0	0	0	0	0	119	14	0	133	12	0	35	0	47	37	86	0	0	123	303
08:15 AM	0	0	0	0	0	0	110	15	0	125	11	0	27	0	38	33	65	0	0	98	261
08:30 AM	0	0	0	0	0	0	106	12	0	118	12	0	45	0	57	41	73	0	0	114	289
Total Volume	0	0	0	0	0	0	443	53	0	496	49	0	136	0	185	145	284	0	0	429	1110
% App. Total	0	0	0	0	0	0	89.3	10.7	0	93.2	26.5	0	73.5	0	81.1	33.8	66.2	0	0	87.2	91.6
PHF	.000	.000	.000	.000	.000	.000	.931	.883	.000	.932	.875	.000	.756	.000	.811	.884	.826	.000	.000	.872	.916
Cars	0	0	0	0	0	0	441	53	0	494	49	0	134	0	183	145	282	0	0	427	1104
% Cars	0	0	0	0	0	0	99.5	100	0	99.6	100	0	98.5	0	98.9	100	99.3	0	0	99.5	99.5
Heavy Vehicles	0	0	0	0	0	0	2	0	0	2	0	0	2	0	2	0	2	0	0	2	6
% Heavy Vehicles	0	0	0	0	0	0	0.5	0	0	0.4	0	0	1.5	0	1.1	0	0.7	0	0	0.5	0.5



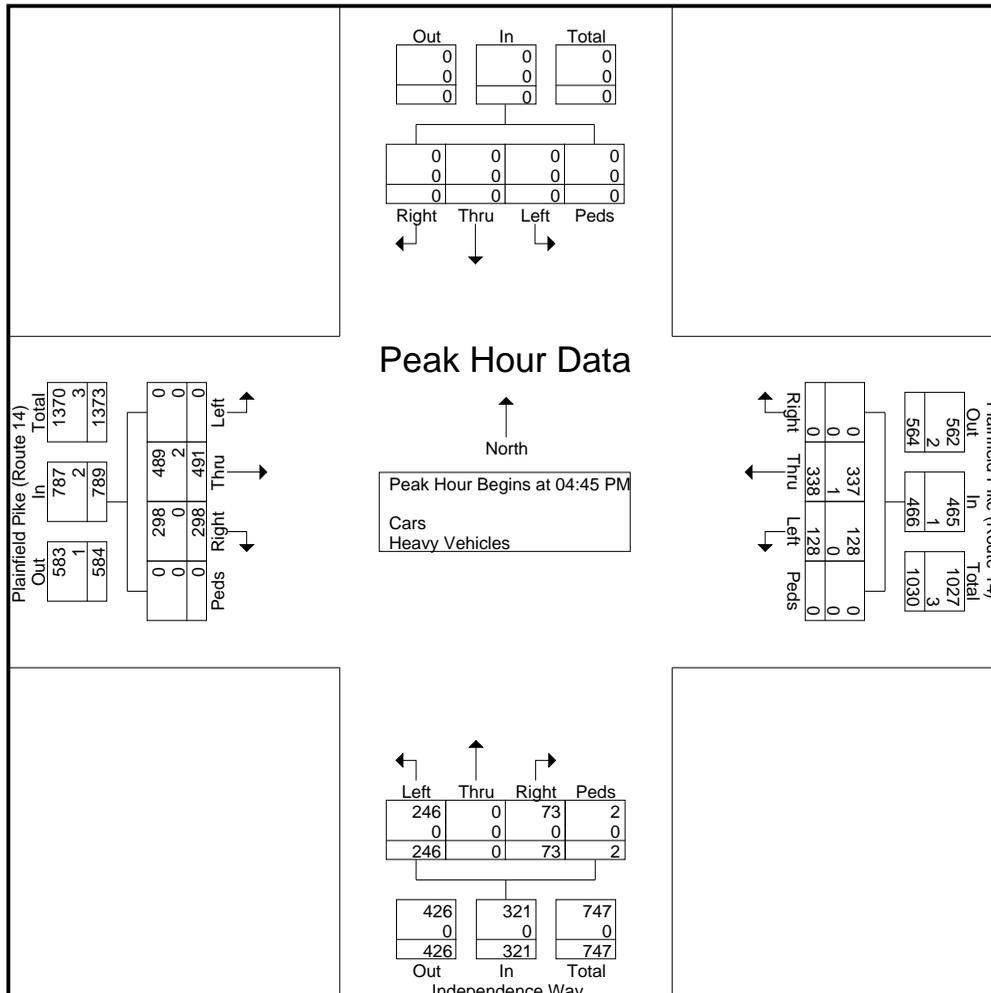
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Weather: 50s/Overcast

File Name : Independence Way at Plainfield Pike  
Site Code : 01044201  
Start Date : 5/19/2022  
Page No : 4

Start Time	Southbound					Plainfield Pike (Route 14) Westbound					Independence Way Northbound					Plainfield Pike (Route 14) Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	0	0	0	0	0	80	31	0	111	17	0	67	2	86	71	112	0	0	183	380
05:00 PM	0	0	0	0	0	0	92	25	0	117	13	0	48	0	61	76	124	0	0	200	378
05:15 PM	0	0	0	0	0	0	85	45	0	130	20	0	74	0	94	74	128	0	0	202	426
05:30 PM	0	0	0	0	0	0	81	27	0	108	23	0	57	0	80	77	127	0	0	204	392
Total Volume	0	0	0	0	0	0	338	128	0	466	73	0	246	2	321	298	491	0	0	789	1576
% App. Total	0	0	0	0	0	0	72.5	27.5	0		22.7	0	76.6	0.6		37.8	62.2	0	0		
PHF	.000	.000	.000	.000	.000	.000	.918	.711	.000	.896	.793	.000	.831	.250	.854	.968	.959	.000	.000	.967	.925
Cars	0	0	0	0	0	0	337	128	0	465	73	0	246	2	321	298	489	0	0	787	1573
% Cars	0	0	0	0	0	0	99.7	100	0	99.8	100	0	100	100	100	100	99.6	0	0	99.7	99.8
Heavy Vehicles	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	3
% Heavy Vehicles	0	0	0	0	0	0	0.3	0	0	0.2	0	0	0	0	0	0	0.4	0	0	0.3	0.2



Independence Way at Commercial Plaza Southern Driveway

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Project: Proposed Residential Developmen  
Town/City: Cranston, RI  
Location: Independence Way at South Plaz  
Weather: 50s/Overcast

File Name : Independence Way at Plaza Southern Driveway  
Site Code : 01044202  
Start Date : 5/19/2022  
Page No : 1

### Groups Printed- Cars - Heavy Vehicles

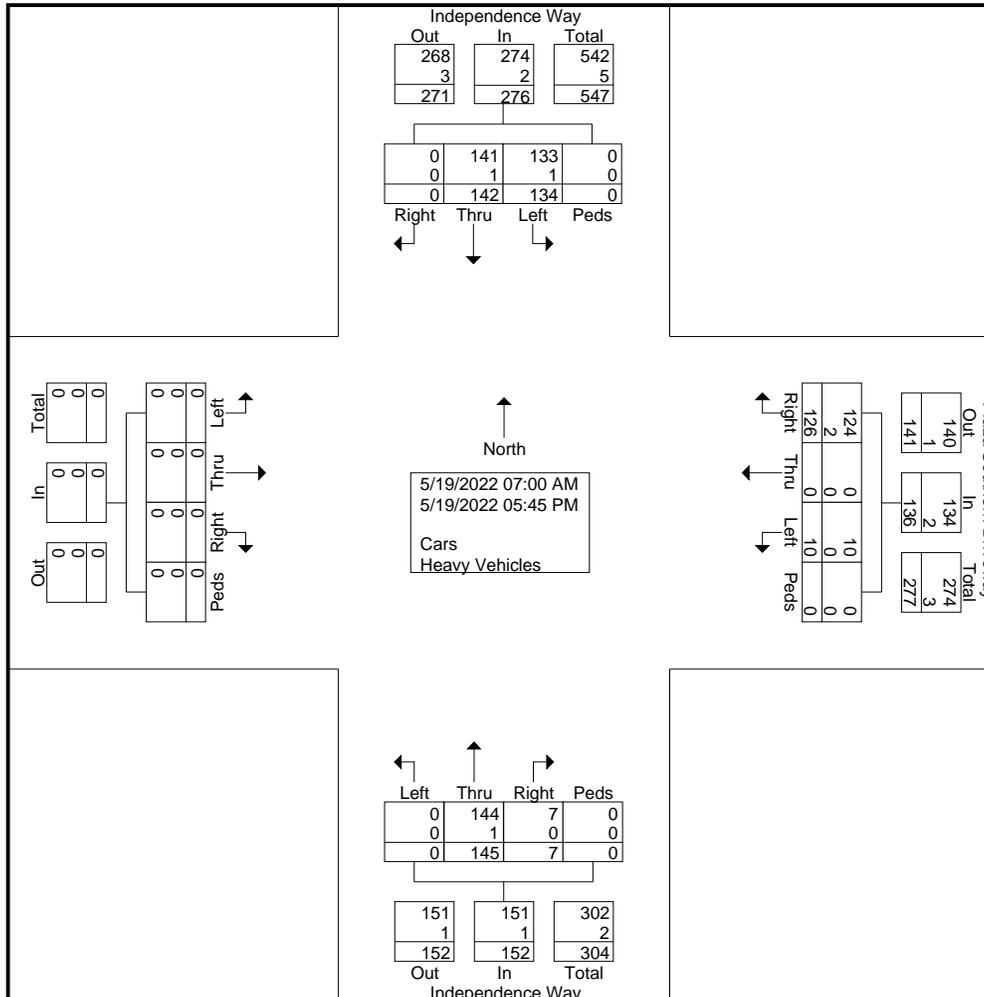
Start Time	Independence Way Southbound					Plaza Southern Driveway Westbound					Independence Way Northbound					Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
07:00 AM	0	6	6	0	12	3	0	0	0	3	0	8	0	0	8	0	0	0	0	0	23
07:15 AM	0	4	5	0	9	5	0	0	0	5	1	13	0	0	14	0	0	0	0	0	28
07:30 AM	0	3	8	0	11	3	0	1	0	4	0	14	0	0	14	0	0	0	0	0	29
07:45 AM	0	3	4	0	7	5	0	0	0	5	0	10	0	0	10	0	0	0	0	0	22
<b>Total</b>	<b>0</b>	<b>16</b>	<b>23</b>	<b>0</b>	<b>39</b>	<b>16</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>17</b>	<b>1</b>	<b>45</b>	<b>0</b>	<b>0</b>	<b>46</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>102</b>
08:00 AM	0	1	3	0	4	3	0	1	0	4	0	9	0	0	9	0	0	0	0	0	17
08:15 AM	0	10	6	0	16	7	0	0	0	7	1	13	0	0	14	0	0	0	0	0	37
08:30 AM	0	7	6	0	13	5	0	0	0	5	1	14	0	0	15	0	0	0	0	0	33
08:45 AM	0	8	7	0	15	4	0	2	0	6	0	12	0	0	12	0	0	0	0	0	33
<b>Total</b>	<b>0</b>	<b>26</b>	<b>22</b>	<b>0</b>	<b>48</b>	<b>19</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>22</b>	<b>2</b>	<b>48</b>	<b>0</b>	<b>0</b>	<b>50</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>120</b>
*** BREAK ***																					
04:00 PM	0	11	10	0	21	15	0	0	0	15	1	3	0	0	4	0	0	0	0	0	40
04:15 PM	0	13	15	0	28	9	0	0	0	9	0	8	0	0	8	0	0	0	0	0	45
04:30 PM	0	16	12	0	28	10	0	0	0	10	1	5	0	0	6	0	0	0	0	0	44
04:45 PM	0	15	7	0	22	13	0	2	0	15	0	8	0	0	8	0	0	0	0	0	45
<b>Total</b>	<b>0</b>	<b>55</b>	<b>44</b>	<b>0</b>	<b>99</b>	<b>47</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>49</b>	<b>2</b>	<b>24</b>	<b>0</b>	<b>0</b>	<b>26</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>174</b>
05:00 PM	0	12	11	0	23	9	0	3	0	12	2	7	0	0	9	0	0	0	0	0	44
05:15 PM	0	9	15	0	24	12	0	1	0	13	0	8	0	0	8	0	0	0	0	0	45
05:30 PM	0	15	10	0	25	10	0	0	0	10	0	7	0	0	7	0	0	0	0	0	42
05:45 PM	0	9	9	0	18	13	0	0	0	13	0	6	0	0	6	0	0	0	0	0	37
<b>Total</b>	<b>0</b>	<b>45</b>	<b>45</b>	<b>0</b>	<b>90</b>	<b>44</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>48</b>	<b>2</b>	<b>28</b>	<b>0</b>	<b>0</b>	<b>30</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>168</b>
<b>Grand Total</b>	<b>0</b>	<b>142</b>	<b>134</b>	<b>0</b>	<b>276</b>	<b>126</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>136</b>	<b>7</b>	<b>145</b>	<b>0</b>	<b>0</b>	<b>152</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>564</b>
Apprch %	0	51.4	48.6	0		92.6	0	7.4	0		4.6	95.4	0	0		0	0	0	0		
Total %	0	25.2	23.8	0	48.9	22.3	0	1.8	0	24.1	1.2	25.7	0	0	27	0	0	0	0	0	
Cars	0	141	133	0	274	124	0	10	0	134	7	144	0	0	151	0	0	0	0	0	559
% Cars	0	99.3	99.3	0	99.3	98.4	0	100	0	98.5	100	99.3	0	0	99.3	0	0	0	0	0	99.1
Heavy Vehicles	0	1	1	0	2	2	0	0	0	2	0	1	0	0	1	0	0	0	0	0	5
% Heavy Vehicles	0	0.7	0.7	0	0.7	1.6	0	0	0	1.5	0	0.7	0	0	0.7	0	0	0	0	0	0.9

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 Location: Independence Way at South Plaz  
 Weather: 50s/Overcast

File Name : Independence Way at Plaza Southern Driveway  
 Site Code : 01044202  
 Start Date : 5/19/2022  
 Page No : 2



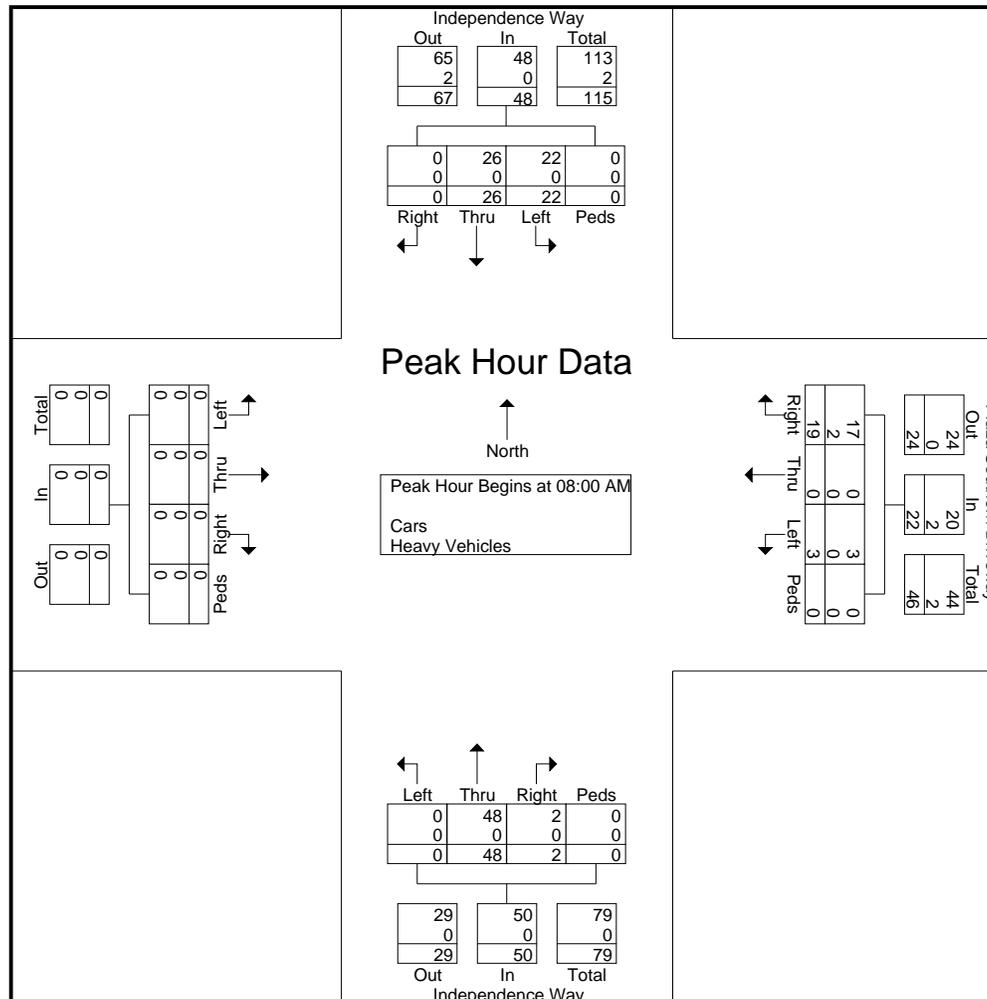


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File Name : Independence Way at Plaza Southern Driveway  
 Site Code : 01044202  
 Start Date : 5/19/2022  
 Page No : 4



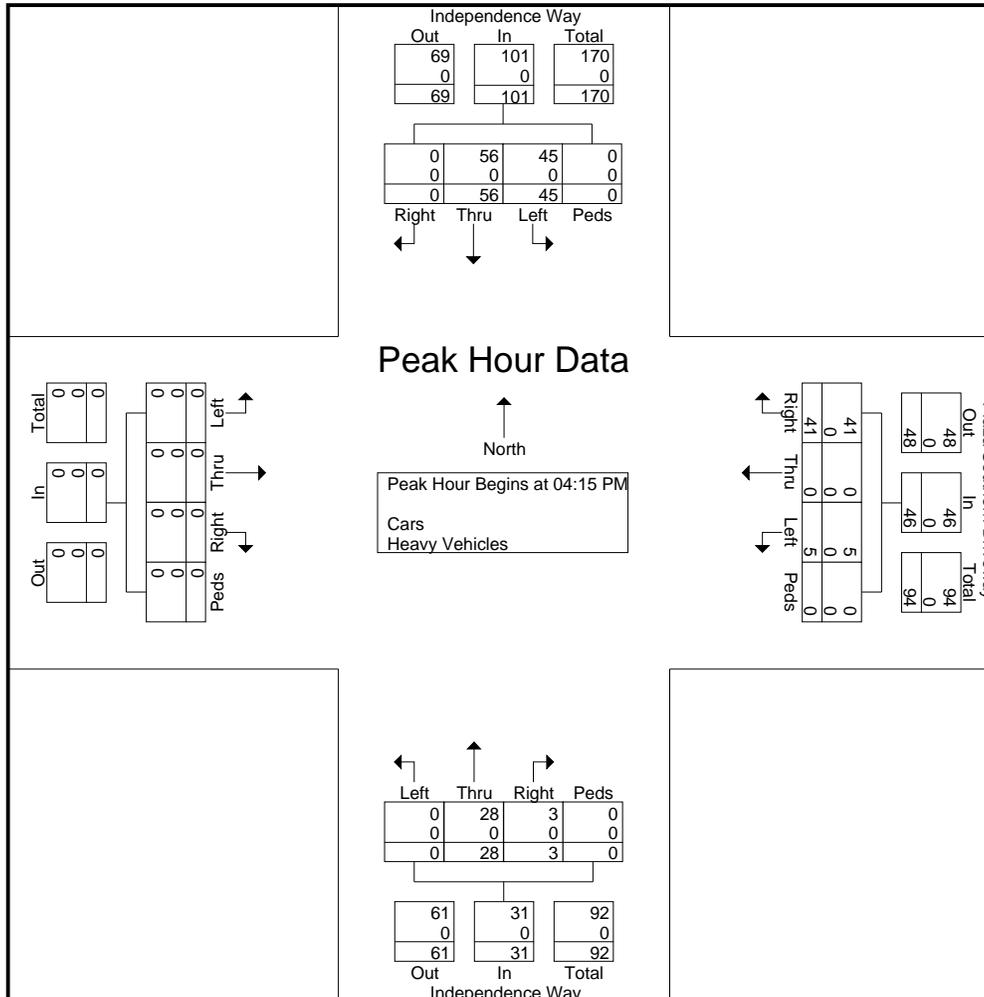


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 Weather: 50s/Overcast

File Name : Independence Way at Plaza Southern Driveway  
 Site Code : 01044202  
 Start Date : 5/19/2022  
 Page No : 6



# APPENDIX B – Traffic Crash Data

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January 2017 through December 2019

Independence Way – Plainfield Pike (Route 14) to Southern Terminus

Crash Data Summary

	Year			Total	Average per Year
	2017	2018	2019		
Intersections					
Plainfield Pike (Route 14) at Independence Way	2	2	4	8	3
Corridor					
Independence Way - Plainfield Pike (Route 14) to Southern Terminus	0	1	2	3	1
Total	2	3	6	11	3

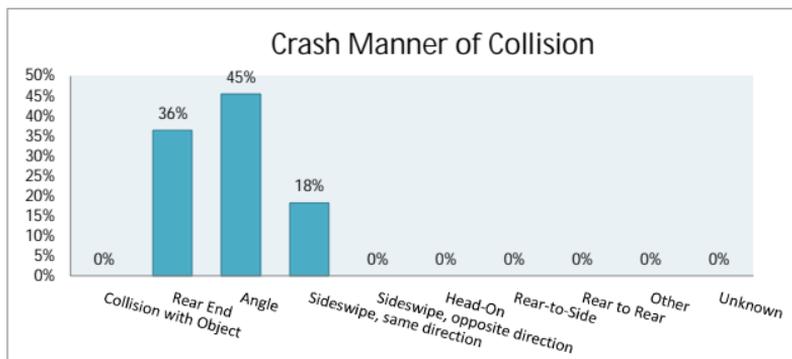
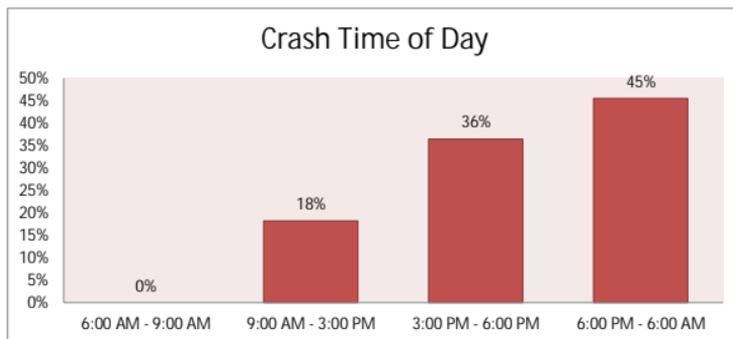
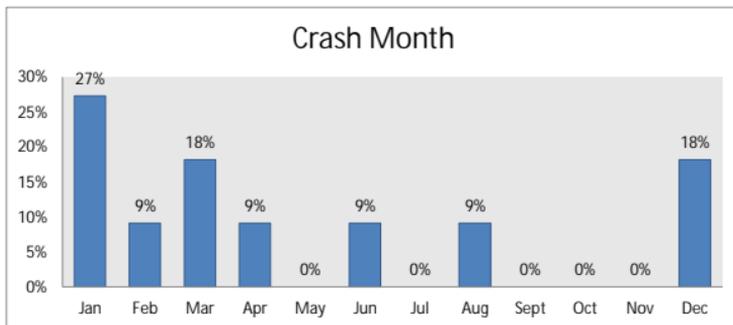
Plainfield Pike (Route 14) at Independence Way

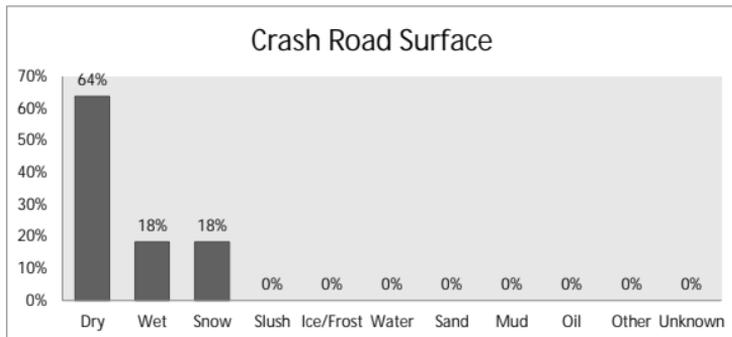
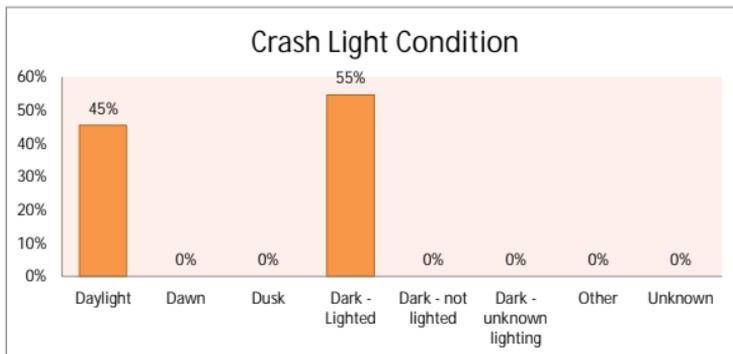
	2017	2018	2019	Total	Percent
<b>Collision Type</b>					
Rear End	0	0	4	4	50%
Angle	1	2	0	3	38%
Head-On	0	0	0	0	0%
Pedestrian	0	0	0	0	0%
Sideswipe, Same Direction	1	0	0	1	13%
Sideswipe, Opposite Direction	0	0	0	0	0%
Rear-to-Side	0	0	0	0	0%
Collision with Object	0	0	0	0	0%
Other	0	0	0	0	0%
Unknown	0	0	0	0	0%
<b>Crash Severity</b>					
Property	2	2	3	7	88%
Injury	0	0	1	1	13%
<b>Light Condition</b>					
Daylight	0	2	2	4	50%
Dawn	0	0	0	0	0%
Dusk	0	0	0	0	0%
Dark - Lighted	2	0	2	4	50%
Dark - Not Lighted	0	0	0	0	0%
Dark - Unknown Lighting	0	0	0	0	0%
Other	0	0	0	0	0%
Unknown	0	0	0	0	0%
<b>Road Condition</b>					
Dry	1	1	3	5	63%
Wet	0	1	0	1	13%
Snow	1	0	1	2	25%
Other	0	0	0	0	0%
Unknown	0	0	0	0	0%
<b>Hour of Day</b>					
6:00 AM - 9:00 AM	0	0	0	0	0%
9:00 AM - 3:00 PM	0	1	0	1	13%
3:00 PM - 6:00 PM	0	1	2	3	38%
6:00 PM - 6:00 AM	2	0	2	4	50%
<b>Total Crashes:</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>8</b>	

Independence Way - Plainfield Pike (Route 14) to Southern Terminus

	2017	2018	2019	Total	Percent
<b>Collision Type</b>					
Rear End	0	0	0	0	0%
Angle	0	0	2	2	67%
Head-On	0	0	0	0	0%
Pedestrian	0	0	0	0	0%
Sideswipe, Same Direction	0	1	0	1	33%
Sideswipe, Opposite Direction	0	0	0	0	0%
Rear-to-Side	0	0	0	0	0%
Collision with Object	0	0	0	0	0%
Other	0	0	0	0	0%
Unknown	0	0	0	0	0%
<b>Crash Severity</b>					
Property	0	1	1	2	67%
Injury	0	0	1	1	33%
<b>Light Condition</b>					
Daylight	0	0	1	1	33%
Dawn	0	0	0	0	0%
Dusk	0	0	0	0	0%
Dark - Lighted	0	1	1	2	67%
Dark - Not Lighted	0	0	0	0	0%
Dark - Unknown Lighting	0	0	0	0	0%
Other	0	0	0	0	0%
Unknown	0	0	0	0	0%
<b>Road Condition</b>					
Dry	0	1	1	2	67%
Wet	0	0	1	1	33%
Snow	0	0	0	0	0%
Other	0	0	0	0	0%
Unknown	0	0	0	0	0%
<b>Hour of Day</b>					
6:00 AM - 9:00 AM	0	0	0	0	0%
9:00 AM - 3:00 PM	0	0	1	1	33%
3:00 PM - 6:00 PM	0	0	1	1	33%
6:00 PM - 6:00 AM	0	1	0	1	33%
<b>Total Crashes:</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	

## Crash Data Summary Charts





# APPENDIX C – Trip Generation

---

ITE Trip Generation Summary

Site Trip Distribution

ITE Land Use Code

ITE Land Use Code 221 – Multifamily Housing (Mid-Rise)

C

ITE Trip Generation Summary

## Trip Generation Summary

### Summary:

	<u>Description</u>	<u>Enter</u>	<u>Exit</u>	<u>Total</u>
<u>Weekday AM Peak Hour</u>				
ITE Land Use Code 221	Multifamily Housing (Mid-Rise)	15	52	67
<u>Weekday PM Peak Hour</u>				
ITE Land Use Code 221	Multifamily Housing (Mid-Rise)	43	28	71

## Calculations;

ITE Land Use Code 221      Multifamily Housing (Mid-Rise)      (180 Dwelling Units)

Independent Variable (X) = Dwelling Units

X = 180

AM Peak

Directional Distribution:

23% Entering    77% Exiting

$$T = 0.37 \times (X)$$

$$\text{Enter: } 15$$

$$T = 0.37 \times 180$$

$$\text{Exit: } 52$$

$$T = 67$$

$$\text{Total: } 67$$

PM Peak

Directional Distribution:

61% Entering    39% Exiting

$$T = 0.39 \times (X)$$

$$\text{Enter: } 43$$

$$T = 0.39 \times 180$$

$$\text{Exit: } 28$$

$$T = 71$$

$$\text{Total: } 71$$

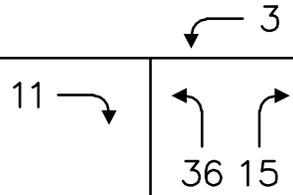
C

Site Trip Distribution



Plainfield Pike

Route 14

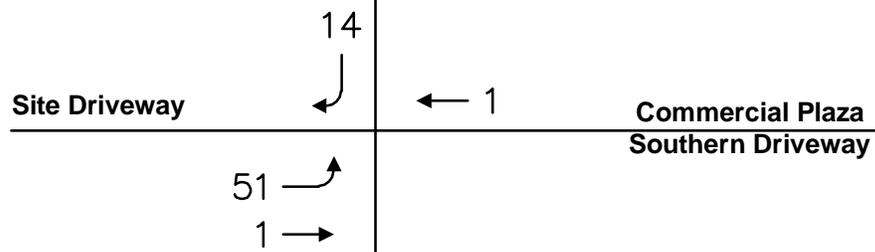


Independence Way

**SITE**

**Site Trips:**

Enter: 15  
Exit: 52  
Total: 67



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**SITE TRIP DISTRIBUTION  
WEEKDAY AM PEAK HOUR**

**PROPOSED RESIDENTIAL DEVELOPMENT  
CRANSTON, RHODE ISLAND**



Plainfield Pike

Route 14

10

31

19 7

Independence Way

**SITE**

**Site Trips:**

Enter: 43  
Exit: 28  
Total: 71

Site Driveway

41

2

Commercial Plaza  
Southern Driveway

26  
2



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SITE TRIP DISTRIBUTION  
WEEKDAY PM PEAK HOUR

PROPOSED RESIDENTIAL DEVELOPMENT  
CRANSTON, RHODE ISLAND

C

ITE Land Use Code

ITE Land Use Code 221 – Multifamily Housing (Mid-Rise)

# Land Use: 221

## Multifamily Housing (Mid-Rise)

---

### Description

Mid-rise multifamily housing includes apartments and condominiums located in a building that has between four and 10 floors of living space. Access to individual dwelling units is through an outside building entrance, a lobby, elevator, and a set of hallways.

Multifamily housing (low-rise) (Land Use 220), multifamily housing (high-rise) (Land Use 222), off-campus student apartment (mid-rise) (Land Use 226), and mid-rise residential with ground-floor commercial (Land Use 231) are related land uses.

### Land Use Subcategory

Data are presented for two subcategories for this land use: (1) not close to rail transit and (2) close to rail transit. A site is considered close to rail transit if the walking distance between the residential site entrance and the closest rail transit station entrance is ½ mile or less.

### Additional Data

For the six sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.5 residents per occupied dwelling unit.

For the five sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96 percent of the total dwelling units were occupied.

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

***It is expected that the number of bedrooms and number of residents are likely correlated to the trips generated by a residential site. To assist in future analysis, trip generation studies of all multifamily housing should attempt to obtain information on occupancy rate and on the mix of residential unit sizes (i.e., number of units by number of bedrooms at the site complex).***

The sites were surveyed in the 1990s, the 2000s, the 2010s, and the 2020s in Alberta (CAN), California, District of Columbia, Florida, Georgia, Illinois, Maryland, Massachusetts, Minnesota, Montana, New Jersey, New York, Ontario (CAN), Oregon, Utah, and Virginia.

### Source Numbers

168, 188, 204, 305, 306, 321, 818, 857, 862, 866, 901, 904, 910, 949, 951, 959, 963, 964, 966, 967, 969, 970, 1004, 1014, 1022, 1023, 1025, 1031, 1032, 1035, 1047, 1056, 1057, 1058, 1071, 1076

# Multifamily Housing (Mid-Rise) Not Close to Rail Transit (221)

## Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 30

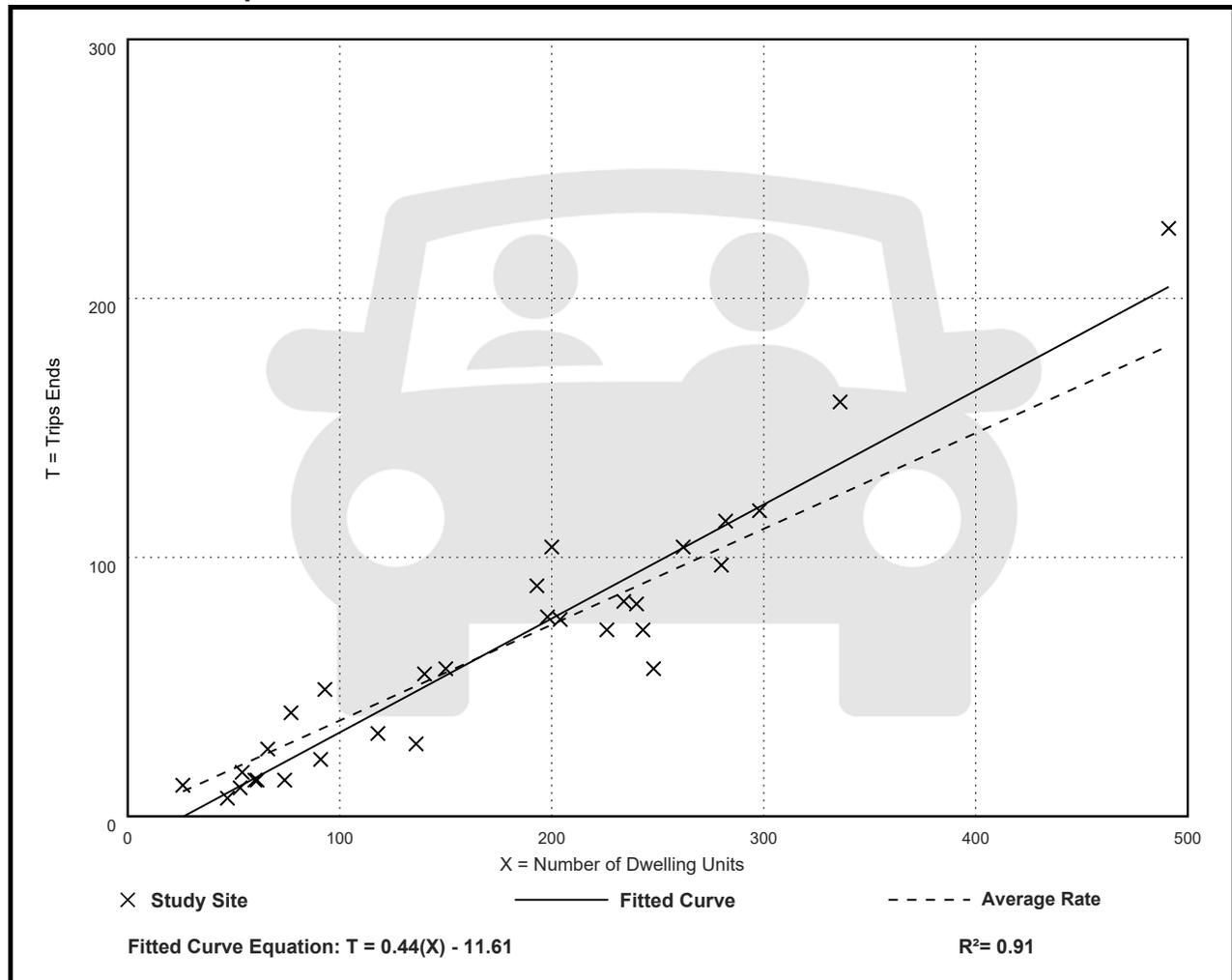
Avg. Num. of Dwelling Units: 173

Directional Distribution: 23% entering, 77% exiting

## Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.37	0.15 - 0.53	0.09

## Data Plot and Equation



# Multifamily Housing (Mid-Rise) Not Close to Rail Transit (221)

## Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 31

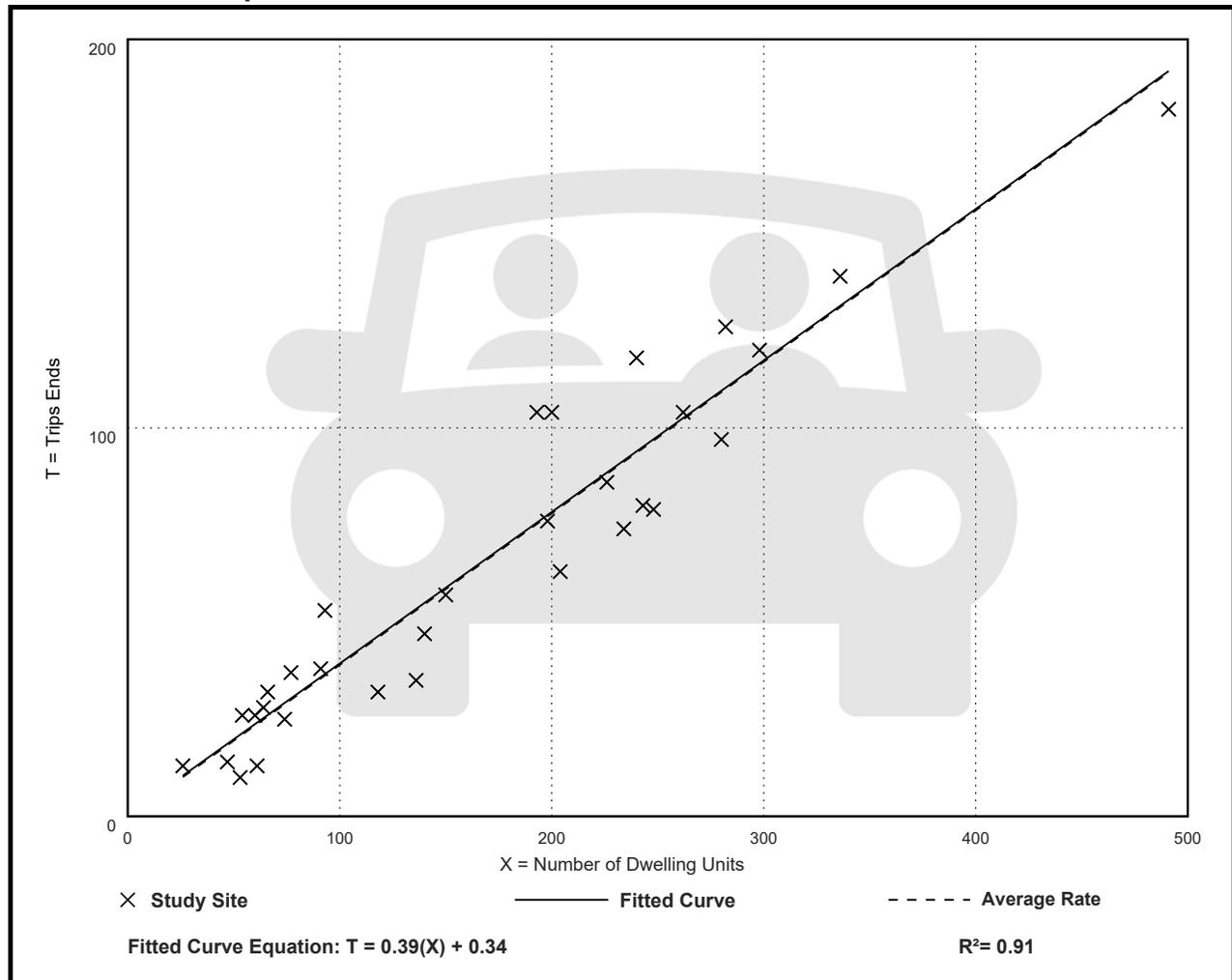
Avg. Num. of Dwelling Units: 169

Directional Distribution: 61% entering, 39% exiting

## Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.39	0.19 - 0.57	0.08

## Data Plot and Equation



# APPENDIX D – Operational Analysis

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## Existing Conditions

Plainfield Pike (Route 14) at Independence Way

Independence Way at Commercial Plaza Southern Driveway

## Future No Build Conditions

Plainfield Pike (Route 14) at Independence Way

Independence Way at Commercial Plaza Southern Driveway

## Future Build Conditions

Plainfield Pike (Route 14) at Independence Way

Independence Way at Commercial Plaza Southern Driveway/Site Driveway

D

Existing Weekday AM/ PM Peak Hour

Plainfield Pike (Route 14) at Independence Way  
Independence Way at Commercial Plaza Southern Driveway

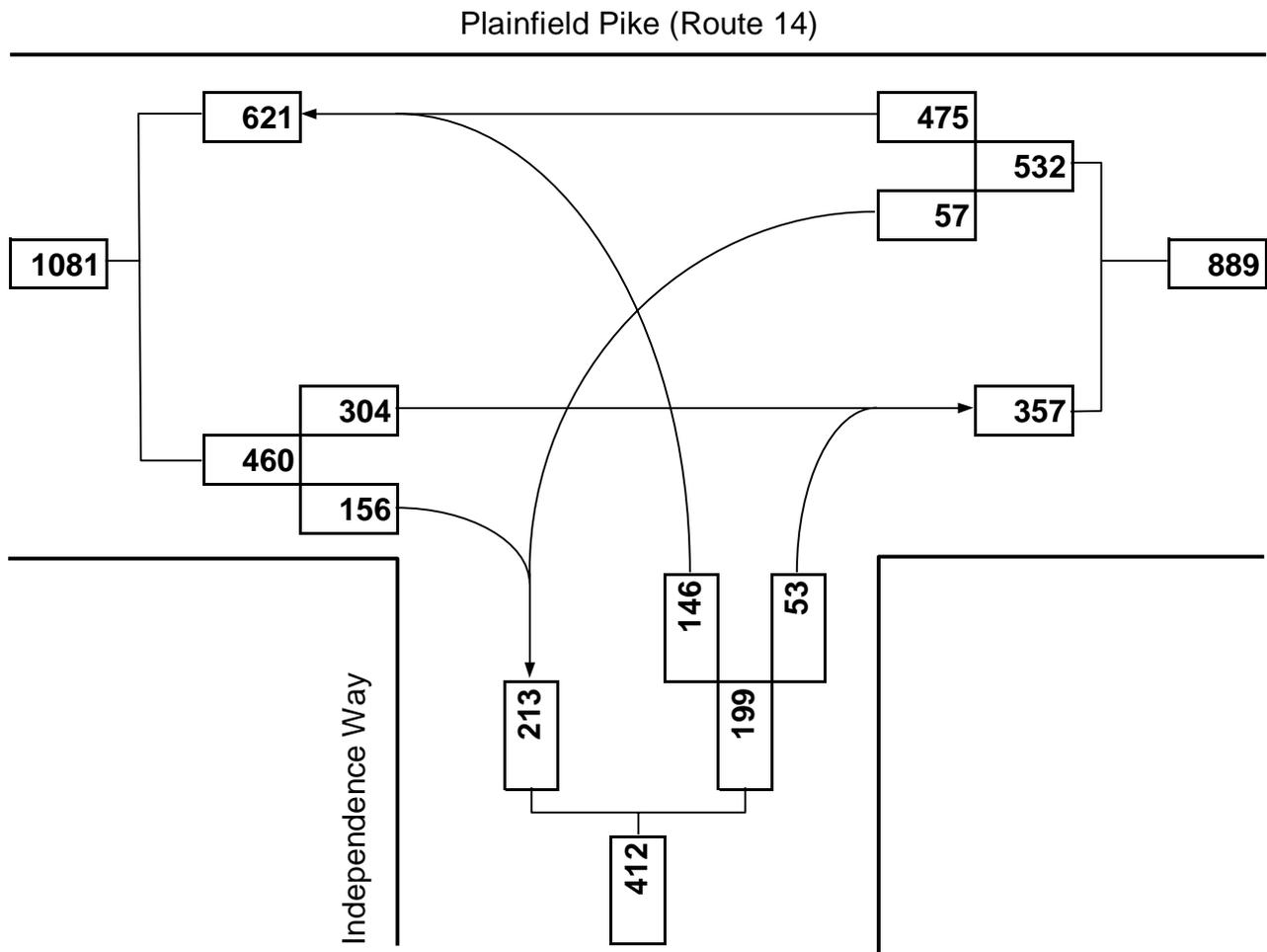
Plainfield Pike (Route 14) at Independence Way



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### Turning Movement Diagram

<b>Major Street:</b>	Plainfield Pike (Route 14)	<b>Minor Street:</b>	Independence Way
<b>City/Town:</b>	Cranston, RI	<b>Day of Week:</b>	Weekday
<b>Reference No.:</b>	10442	<b>Peak Period:</b>	8:00 AM - 9:00 AM
<b>Existing:</b>	AM Peak Hour	<b>Future:</b>	n/a



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/02/2022  
Cranston, RI

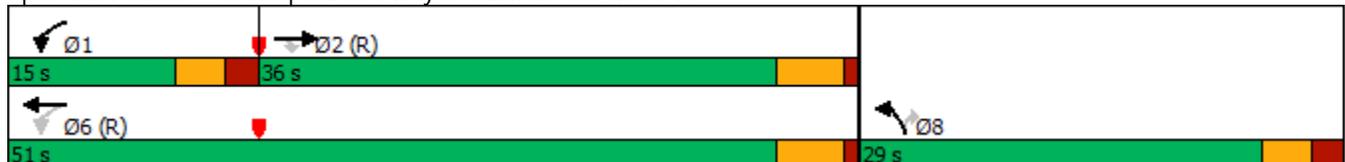


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↘	↗
Traffic Volume (vph)	304	156	57	475	146	53
Future Volume (vph)	304	156	57	475	146	53
Lane Group Flow (vph)	330	170	62	516	159	58
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	8.0	8.0	6.0	8.0	6.0	6.0
Minimum Split (s)	13.0	13.0	11.0	13.0	11.0	11.0
Total Split (s)	36.0	36.0	15.0	51.0	29.0	29.0
Total Split (%)	45.0%	45.0%	18.8%	63.8%	36.3%	36.3%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)	1.0	1.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Min	C-Min	None	C-Min	None	None
v/c Ratio	0.29	0.16	0.09	0.37	0.60	0.20
Control Delay	9.6	2.1	4.2	5.6	40.8	9.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	2.1	4.2	5.6	40.8	9.8
Queue Length 50th (ft)	75	0	7	78	75	0
Queue Length 95th (ft)	145	27	21	156	125	29
Internal Link Dist (ft)	453			571	906	
Turn Bay Length (ft)		100	150		200	
Base Capacity (vph)	1143	1057	764	1378	531	525
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.16	0.08	0.37	0.30	0.11

Intersection Summary

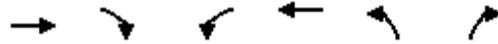
Cycle Length: 80  
 Actuated Cycle Length: 80  
 Offset: 60 (75%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 40  
 Control Type: Actuated-Coordinated

Splits and Phases: 3: Independence Way & Plainfield Pike/Route 14



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/02/2022  
Cranston, RI



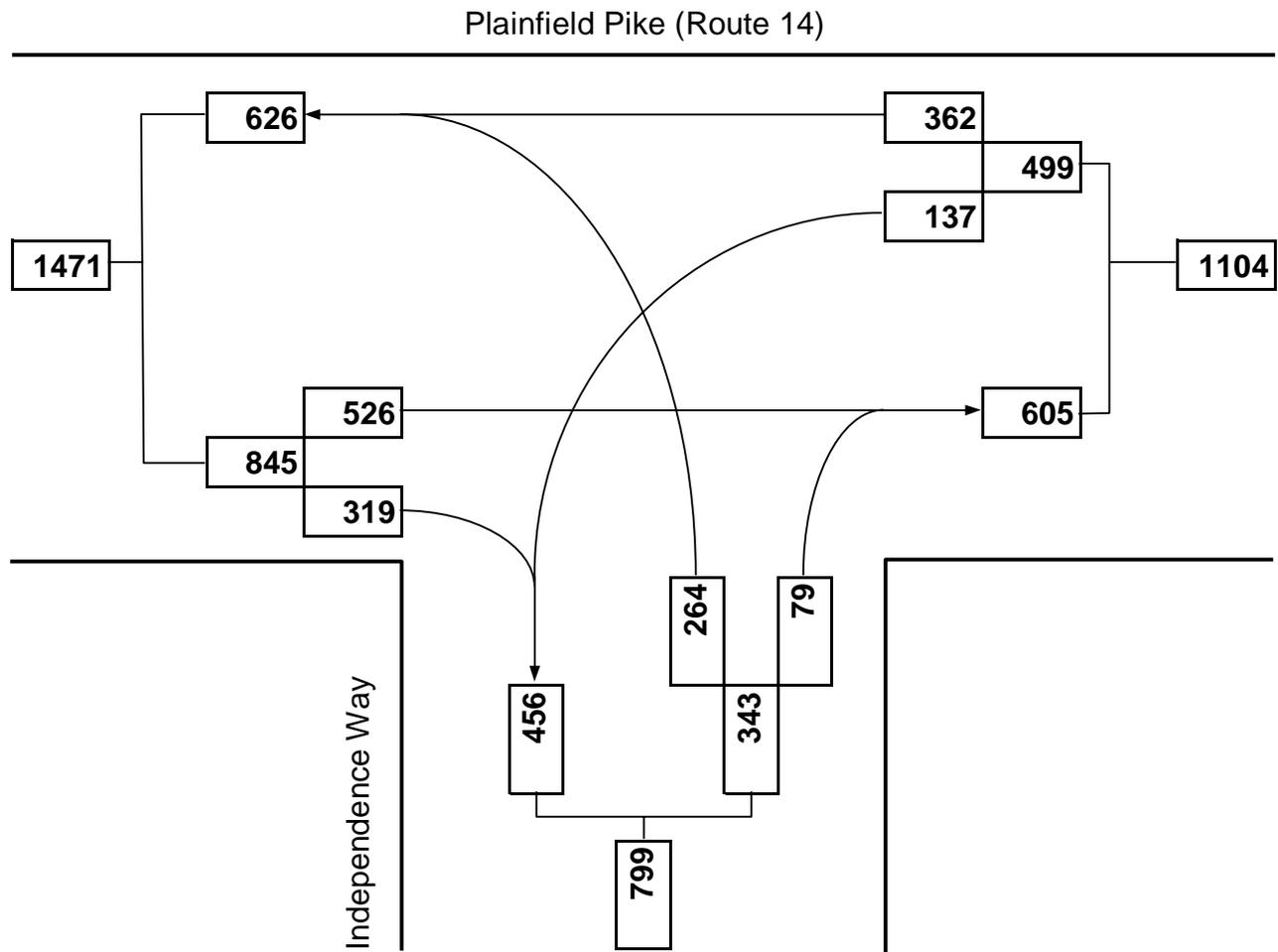
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↖	↗
Traffic Volume (veh/h)	304	156	57	475	146	53
Future Volume (veh/h)	304	156	57	475	146	53
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1900	1870	1900	1870	1900
Adj Flow Rate, veh/h	330	170	62	516	159	58
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	2	0	2	0
Cap, veh/h	1197	1030	695	1441	208	188
Arrive On Green	0.64	0.64	0.06	0.76	0.12	0.12
Sat Flow, veh/h	1870	1610	1781	1900	1781	1610
Grp Volume(v), veh/h	330	170	62	516	159	58
Grp Sat Flow(s),veh/h/ln	1870	1610	1781	1900	1781	1610
Q Serve(g_s), s	6.2	3.4	0.8	7.2	6.9	2.6
Cycle Q Clear(g_c), s	6.2	3.4	0.8	7.2	6.9	2.6
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1197	1030	695	1441	208	188
V/C Ratio(X)	0.28	0.17	0.09	0.36	0.76	0.31
Avail Cap(c_a), veh/h	1197	1030	818	1441	534	483
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.3	5.8	3.7	3.2	34.3	32.4
Incr Delay (d2), s/veh	0.6	0.3	0.0	0.7	4.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	1.1	0.2	2.0	3.2	1.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	6.9	6.1	3.7	3.9	38.3	33.0
LnGrp LOS	A	A	A	A	D	C
Approach Vol, veh/h	500			578	217	
Approach Delay, s/veh	6.6			3.9	36.8	
Approach LOS	A			A	D	
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	9.5	56.2			65.7	14.3
Change Period (Y+Rc), s	5.0	5.0			5.0	5.0
Max Green Setting (Gmax), s	10.0	31.0			46.0	24.0
Max Q Clear Time (g_c+l1), s	2.8	8.2			9.2	8.9
Green Ext Time (p_c), s	0.0	0.6			1.9	0.5
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			10.5			
HCM 6th LOS			B			



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### Turning Movement Diagram

<b>Major Street:</b>	Plainfield Pike (Route 14)	<b>Minor Street:</b>	Independence Way
<b>City/Town:</b>	Cranston, RI	<b>Day of Week:</b>	Weekday
<b>Reference No.:</b>	10442	<b>Peak Period:</b>	4:30 PM - 5:30 PM
<b>Existing:</b>	PM Peak Hour	<b>Future:</b>	n/a



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/02/2022  
Cranston, RI

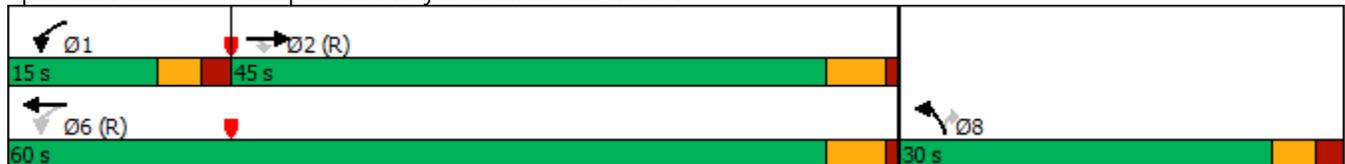


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	526	319	137	362	264	79
Future Volume (vph)	526	319	137	362	264	79
Lane Group Flow (vph)	566	343	147	389	284	85
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	8.0	8.0	6.0	8.0	6.0	6.0
Minimum Split (s)	13.0	13.0	11.0	13.0	11.0	11.0
Total Split (s)	45.0	45.0	15.0	60.0	30.0	30.0
Total Split (%)	50.0%	50.0%	16.7%	66.7%	33.3%	33.3%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)	1.0	1.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Min	C-Min	None	C-Min	None	None
v/c Ratio	0.56	0.35	0.31	0.30	0.76	0.21
Control Delay	17.9	6.2	7.7	7.3	46.0	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.9	6.2	7.7	7.3	46.0	7.5
Queue Length 50th (ft)	198	33	26	78	152	0
Queue Length 95th (ft)	369	102	58	150	219	34
Internal Link Dist (ft)	453			571	906	
Turn Bay Length (ft)		100	150		200	
Base Capacity (vph)	1008	974	507	1293	501	510
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.35	0.29	0.30	0.57	0.17

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 76 (84%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 60  
 Control Type: Actuated-Coordinated

Splits and Phases: 3: Independence Way & Plainfield Pike/Route 14



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/02/2022  
Cranston, RI



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↖	↗
Traffic Volume (veh/h)	526	319	137	362	264	79
Future Volume (veh/h)	526	319	137	362	264	79
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1900	1870	1900	1900	1900
Adj Flow Rate, veh/h	566	343	147	389	284	85
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	0	2	0	0	0
Cap, veh/h	1095	943	445	1342	331	294
Arrive On Green	0.59	0.59	0.06	0.71	0.18	0.18
Sat Flow, veh/h	1870	1610	1781	1900	1810	1610
Grp Volume(v), veh/h	566	343	147	389	284	85
Grp Sat Flow(s),veh/h/ln	1870	1610	1781	1900	1810	1610
Q Serve(g_s), s	16.2	10.1	2.6	6.8	13.7	4.1
Cycle Q Clear(g_c), s	16.2	10.1	2.6	6.8	13.7	4.1
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1095	943	445	1342	331	294
V/C Ratio(X)	0.52	0.36	0.33	0.29	0.86	0.29
Avail Cap(c_a), veh/h	1095	943	527	1342	503	447
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.1	9.8	7.7	4.9	35.7	31.7
Incr Delay (d2), s/veh	1.7	1.1	0.2	0.5	7.6	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.6	3.5	0.9	2.4	6.7	1.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	12.8	10.9	7.9	5.4	43.3	32.1
LnGrp LOS	B	B	A	A	D	C
Approach Vol, veh/h				536	369	
Approach Delay, s/veh				6.1	40.7	
Approach LOS				A	D	
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	10.8	57.7			68.6	21.4
Change Period (Y+Rc), s	5.0	5.0			5.0	5.0
Max Green Setting (Gmax), s	10.0	40.0			55.0	25.0
Max Q Clear Time (g_c+l1), s	4.6	18.2			8.8	15.7
Green Ext Time (p_c), s	0.1	1.0			1.3	0.7
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			16.1			
HCM 6th LOS			B			

Independence Way at Commercial Plaza Southern Driveway



Proposed Residential Development  
 Independence Way at Commercial Plaza Southern Driveway

06/02/2022  
 Cranston, RI

Intersection						
Int Delay, s/veh	3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	19	48	2	22	26
Future Vol, veh/h	3	19	48	2	22	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	0	2	0	0	0	0
Mvmt Flow	4	23	59	2	27	32

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	146	60	0	0	61	0
Stage 1	60	-	-	-	-	-
Stage 2	86	-	-	-	-	-
Critical Hdwy	6.4	6.22	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.318	-	-	2.2	-
Pot Cap-1 Maneuver	851	1005	-	-	1555	-
Stage 1	968	-	-	-	-	-
Stage 2	942	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	836	1005	-	-	1555	-
Mov Cap-2 Maneuver	836	-	-	-	-	-
Stage 1	968	-	-	-	-	-
Stage 2	925	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	3.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	978	1555
HCM Lane V/C Ratio	-	-	0.028	0.017
HCM Control Delay (s)	-	-	8.8	7.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1

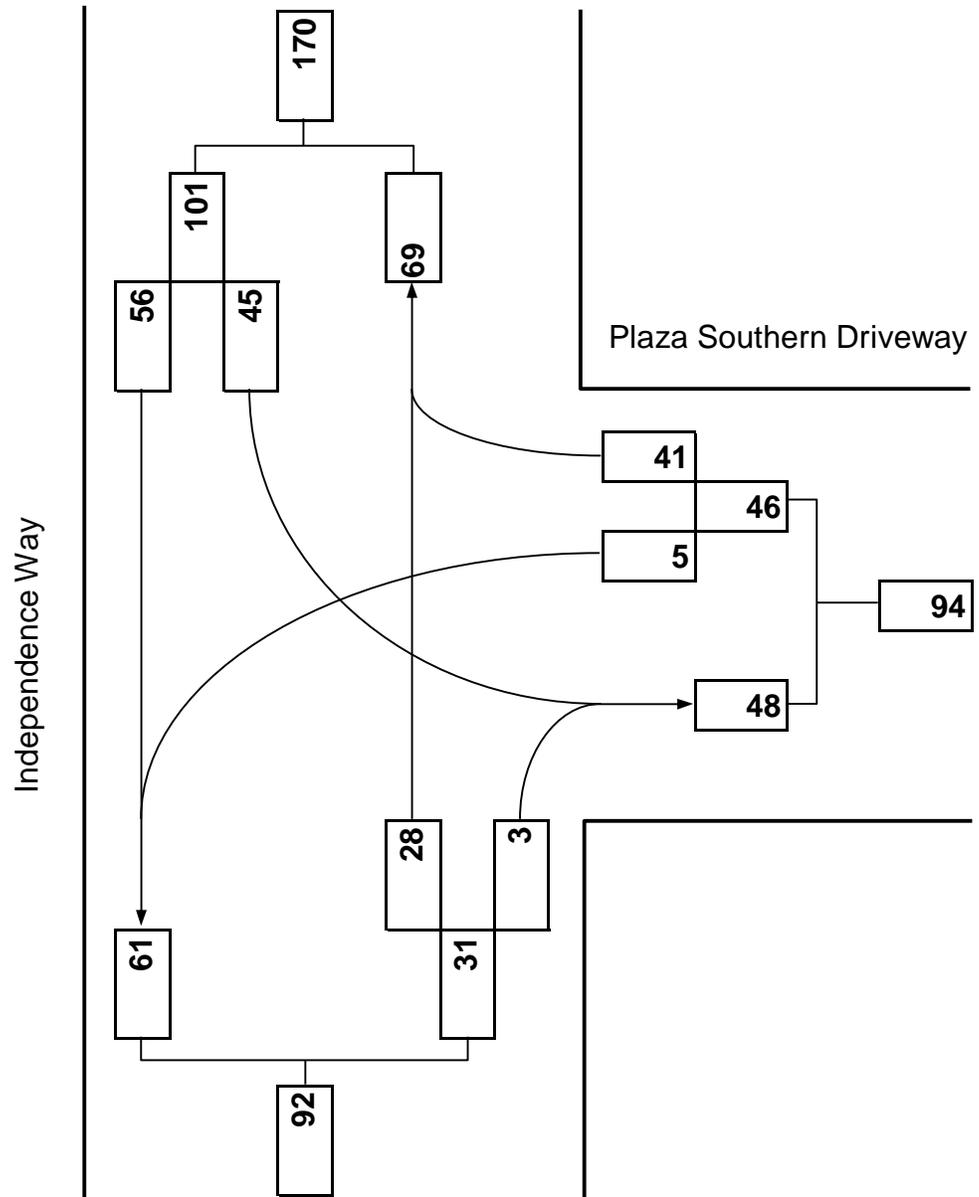


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### Turning Movement Diagram

**Major Street:** Independence Way  
**City/Town:** Cranston, RI  
**Reference No.:** 10442  
**Existing:** PM Peak Hour

**Minor Street:** Plaza Southern Driveway  
**Day of Week:** Weekday  
**Peak Period:** 4:30 PM - 5:30 PM  
**Future:** n/a



Proposed Residential Development  
 Independence Way at Commercial Plaza Southern Driveway

06/02/2022  
 Cranston, RI

Intersection						
Int Delay, s/veh	4.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	41	28	3	45	56
Future Vol, veh/h	5	41	28	3	45	56
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	5	41	28	3	45	57

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	177	30	0	0	31	0
Stage 1	30	-	-	-	-	-
Stage 2	147	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	817	1050	-	-	1595	-
Stage 1	998	-	-	-	-	-
Stage 2	885	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	793	1050	-	-	1595	-
Mov Cap-2 Maneuver	793	-	-	-	-	-
Stage 1	998	-	-	-	-	-
Stage 2	859	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.7	0	3.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	1014	1595
HCM Lane V/C Ratio	-	-	0.046	0.028
HCM Control Delay (s)	-	-	8.7	7.3
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1

D

Future No Build Weekday AM/ PM Peak Hour

Plainfield Pike (Route 14) at Independence Way  
Independence Way at Commercial Plaza Southern Driveway

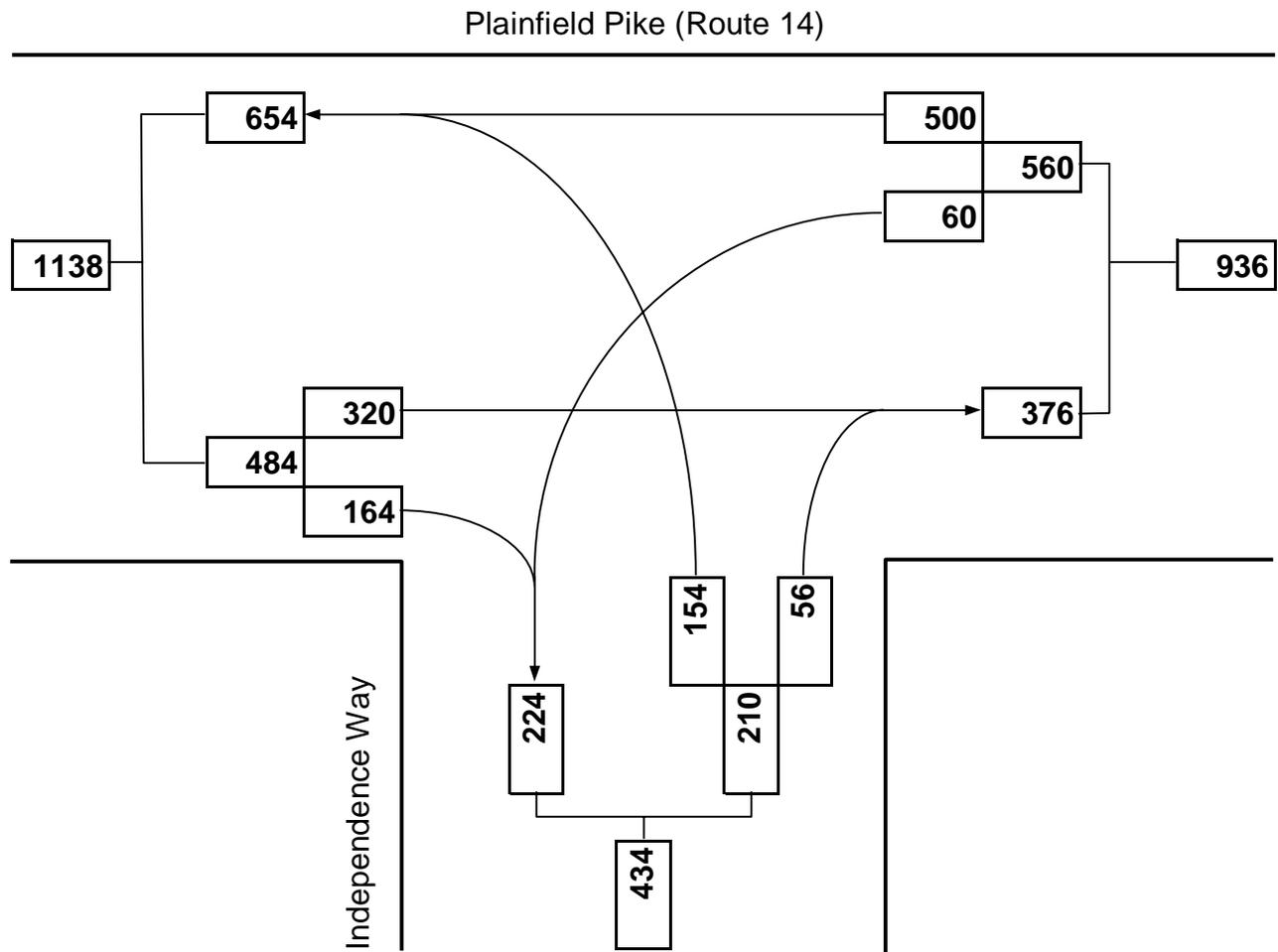
Plainfield Pike (Route 14) at Independence Way



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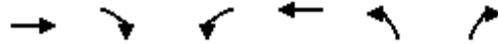
### Turning Movement Diagram

<b>Major Street:</b>	Plainfield Pike (Route 14)	<b>Minor Street:</b>	Independence Way
<b>City/Town:</b>	Cranston, RI	<b>Day of Week:</b>	Weekday
<b>Reference No.:</b>	10442	<b>Peak Period:</b>	AM Peak Hour
<b>Existing:</b>	n/a	<b>Future:</b>	2027 No Build



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/02/2022  
Cranston, RI

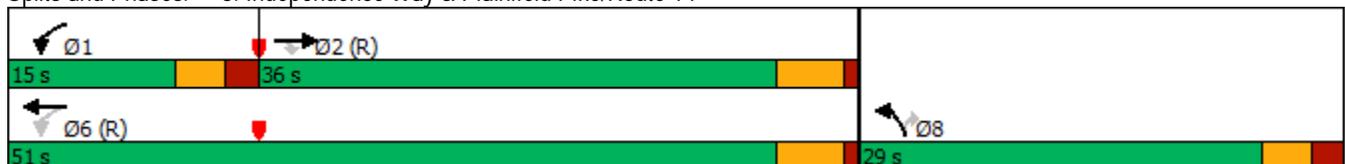


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	320	164	60	500	154	56
Future Volume (vph)	320	164	60	500	154	56
Lane Group Flow (vph)	348	178	65	543	167	61
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	8.0	8.0	6.0	8.0	6.0	6.0
Minimum Split (s)	13.0	13.0	11.0	13.0	11.0	11.0
Total Split (s)	36.0	36.0	15.0	51.0	29.0	29.0
Total Split (%)	45.0%	45.0%	18.8%	63.8%	36.3%	36.3%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)	1.0	1.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Min	C-Min	None	C-Min	None	None
v/c Ratio	0.31	0.17	0.09	0.40	0.61	0.20
Control Delay	10.0	2.1	4.3	6.0	40.8	9.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.0	2.1	4.3	6.0	40.8	9.5
Queue Length 50th (ft)	81	0	8	86	79	0
Queue Length 95th (ft)	157	28	22	172	131	29
Internal Link Dist (ft)	453			571	906	
Turn Bay Length (ft)		100	150		200	
Base Capacity (vph)	1135	1053	744	1370	531	527
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.17	0.09	0.40	0.31	0.12

Intersection Summary

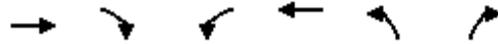
Cycle Length: 80  
 Actuated Cycle Length: 80  
 Offset: 60 (75%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 40  
 Control Type: Actuated-Coordinated

Splits and Phases: 3: Independence Way & Plainfield Pike/Route 14



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/02/2022  
Cranston, RI



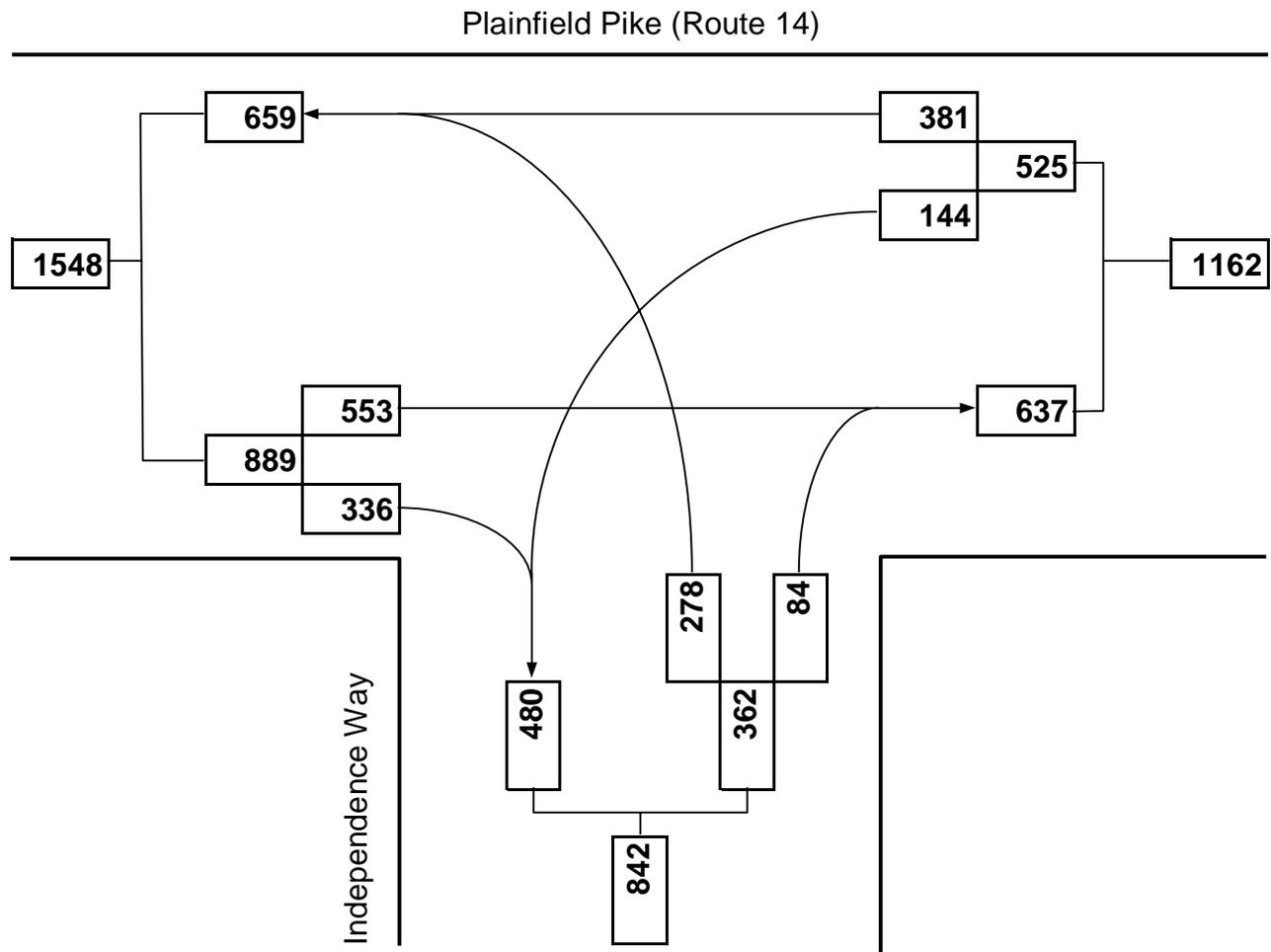
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↖	↗
Traffic Volume (veh/h)	320	164	60	500	154	56
Future Volume (veh/h)	320	164	60	500	154	56
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1900	1870	1900	1870	1900
Adj Flow Rate, veh/h	348	178	65	543	167	61
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	2	0	2	0
Cap, veh/h	1185	1020	674	1432	216	196
Arrive On Green	0.63	0.63	0.06	0.75	0.12	0.12
Sat Flow, veh/h	1870	1610	1781	1900	1781	1610
Grp Volume(v), veh/h	348	178	65	543	167	61
Grp Sat Flow(s),veh/h/ln	1870	1610	1781	1900	1781	1610
Q Serve(g_s), s	6.7	3.6	0.9	7.9	7.3	2.8
Cycle Q Clear(g_c), s	6.7	3.6	0.9	7.9	7.3	2.8
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1185	1020	674	1432	216	196
V/C Ratio(X)	0.29	0.17	0.10	0.38	0.77	0.31
Avail Cap(c_a), veh/h	1185	1020	795	1432	534	483
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.6	6.0	3.9	3.4	34.1	32.1
Incr Delay (d2), s/veh	0.6	0.4	0.0	0.8	4.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	1.2	0.2	2.3	3.3	1.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.2	6.4	3.9	4.2	38.0	32.7
LnGrp LOS	A	A	A	A	D	C
Approach Vol, veh/h	526			608	228	
Approach Delay, s/veh	6.9			4.1	36.6	
Approach LOS	A			A	D	
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	9.6	55.7			65.3	14.7
Change Period (Y+Rc), s	5.0	5.0			5.0	5.0
Max Green Setting (Gmax), s	10.0	31.0			46.0	24.0
Max Q Clear Time (g_c+l1), s	2.9	8.7			9.9	9.3
Green Ext Time (p_c), s	0.0	0.6			2.0	0.5
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			10.7			
HCM 6th LOS			B			



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### Turning Movement Diagram

<b>Major Street:</b>	Plainfield Pike (Route 14)	<b>Minor Street:</b>	Independence Way
<b>City/Town:</b>	Cranston, RI	<b>Day of Week:</b>	Weekday
<b>Reference No.:</b>	10442	<b>Peak Period:</b>	PM Peak Hour
<b>Existing:</b>	n/a	<b>Future:</b>	2027 No Build



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/02/2022  
Cranston, RI

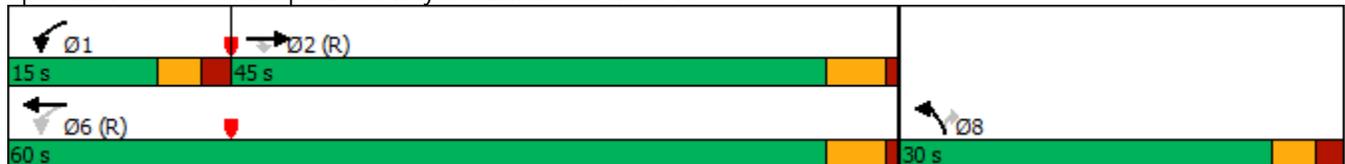


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↖	↗
Traffic Volume (vph)	553	336	144	381	278	84
Future Volume (vph)	553	336	144	381	278	84
Lane Group Flow (vph)	595	361	155	410	299	90
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	8.0	8.0	6.0	8.0	6.0	6.0
Minimum Split (s)	13.0	13.0	11.0	13.0	11.0	11.0
Total Split (s)	45.0	45.0	15.0	60.0	30.0	30.0
Total Split (%)	50.0%	50.0%	16.7%	66.7%	33.3%	33.3%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)	1.0	1.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Min	C-Min	None	C-Min	None	None
v/c Ratio	0.60	0.37	0.35	0.32	0.77	0.22
Control Delay	19.2	6.8	8.3	7.6	46.7	7.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.2	6.8	8.3	7.6	46.7	7.2
Queue Length 50th (ft)	219	39	28	86	160	0
Queue Length 95th (ft)	396	113	61	159	232	34
Internal Link Dist (ft)	453			571	906	
Turn Bay Length (ft)		100	150		200	
Base Capacity (vph)	994	963	478	1282	501	513
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.37	0.32	0.32	0.60	0.18

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 76 (84%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 60  
 Control Type: Actuated-Coordinated

Splits and Phases: 3: Independence Way & Plainfield Pike/Route 14



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/02/2022  
Cranston, RI



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↖	↗
Traffic Volume (veh/h)	553	336	144	381	278	84
Future Volume (veh/h)	553	336	144	381	278	84
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1900	1870	1900	1900	1900
Adj Flow Rate, veh/h	595	361	155	410	299	90
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	0	2	0	0	0
Cap, veh/h	1079	929	419	1326	345	307
Arrive On Green	0.58	0.58	0.07	0.70	0.19	0.19
Sat Flow, veh/h	1870	1610	1781	1900	1810	1610
Grp Volume(v), veh/h	595	361	155	410	299	90
Grp Sat Flow(s),veh/h/ln	1870	1610	1781	1900	1810	1610
Q Serve(g_s), s	17.8	11.0	2.9	7.5	14.4	4.3
Cycle Q Clear(g_c), s	17.8	11.0	2.9	7.5	14.4	4.3
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1079	929	419	1326	345	307
V/C Ratio(X)	0.55	0.39	0.37	0.31	0.87	0.29
Avail Cap(c_a), veh/h	1079	929	501	1326	503	447
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.8	10.4	8.5	5.2	35.3	31.2
Incr Delay (d2), s/veh	2.0	1.2	0.2	0.6	9.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.3	3.9	1.0	2.7	7.2	1.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	13.8	11.6	8.7	5.8	44.3	31.6
LnGrp LOS	B	B	A	A	D	C
Approach Vol, veh/h	956			565	389	
Approach Delay, s/veh	13.0			6.6	41.4	
Approach LOS	B			A	D	
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	10.9	56.9			67.8	22.2
Change Period (Y+Rc), s	5.0	5.0			5.0	5.0
Max Green Setting (Gmax), s	10.0	40.0			55.0	25.0
Max Q Clear Time (g_c+I1), s	4.9	19.8			9.5	16.4
Green Ext Time (p_c), s	0.1	1.1			1.4	0.8
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			16.9			
HCM 6th LOS			B			

Independence Way at Commercial Plaza Southern Driveway

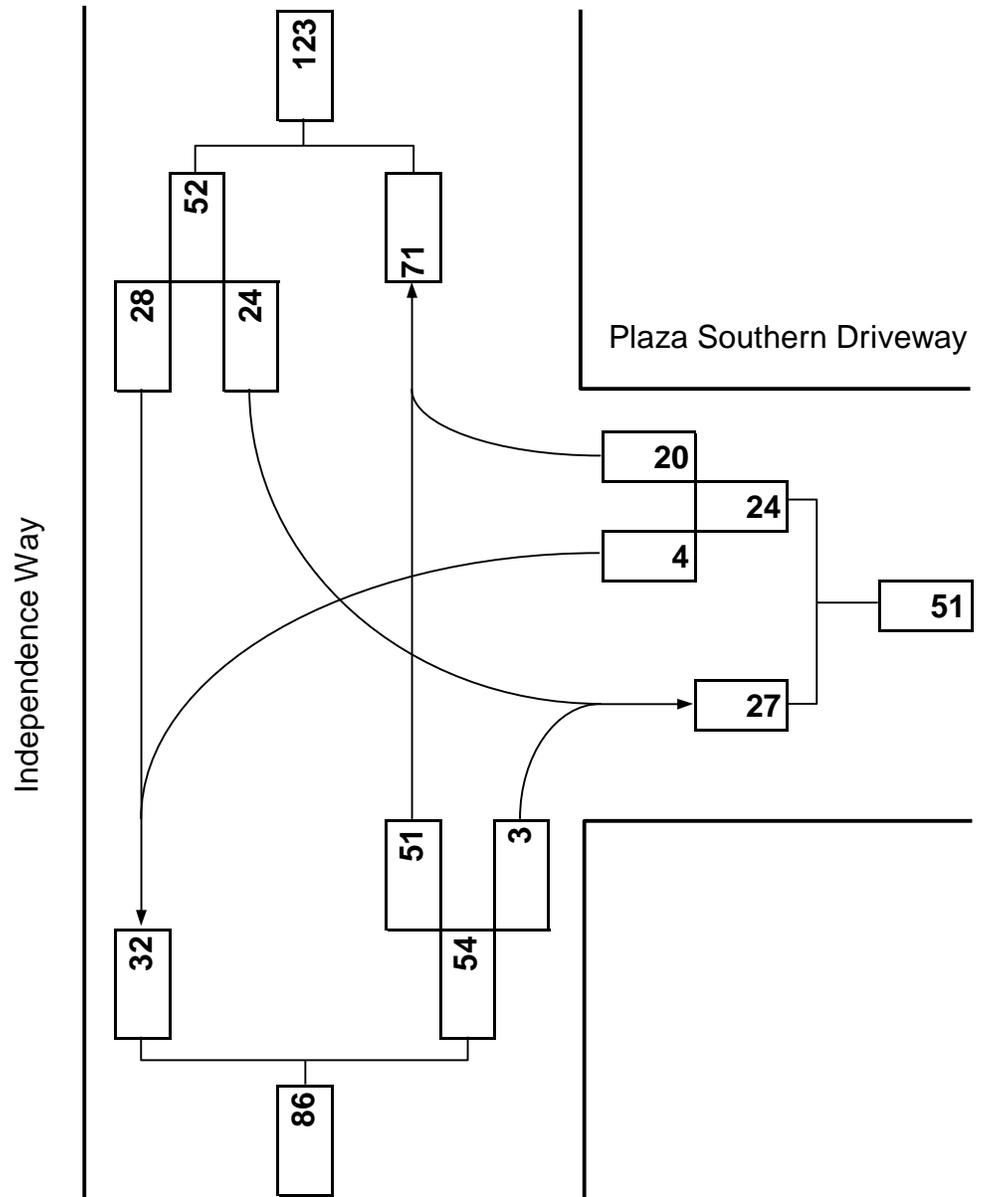


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### Turning Movement Diagram

**Major Street:** Independence Way  
**City/Town:** Cranston, RI  
**Reference No.:** 10442  
**Existing:** n/a

**Minor Street:** Plaza Southern Driveway  
**Day of Week:** Weekday  
**Peak Period:** AM Peak Hour  
**Future:** 2027 No Build



Proposed Residential Development  
 Independence Way at Commercial Plaza Southern Driveway

06/02/2022  
 Cranston, RI

Intersection						
Int Delay, s/veh	3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	4	20	51	3	24	28
Future Vol, veh/h	4	20	51	3	24	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	0	2	0	0	0	0
Mvmt Flow	5	25	63	4	30	35

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	160	65	0	0	67	0
Stage 1	65	-	-	-	-	-
Stage 2	95	-	-	-	-	-
Critical Hdwy	6.4	6.22	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.318	-	-	2.2	-
Pot Cap-1 Maneuver	836	999	-	-	1547	-
Stage 1	963	-	-	-	-	-
Stage 2	934	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	819	999	-	-	1547	-
Mov Cap-2 Maneuver	819	-	-	-	-	-
Stage 1	963	-	-	-	-	-
Stage 2	915	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	3.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	964	1547
HCM Lane V/C Ratio	-	-	0.031	0.019
HCM Control Delay (s)	-	-	8.9	7.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1

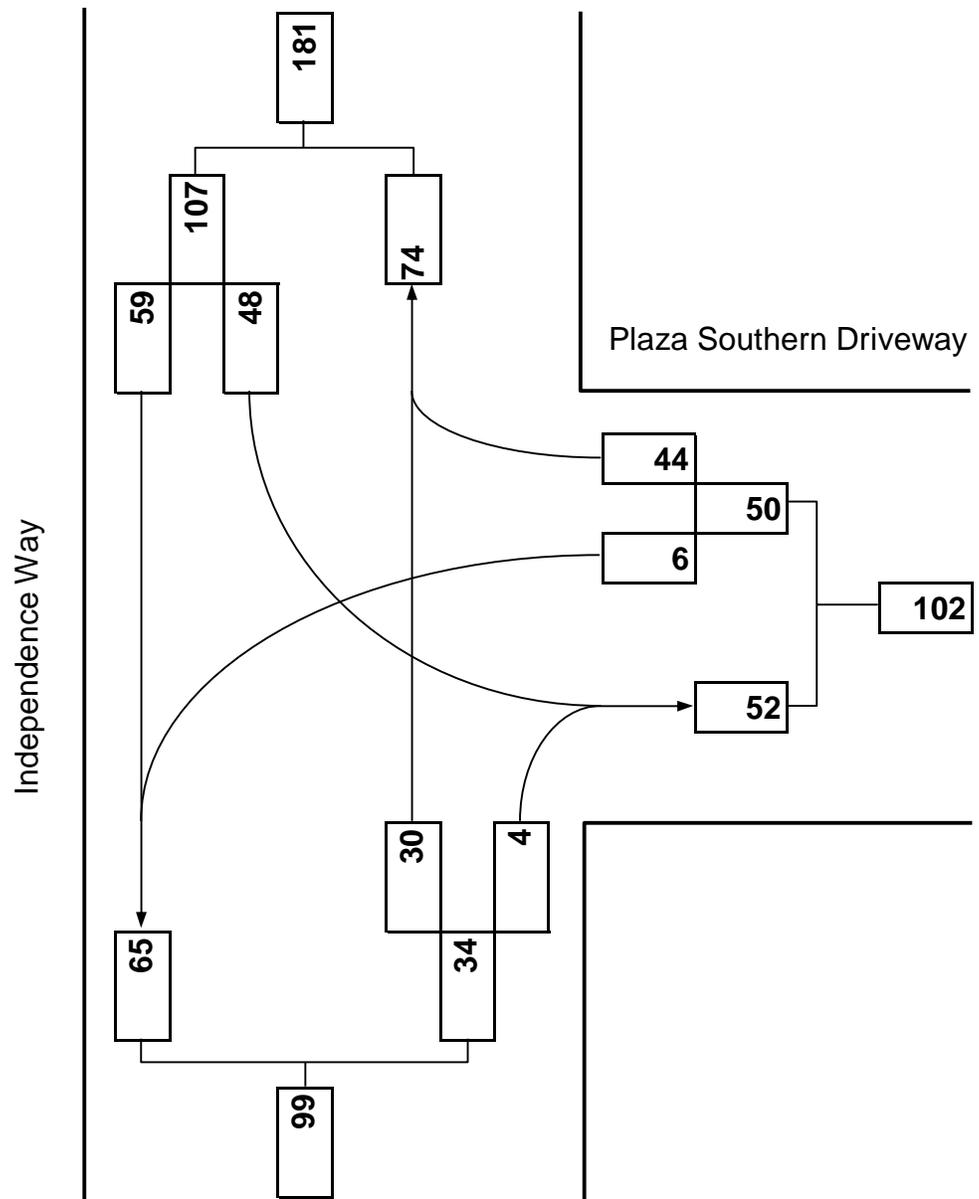


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### Turning Movement Diagram

**Major Street:** Independence Way  
**City/Town:** Cranston, RI  
**Reference No.:** 10442  
**Existing:** n/a

**Minor Street:** Plaza Southern Driveway  
**Day of Week:** Weekday  
**Peak Period:** PM Peak Hour  
**Future:** 2027 No Build



Proposed Residential Development  
 Independence Way at Commercial Plaza Southern Driveway

06/02/2022  
 Cranston, RI

Intersection						
Int Delay, s/veh	4.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	44	30	4	48	59
Future Vol, veh/h	6	44	30	4	48	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	6	44	30	4	48	60

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	188	32	0	0	34	0
Stage 1	32	-	-	-	-	-
Stage 2	156	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	806	1048	-	-	1591	-
Stage 1	996	-	-	-	-	-
Stage 2	877	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	781	1048	-	-	1591	-
Mov Cap-2 Maneuver	781	-	-	-	-	-
Stage 1	996	-	-	-	-	-
Stage 2	850	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	3.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	1007	1591
HCM Lane V/C Ratio	-	-	0.05	0.03
HCM Control Delay (s)	-	-	8.8	7.3
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1

D

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Future Build Weekday AM / PM Peak Hour

Plainfield Pike (Route 14) at Independence Way  
Independence Way at Commercial Plaza Southern Driveway

Plainfield Pike (Route 14) at Independence Way



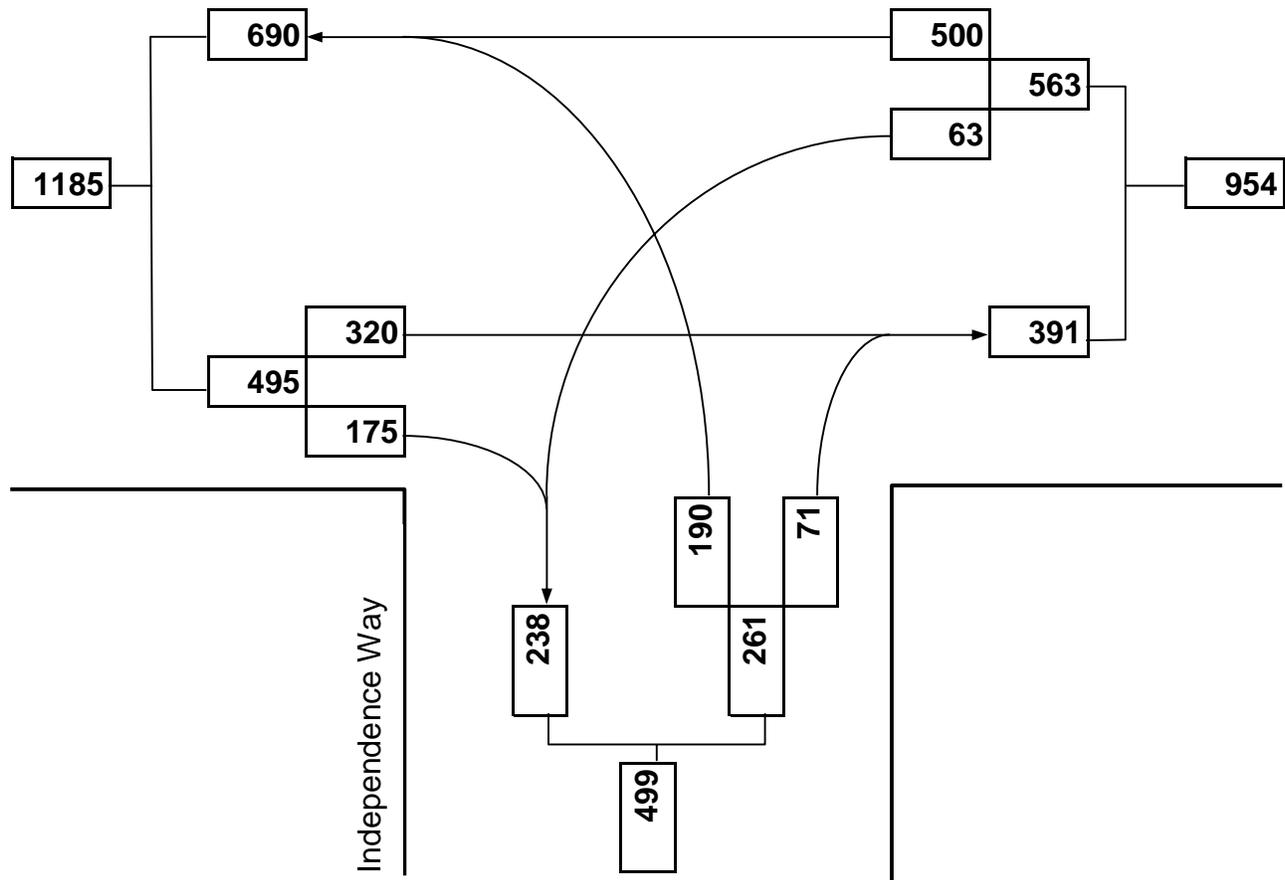
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### Turning Movement Diagram

<b>Major Street:</b>	Plainfield Pike (Route 14)	<b>Minor Street:</b>	Independence Way
<b>City/Town:</b>	Cranston, RI	<b>Day of Week:</b>	Weekday
<b>Reference No.:</b>	10442	<b>Peak Period:</b>	AM Peak Hour
<b>Existing:</b>	n/a	<b>Future:</b>	2027 Build

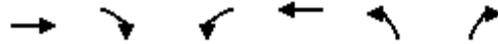


Plainfield Pike (Route 14)



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/21/2022  
Cranston, RI

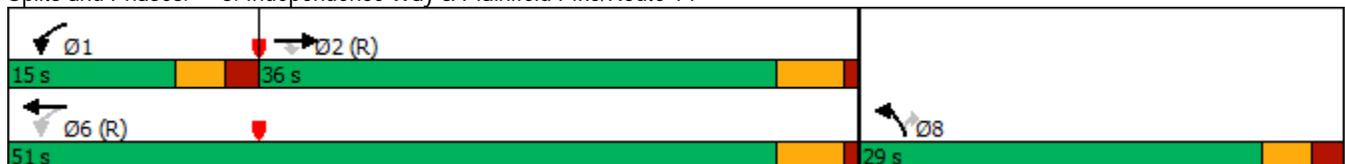


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	320	175	63	500	190	71
Future Volume (vph)	320	175	63	500	190	71
Lane Group Flow (vph)	348	190	68	543	207	77
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	8.0	8.0	6.0	8.0	6.0	6.0
Minimum Split (s)	13.0	13.0	11.0	13.0	11.0	11.0
Total Split (s)	36.0	36.0	15.0	51.0	29.0	29.0
Total Split (%)	45.0%	45.0%	18.8%	63.8%	36.3%	36.3%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)	1.0	1.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Min	C-Min	None	C-Min	None	None
v/c Ratio	0.32	0.19	0.10	0.41	0.67	0.22
Control Delay	11.2	2.3	5.1	6.9	40.7	8.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.2	2.3	5.1	6.9	40.7	8.2
Queue Length 50th (ft)	86	0	9	96	98	0
Queue Length 95th (ft)	169	32	26	190	153	32
Internal Link Dist (ft)	453			571	906	
Turn Bay Length (ft)		100	150		200	
Base Capacity (vph)	1091	1025	717	1328	531	538
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.19	0.09	0.41	0.39	0.14

Intersection Summary

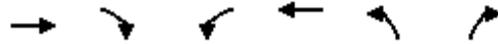
Cycle Length: 80  
 Actuated Cycle Length: 80  
 Offset: 60 (75%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 40  
 Control Type: Actuated-Coordinated

Splits and Phases: 3: Independence Way & Plainfield Pike/Route 14



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/21/2022  
Cranston, RI



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↖	↗
Traffic Volume (veh/h)	320	175	63	500	190	71
Future Volume (veh/h)	320	175	63	500	190	71
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1900	1870	1900	1870	1900
Adj Flow Rate, veh/h	348	190	68	543	207	77
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	2	0	2	0
Cap, veh/h	1139	981	645	1387	258	234
Arrive On Green	0.61	0.61	0.06	0.73	0.15	0.15
Sat Flow, veh/h	1870	1610	1781	1900	1781	1610
Grp Volume(v), veh/h	348	190	68	543	207	77
Grp Sat Flow(s),veh/h/ln	1870	1610	1781	1900	1781	1610
Q Serve(g_s), s	7.2	4.2	1.0	8.6	9.0	3.4
Cycle Q Clear(g_c), s	7.2	4.2	1.0	8.6	9.0	3.4
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1139	981	645	1387	258	234
V/C Ratio(X)	0.31	0.19	0.11	0.39	0.80	0.33
Avail Cap(c_a), veh/h	1139	981	763	1387	534	483
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	7.5	6.9	4.5	4.1	33.1	30.7
Incr Delay (d2), s/veh	0.7	0.4	0.0	0.8	3.9	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	1.4	0.3	2.7	4.1	1.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	8.2	7.4	4.5	4.9	37.0	31.3
LnGrp LOS	A	A	A	A	D	C
Approach Vol, veh/h	538			611	284	
Approach Delay, s/veh	7.9			4.9	35.5	
Approach LOS	A			A	D	
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	9.7	53.7			63.4	16.6
Change Period (Y+Rc), s	5.0	5.0			5.0	5.0
Max Green Setting (Gmax), s	10.0	31.0			46.0	24.0
Max Q Clear Time (g_c+l1), s	3.0	9.2			10.6	11.0
Green Ext Time (p_c), s	0.0	0.6			2.0	0.6
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			12.1			
HCM 6th LOS			B			



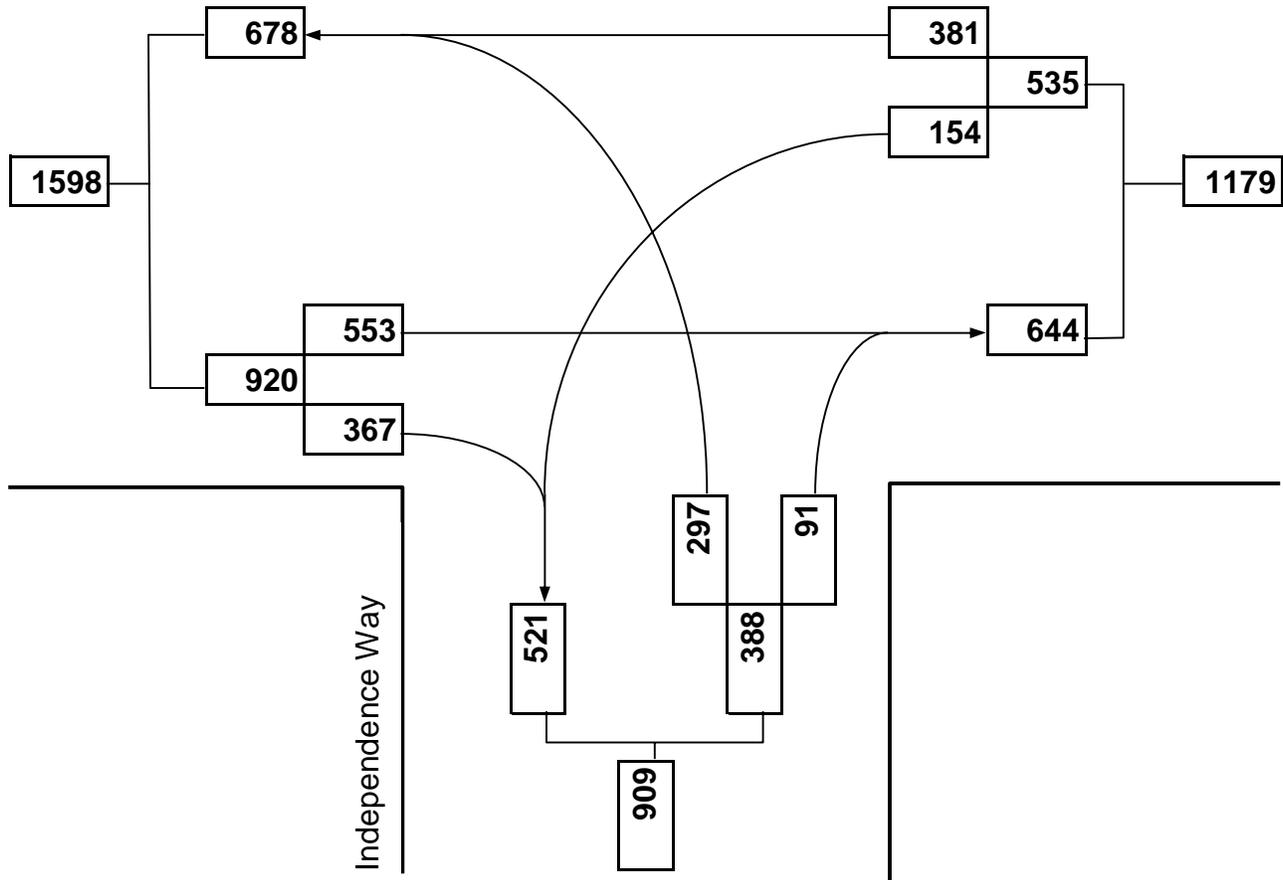
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### Turning Movement Diagram

<b>Major Street:</b>	Plainfield Pike (Route 14)	<b>Minor Street:</b>	Independence Way
<b>City/Town:</b>	Cranston, RI	<b>Day of Week:</b>	Weekday
<b>Reference No.:</b>	10442	<b>Peak Period:</b>	PM Peak Hour
<b>Existing:</b>	n/a	<b>Future:</b>	2027 Build



Plainfield Pike (Route 14)



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/21/2022  
Cranston, RI

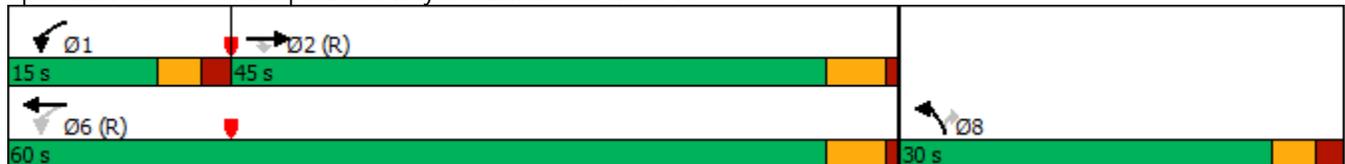


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	553	367	154	381	297	91
Future Volume (vph)	553	367	154	381	297	91
Lane Group Flow (vph)	595	395	166	410	319	98
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	8.0	8.0	6.0	8.0	6.0	6.0
Minimum Split (s)	13.0	13.0	11.0	13.0	11.0	11.0
Total Split (s)	45.0	45.0	15.0	60.0	30.0	30.0
Total Split (%)	50.0%	50.0%	16.7%	66.7%	33.3%	33.3%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	3.0
All-Red Time (s)	1.0	1.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Min	C-Min	None	C-Min	None	None
v/c Ratio	0.61	0.41	0.38	0.32	0.80	0.23
Control Delay	19.9	7.2	8.9	7.9	47.6	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.9	7.2	8.9	7.9	47.6	6.9
Queue Length 50th (ft)	227	45	31	90	170	0
Queue Length 95th (ft)	396	125	64	159	250	36
Internal Link Dist (ft)	453			571	906	
Turn Bay Length (ft)		100	150		200	
Base Capacity (vph)	975	959	466	1267	501	519
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.41	0.36	0.32	0.64	0.19

Intersection Summary

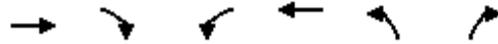
Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 76 (84%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 60  
 Control Type: Actuated-Coordinated

Splits and Phases: 3: Independence Way & Plainfield Pike/Route 14



Proposed Residential Development  
Plainfield Pike (Route 14) at Independence Way

06/21/2022  
Cranston, RI



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↖	↗
Traffic Volume (veh/h)	553	367	154	381	297	91
Future Volume (veh/h)	553	367	154	381	297	91
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1900	1870	1900	1900	1900
Adj Flow Rate, veh/h	595	395	166	410	319	98
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	0	2	0	0	0
Cap, veh/h	1059	911	404	1306	365	325
Arrive On Green	0.57	0.57	0.07	0.69	0.20	0.20
Sat Flow, veh/h	1870	1610	1781	1900	1810	1610
Grp Volume(v), veh/h	595	395	166	410	319	98
Grp Sat Flow(s),veh/h/ln	1870	1610	1781	1900	1810	1610
Q Serve(g_s), s	18.2	12.7	3.2	7.7	15.4	4.7
Cycle Q Clear(g_c), s	18.2	12.7	3.2	7.7	15.4	4.7
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1059	911	404	1306	365	325
V/C Ratio(X)	0.56	0.43	0.41	0.31	0.87	0.30
Avail Cap(c_a), veh/h	1059	911	485	1306	503	447
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.4	11.2	9.2	5.6	34.8	30.5
Incr Delay (d2), s/veh	2.2	1.5	0.3	0.6	10.8	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	4.5	1.1	2.8	7.8	1.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	14.6	12.7	9.5	6.2	45.6	30.9
LnGrp LOS	B	B	A	A	D	C
Approach Vol, veh/h	990			576	417	
Approach Delay, s/veh	13.9			7.2	42.1	
Approach LOS	B			A	D	
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	10.9	55.9			66.8	23.2
Change Period (Y+Rc), s	5.0	5.0			5.0	5.0
Max Green Setting (Gmax), s	10.0	40.0			55.0	25.0
Max Q Clear Time (g_c+l1), s	5.2	20.2			9.7	17.4
Green Ext Time (p_c), s	0.1	1.0			1.4	0.8
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			17.9			
HCM 6th LOS			B			

Independence Way at Commercial Plaza Southern Driveway

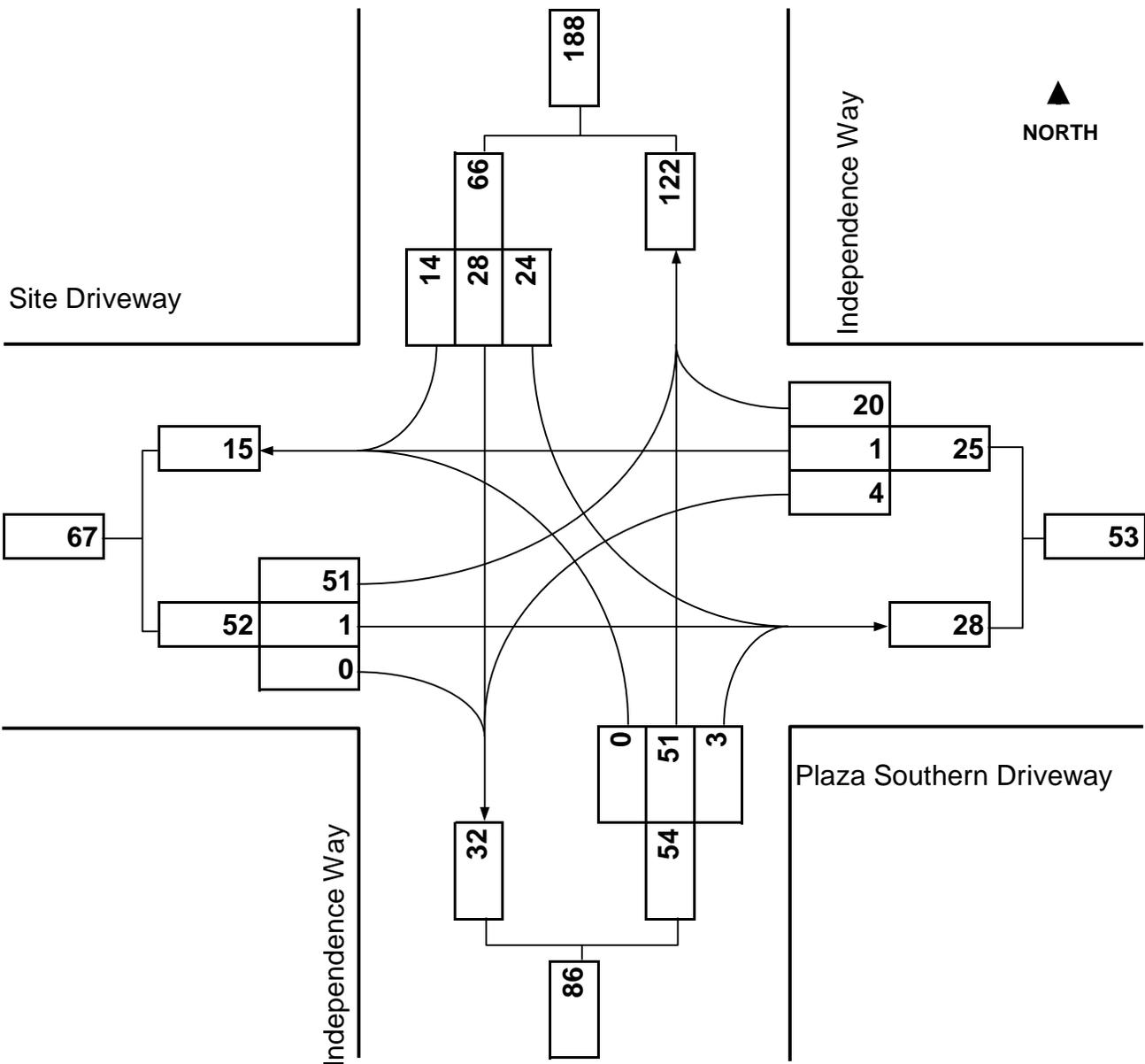


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### Turning Movement Diagram

**Major Street:** Independence Way  
**City/Town:** Cranston, RI  
**Reference No.:** 10442  
**Existing:** n/a

**Minor Street:** Plaza Southern/Site Diveways  
**Day of Week:** Weekday  
**Peak Period:** AM Peak Hour  
**Future:** 2027 Build



Proposed Residential Development  
 Independence Way at Commercial Plaza Southern/Site Driveways

06/21/2022  
 Cranston, RI

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	51	1	0	4	1	20	0	51	3	24	28	14
Future Vol, veh/h	51	1	0	4	1	20	0	51	3	24	28	14
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	81	92	81	92	81	81	81	81	92
Heavy Vehicles, %	2	2	2	0	2	2	2	0	0	0	0	2
Mvmt Flow	55	1	0	5	1	25	0	63	4	30	35	15

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	181	170	43	168	175	65	50	0	0	67	0	0
Stage 1	103	103	-	65	65	-	-	-	-	-	-	-
Stage 2	78	67	-	103	110	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.22	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.318	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	781	723	1027	800	718	999	1557	-	-	1547	-	-
Stage 1	903	810	-	951	841	-	-	-	-	-	-	-
Stage 2	931	839	-	908	804	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	749	709	1027	787	704	999	1557	-	-	1547	-	-
Mov Cap-2 Maneuver	749	709	-	787	704	-	-	-	-	-	-	-
Stage 1	903	794	-	951	841	-	-	-	-	-	-	-
Stage 2	907	839	-	889	788	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	10.2		8.9		0		2.8	
HCM LOS	B		A					

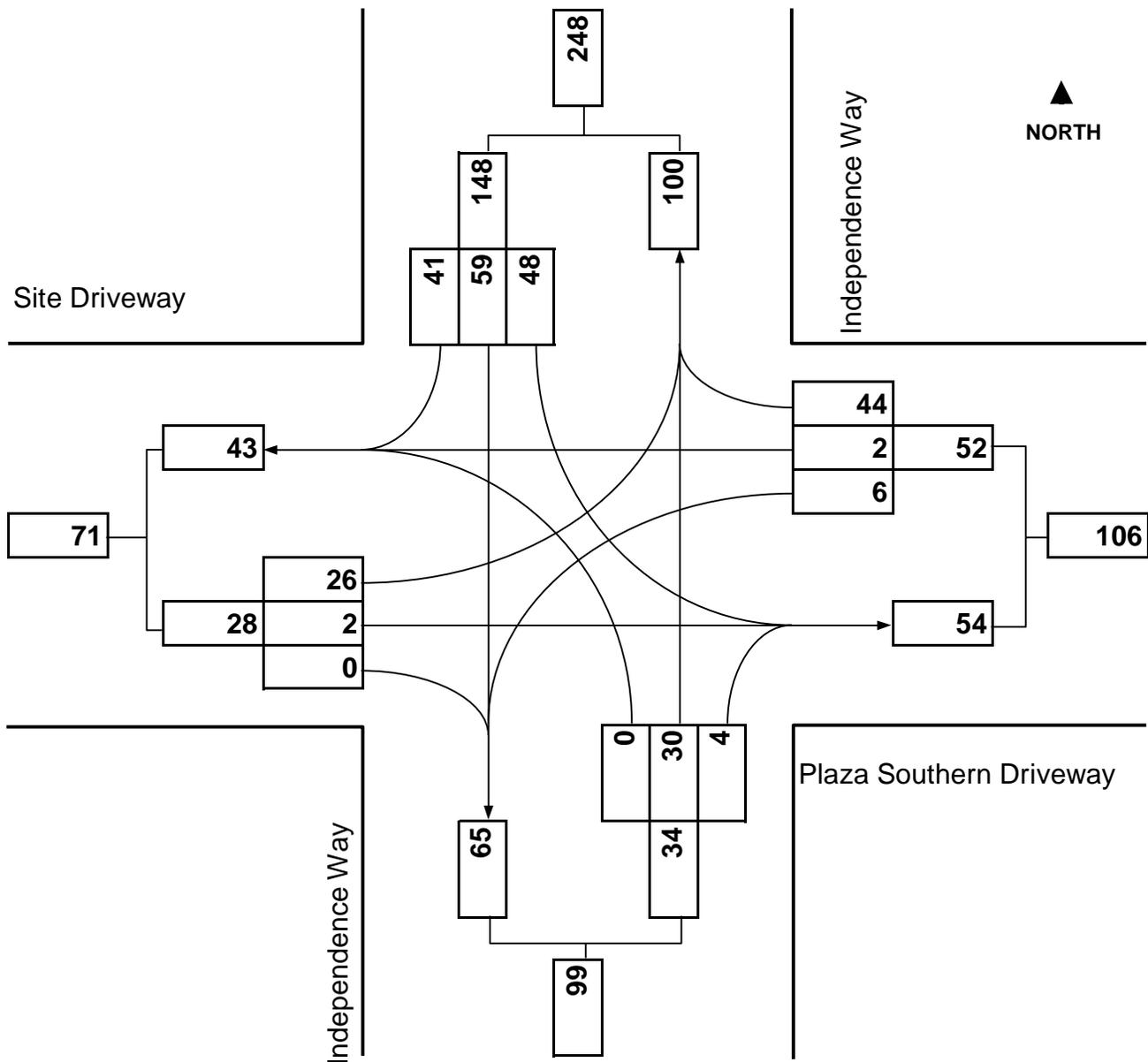
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1557	-	-	748	944	1547	-
HCM Lane V/C Ratio	-	-	-	0.076	0.033	0.019	-
HCM Control Delay (s)	0	-	-	10.2	8.9	7.4	0
HCM Lane LOS	A	-	-	B	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0.2	0.1	0.1	-



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### Turning Movement Diagram

<b>Major Street:</b>	Independence Way	<b>Minor Street:</b>	Plaza Southern/Site Diveways
<b>City/Town:</b>	Cranston, RI	<b>Day of Week:</b>	Weekday
<b>Reference No.:</b>	10442	<b>Peak Period:</b>	PM Peak Hour
<b>Existing:</b>	n/a	<b>Future:</b>	2027 Build



Proposed Residential Development  
 Independence Way at Commercial Plaza Southern/Site Driveways

06/21/2022  
 Cranston, RI

Intersection												
Int Delay, s/veh	4.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	26	2	0	6	2	44	0	30	4	48	59	41
Future Vol, veh/h	26	2	0	6	2	44	0	30	4	48	59	41
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	99	92	99	92	99	99	99	99	92
Heavy Vehicles, %	2	2	2	0	2	0	2	0	0	0	0	2
Mvmt Flow	28	2	0	6	2	44	0	30	4	48	60	45

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	234	213	83	212	233	32	105	0	0	34	0	0
Stage 1	179	179	-	32	32	-	-	-	-	-	-	-
Stage 2	55	34	-	180	201	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	721	684	976	749	667	1048	1486	-	-	1591	-	-
Stage 1	823	751	-	990	868	-	-	-	-	-	-	-
Stage 2	957	867	-	826	735	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	672	662	976	729	646	1048	1486	-	-	1591	-	-
Mov Cap-2 Maneuver	672	662	-	729	646	-	-	-	-	-	-	-
Stage 1	823	727	-	990	868	-	-	-	-	-	-	-
Stage 2	914	867	-	797	711	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB			
HCM Control Delay, s	10.6		8.9		0		2.3			
HCM LOS	B		A							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1486	-	-	671	974	1591	-
HCM Lane V/C Ratio	-	-	-	0.045	0.054	0.03	-
HCM Control Delay (s)	0	-	-	10.6	8.9	7.3	0
HCM Lane LOS	A	-	-	B	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0.1	-