# Carnegie Mellon University

# INSTITUTIONAL MASTER PLAN 2022

## Approved by City Council - November 23, 2022

## TRANSPORTATION IMPACT STUDY ONLY

Carnegie Mellon University

# TRANSPORTATION IMPACT STUDY

TIS Approval Letter
1. Introduction / Project Summary
2. Site Plan and Access
3. Multimodal Analysis
4. Trip Generation
5. Roadway Network and Operations Analysis
6. Parking
7. Recommendations / Conclusion
Tables
Figures

ED GAINEY
MAYOR

KIM LUCAS
DIRECTOR

CITY OF PITTSBURGH
**DEPARTMENT OF MOBILITY & INFRASTRUCTURE**
CITY-COUNTY BUILDING

August 26, 2022

Richard A. Krajcovic Jr.
GAI Consultants, Inc.
385 East Waterfront Drive
Homestead, PA 15120-5005

RE: Carnegie Mellon University Institutional Master Plan Transportation Impact Study

Dear Mr. Krajcovic,

The City of Pittsburgh Department of Mobility and Infrastructure (DOMI) received the Transportation Impact Study (TIS) prepared by your office on June 1, 2022 for the Carnegie Mellon University Institutional Master Plan. DOMI reviewed the TIS and provided comment on August 5, 2022 and August 23, 2022. DOMI received the comment response on August 5, 2022 and August 26, 2022. The TIS was approved on August 26, 2022.

Please contact me at katherine.reed@pittsburghpa.gov if you have any further questions.

Sincerely,

Katie K. Reed

Katie K. Reed
Principal Development Review Planner
Department of Mobility and Infrastructure (DOMI)

gaiconsultants.com | transforming ideas into reality®

gai consultants

# Carnegie Mellon University

# 2022-2032 Institutional Master Plan

# Traffic Impact Study

## Carnegie Mellon University
## City of Pittsburgh, Allegheny County, Pennsylvania

GAI Project Number: R200398.00

May 2022

Prepared by: GAI Consultants, Inc.
Pittsburgh Office
385 East Waterfront Drive
Homestead, Pennsylvania 15120-5005

Prepared for: Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, PA 15213

# Carnegie Mellon University

# 2022-2032 Institutional Master Plan

# Traffic Impact Study

## City of Pittsburgh, Allegheny County, Pennsylvania

GAI Project Number: R200398.00

May 2022

Prepared for:
Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, Pennsylvania 15213


Prepared by:
GAI Consultants, Inc.
Pittsburgh Office
385 East Waterfront Drive
Homestead, Pennsylvania 15120-5005

Report Authors:

Todd M. Wilson, MBA, P.E.,
Project Engineer

Richard A. Krajcovic, Jr., MBA, P.E., PTOE
Director/Associate, Engineering
Transportation Business Unit

# Table of Contents

1.0 Introduction / Project Summary ..... 1

2.0 Site Plan and Access ..... 2
2.1 Vehicular Site Access ..... 2
2.2 Loading ..... 3

3.0 Multimodal Analysis ..... 3
3.1 Bicycle and Scooter Parking ..... 3
3.2 Bicycle Routes to or Near Site ..... 4
3.3 Pedestrian Access, Circulation and Safety ..... 4
3.4 Transit Routes to or Near Site ..... 5

4.0 Trip Generation ..... 5
4.1 Trip Removals ..... 5
4.2 Trip Adjustment Factors ..... 6

5.0 Roadway Network and Operations Analysis ..... 6
5.1 Area of Impact – Required Data Collection ..... 6
5.2 ATR ..... 6
5.3 Study Periods ..... 6
5.4 Trip Distribution and Assignment ..... 6
5.5 Background Traffic / Future Conditions ..... 7
5.5.1 Future Year Conditions ..... 7
5.5.2 Trip Removals ..... 7
5.5.3 New Projects to be Added to Base Traffic ..... 7
5.6 Capacity Analysis ..... 7
5.6.1 Existing Conditions ..... 8
5.6.2 Analysis Year without IMP Projects ..... 8
5.6.3 Analysis Year with IMP Projects without TDM ..... 9
5.6.4 Analysis Year with IMP Projects and TDM ..... 10
5.6.5 Analysis Year with New Project, TDM, and Mitigation ..... 10
5.7 Queuing Analysis ..... 11
5.8 Traffic Signal Warrant Analysis ..... 12
5.9 Crash History/Analysis ..... 12

6.0 Parking ..... 13
6.1 Existing Conditions ..... 13
6.2 Proposed Parking ..... 13
6.3 Transportation Demand Management ..... 14
6.4 Parking Demand Analysis ..... 15
6.5 Other Transportation ..... 15

7.0 Recommendations/Conclusion ..... 16

Table 1.1 Development Description
Table 1.2 Status of 2012-2022 IMP Projects
Table 2.1 Vehicular Site Access

Table of Contents (Continued)

Table 3.1 Transit Routes
Table 4.1 Trip Generation without TDM Mitigation (Full Buildout, 100% of Master Plan)
Table 4.2 Trip Generation without TDM Mitigation (Anticipated Buildout, 50% of Master Plan)
Table 4.3 Trip Generation with TDM Mitigation (Full Buildout, 100% of Master Plan)
Table 4.4 Trip Generation with TDM Mitigation (Anticipated Buildout, 50% of Master Plan)
Table 5.1 Level of Service and Delay
Table 5.2 Institutional Master Plan Mobility Projects for Transportation Demand Management
Table 5.3 95th Percentile Vehicle Queue Length Summary
Table 5.4 Reportable Five-Year Crash Experience 2016-2020
Table 5.5 Reportable and Non-Reportable Crashes from Campus Police, January 2018 - June 2021
Table 6.1 Parking Inventory and Anticipated Changes
Table 6.2 Parking Supply and Demand Analysis
Table 6.3 Transportation Demand Management Reduction Strategies
Table 6.4 Transportation Demand Management Checklist
Table 6.5 Site Plan Strategies

Figure 1.0 Carnegie Mellon EMI District Location
Figure 2.0 Site Plan
Figure 2.1 Vehicular Site Access
Figure 3.0 On-campus Bicycle Parking
Figure 3.1 Pedestrian and Bicycle Network
Figure 3.2 Planned BRT Service
Figure 3.3 Transit and Shuttle Network
Figure 4.0 2018 Parking Survey Mode Shares
Figure 5.0 Traffic Study Area of Impact
Figure 5.1 Turning Movement Counts from Previous Studies
Figure 5.2 Forecasted Current Year (2022) Turning Movement Counts
Figure 5.3 Existing ADT Volume
Figure 5.4.1 Existing Traffic Distribution
Figure 5.4.2 Proposed Master Planning Year (2032) Entering Parking Trip Reassignment
Figure 5.4.3 Proposed Master Planning Year (2032) Exiting Parking Trip Reassignment
Figure 5.5 Forecasted Master Planning Year (2032) Turning Movement Counts without Development
Figure 5.6.1 Proposed Master Planning Year (2032) AM Peak Hour Trips with Parking Reassignment
Figure 5.6.2 Proposed Master Planning Year (2032) AM Peak Hour New Trips (No TDM)
Figure 5.6.3 Proposed Master Planning Year (2032) PM Peak Hour Trips with Parking Reassignment
Figure 5.6.4 Proposed Master Planning Year (2032) PM Peak Hour New Trips (No TDM)
Figure 5.6.5 Forecasted Master Planning Year (2032) Max. Trip Conditions (50% Buildout, No TDM)
Figure 5.6.6 Forecasted Master Planning Year (2032) Anticipated Conditions (50% Buildout and TDM)
Figure 5.7 Fifth Avenue and Morewood Avenue Northbound Approach Realignment

Table of Contents (Continued)

Figure 5.8 Summary Crash Locations (5 Years)
Figure 6.0 Existing Parking Inventory
Figure 6.1 Existing Residential Permit Parking
Figure 6.2 Parking Capacity Changes 2022-2032

Appendix A Carnegie Mellon University Demographics
Appendix B Approved TIS Scoping Form
Appendix C Trip Generation Calculation Sheets
Appendix D Carnegie Mellon 2018 Parking Master Plan Highlights
Appendix E Turning Movement Counts from Previous Studies
Appendix F Level of Service Definitions
Appendix G Existing Traffic Signal Plans
Appendix H Capacity Calculations – 2022 Existing Conditions
Appendix I Proposed Intersection Plans with Bus Rapid Transit
Appendix J Capacity Calculations – 2032 Forecasted Master Plan Year without Development
Appendix K Capacity Calculations – 2032 Forecasted Master Plan Year with Development without Transportation Demand Management Mitigation
Appendix L Capacity Calculations – 2032 Forecasted Master Plan Year with Development and Transportation Demand Management Mitigation
Appendix M Capacity Calculations – 2032 Forecasted Master Plan Yar with Development, Transportation Demand Management Mitigation, and Roadway Improvements
Appendix N SimTraffic 95th Percentile Queue Length Summaries
Appendix O Five-Year Reportable Crash Summaries
Appendix P Existing Parking Lot Inventory and Capacity
Appendix Q Parking Demand Analysis Calculation

© 2022 GAI Consultants, Inc.

# 1.0 Introduction / Project Summary

Carnegie Mellon University, a world class global research university, through its 2022-2032 Institutional Master Plan (IMP), aims to further their vision of having transformative impact on society through continual innovation in education, research, creativity, and entrepreneurship. In supporting that aim and recognizing the university's setting—between neighborhoods and adjacent to a city park—the Master Plan is intended to align university growth with City of Pittsburgh and neighborhood planning goals. Refer to **Figure 1.0** for a location map showing Carnegie Mellon University and its EMI District.

The Master Plan contains 20 proposed development projects within the university's EMI District. Refer to **Figure 2.0** for a site plan showing these development projects and **Table 1.1** for a description of these development projects. These projects have the potential to add up to 2,632,300 square feet of space and 1,955 undergraduate beds. Master planning projects are intended to represent the maximum use of each site, though the actual development sites and schedule of development will likely be less. For example, only 31 percent of the proposed square footage in the 2012-2022 Master Plan was realized, shown in **Table 1.2.** Therefore, anticipated future conditions will assume a conservative 50 percent of proposed square footage within this study. Trip generation is provided for both conditions, though all traffic analysis is based on the 50 percent build condition.

While these projects will allow for expansion, they are also intended to alleviate the overcrowding of existing space that has been occurring over the past several decades. Shown in **Appendix A**, in 2000, Carnegie Mellon's Pittsburgh Campus enrolled 5,105 undergraduate students, 3,185 graduate students, 1,243 faculty, and 2,407 staff, with a total campus footprint of approximately 2,750,000 net assignable square feet (nasf). By 2019, the campus has grown to 6,517 undergraduate students, 6,613 graduate students, 1,374 faculty, and 4,377 staff, with a total campus footprint of approximately 4,250,000 nasf. While the campus headcount grew by 58 percent, the campus footprint grew by closer to 55 percent. This densification resulted in a reduction of net assignable square footage from 250 nasf/person to just 211 nasf/person. While the campus is planning more modest student and faculty growth during the 2022-2032 master planning horizon period, the university aims to grow its facilities at a greater rate than its student and employee headcount to return to the less dense configuration of 250 nasf/person. Likewise, IMP projects are intended to address some of the undergraduate housing that is currently leased in off-campus buildings. By building more on-campus housing, Carnegie Mellon can shift those students onto campus to house almost all undergraduate students on site.

With its membership in the Pittsburgh 2030 District, and through its master plan, the university has been striving to achieve a more sustainable pattern of multimodal traffic growth that requires no net new parking. Landlocked between Oakland, Squirrel Hill, and Shadyside, simply adding lanes and widening streets is not feasible throughout the campus area. Building wider and higher capacity streets may degrade safety and convenience of multimodal alternatives. Building on the previous master plan, in which multi-lane Forbes Avenue was converted to a complete street with bicycle lanes, buffered sidewalks, pedestrian signals, and fewer lanes, this master plan continues prioritizing investing in sustainable transportation alternatives. Complimenting the City of Pittsburgh's Best Practices for Institutional Master Plans, this Traffic Impact Study provides the supporting framework to support the university's mobility goals:

- Meet or exceed the Pittsburgh District 2030 performance targets and the IMP mode share targets to reduce reliance on single occupant vehicle commuting.
- Implement Transportation Demand Management (TDM) to achieve mode share targets.
- Provide no net new parking, with parking demand mitigated through appropriate multimodal projects within the 10-year master planning horizon.

The following sections detail the traffic impact study, parking study, and TDM plan for the ten-year Master Planning Horizon Year, 2032. This study was performed to meet the requirements established by the City of Pittsburgh Departments of Mobility and Infrastructure (DOMI), Department of Public Works (DPW), and Department of City Planning (DCP), fulfilling the traffic impact study scoping form, approved on April 26, 2022. Refer to **Appendix B** for the approved form. Proposed future conditions analyzed assume 50% of full buildout development, a target space allocation of 250 nasf/person, and successful TDM. As individual traffic studies will be required for each development component during the master planning horizon, those studies will verify that these targets are being met and will investigate if any further mitigation is needed.

# 2.0 Site Plan and Access

Within the Master Plan, Carnegie Mellon is proposing 20 potential projects within its EMI District. Refer to **Figure 2.0** for the Site Plan and **Table 1.1** for a description of these development projects.

## 2.1 Vehicular Site Access

Carnegie Mellon University is bisected along Forbes Avenue, which is a state route (SR 2108) west of the Beeler Street / East Campus Garage signalized intersection. SR 2108 continues along Beeler Street to the east, while Forbes Avenue becomes a city-owned street to the southeast. All other roads in the campus area are City-owned.

The campus has three distinct neighborhoods: The historic core, which is south of Forbes Avenue, the north campus which is north of Forbes Avenue and east of Junction Hollow (Neville Street), and the Craig Street area which is west of Junction Hollow (Neville Street). The historic core is bounded by Forbes Avenue to the north, Margaret Morrison and Tech Street to the east, Frew Street to the south, and Boundary Street to the west. All are two-lane roadways. There is parallel parking along Margaret Morrison and Tech streets and perpendicular parking along Frew Street. In the north campus, Morewood Avenue bisects the neighborhood, running north from Forbes Avenue. Fifth Avenue bisects the neighborhood running east and west. Residential buildings are also along Clyde Street which runs north from Fifth Avenue. The Craig Street area takes on a more urban feel, as university-owned buildings are interspersed with other commercial, residential, and institutional properties. The north/south streets include Bellefield Avenue (the western border), Dithridge Street, Craig Street, and Neville Street (the eastern border). The east/west streets include Forbes Avenue (the southern border), Filmore Street, Winthrop Street, Henry Street, and Fifth Avenue (the northern border). All streets allow limited on-street parking, either permit or metered. Fifth Avenue is two lanes in each direction and Bellefield Avenue is a one-way street with two lanes in the northbound direction. The other streets are generally one lane in each direction.

Carnegie Mellon has several access driveways along these study roadways. Refer to **Table 2.1** summarizing all existing and proposed site access points from public streets, with **Figure 2.1** showing existing and proposed access control. Throughout the master plan's proposed projects, most driveways will be maintained in their existing configuration. Signalization is not proposed to be added at any location. Depending on which master plan projects are built, a summary of driveways that may require geometric modifications is as follows:

- The shared Donner and Margaret Morrison Hall driveway will be modified as needed to accommodate Margaret Morrison Hall expansion and/or Donner Hall replacement.
- A new driveway is proposed for the South of Forbes Development to connect to Boundary Street (the only all new driveway location proposed).
- The Greek Quad driveways may be reconfigured as part of the Greek Quad redevelopment.

- The Filmore Street and Zebina Way surface lot may be replaced with underground facilities as part of redevelopment, potentially necessitating a change in driveway access.
- The Whitfield Hall driveway may be adjusted as part of redevelopment.

The following existing vehicular driveways will become limited to pedestrians, bicycles, authorized vehicles, and service vehicles for typical use within the master planning horizon timeframe:

- Hamerschlag Drive at Frew Street
- College of Fine Arts Drive at Tech Street and Margaret Morrison Street
- Cyert Hall Drive at Forbes Avenue (Existing lot to be reduced in size or eliminated)

Additionally, new parking facilities may be proposed to connect to existing facilities that use the following driveways:

- Carnegie Museum Driveway at Forbes Avenue and Craig Street
- Tepper School of Business Driveway at Forbes Avenue
- Morewood Place at Morewood Avenue

## 2.2 Loading

No campus-wide changes are proposed to on-site loading, which be analyzed through the design review process for each individual development as required.

# 3.0 Multimodal Analysis

Carnegie Mellon University encourages multimodal site access, having invested in bicycle, pedestrian, and transit alternatives. The following section details the bicycle and pedestrian network (**Figures 3.0 and 3.1**) and the public transportation and university shuttle network (**Figures 3.2 and 3.3**).

## 3.1 Bicycle and Scooter Parking

Carnegie Mellon maintains bicycle racks throughout campus, as well as covered bicycle parking in the East Campus Garage, which is gated. Bicycle parking is located across from the security office. The university supplies bicycle racks based on demand to ensure adequate bicycle parking throughout campus. Carnegie Mellon's transportation website provides a map of campus bike rack locations, shown in **Figure 3.0**, as well as information about local bicycle shops and easy bicycle loops near campus. There are bicycle end-of-trip facilities on campus, including showers, changing rooms, and repair stations. The League of American Bicyclists' Bicycle Friendly University program intends to help guide universities to provide a bikeable campus for students, staff, and visitors. Universities are scored based on their activities in engineering, education, encouragement, enforcement, and evaluation. In 2014, Carnegie Mellon was recognized by the League of American Bicyclists as Bicycle Friendly University, earning the silver level award. Carnegie Mellon continues to invest in its bicycle infrastructure, in eventual pursuit of a gold level award.

For proposed projects within this master plan, Carnegie Mellon maintains its commitment to provide bicycle parking for new developments. The number and configuration of new bicycle parking spaces per development will be determined in the site development process for each master plan project. The university is currently coordinating with the new bikeshare operator POGOH, formerly Healthy Ride, to help identify potential expansion areas. The previous existing Healthy Ride bikeshare stations are shown in **Figure 3.1**. One was located immediately south of campus at the intersection of Frew Street and Schenley Drive, one was located west of campus at the intersection of Craig Street and Fifth

Avenue, and one was located north of campus at the intersection of Neville Street and Ellsworth Avenue. POGOH and Carnegie Mellon are looking to expand the program.

The university is also committed to ensure the safe operation of personal wheeled mobility vehicles such as e-scooters by campus users, including safe parking locations. Announced in 2021, the new Personal Wheeled Transportation Policy is under development with a goal "to provide a safe environment for all members of the campus community, while allowing for the convenient use of personal wheeled vehicles." It should be finalized in 2022 or 2023. The university is continuing to coordinate with the e-scooter operator (Spin). A Spin electric scooter station is just south of campus along Schenley Drive opposite the entrance to Phipps Conservatory. Proposed scooter parking locations are shown in **Figure 3.1**.

## 3.2 Bicycle Routes to or Near Site

Carnegie Mellon is between two east and west bicycle routes along Schenley Drive and Forbes Avenue. Schenley Drive has a cycle track from Oakland to the Panther Hollow Road intersection. The cycle track turns to onto Panther Hollow Road into Schenley Park, while Schenley Drive continues towards Squirrel Hill with shoulders that bicyclists can use. Forbes Avenue has directional bicycle lanes through campus from Oakland to Squirrel Hill, which was implemented as a project presented in the 2012 master plan. Morewood Avenue, running north from Forbes Avenue, and Neville Street, running north from Fifth Avenue, are marked on-street bicycle routes with sharrows. Boundary Street, Frew Street, Tech Street, Margaret Morrison Street, Craig Street, Bellefield Avenue, and Fifth Avenue west of Craig Street are all considered cautionary on-street bicycle routes, as they do not have bicycle markings but provide important connections to other streets within the bicycle network. The POGOH (Healthy Ride) bike share stations are located between the southern border of campus and the Schenley Park cycle track on Frew Street, in the western part of the Craig Street area of campus near Fifth Avenue, and north of campus at the intersection of Ellsworth Avenue and Neville Street which are both marked on-street bike routes. Refer to **Figure 3.1** for a map of the Pedestrian and Bicycle Network.

The following master plan projects are proposed to enhance the bicycle network:

- Install a cycle track along Morewood Avenue from Forbes Avenue to Fifth Avenue.
- Construct a cycle track through campus from Morewood Avenue to Frew Street.
- Provide a shared use path marked for bicycles in the uphill direction along Frew Street.
- Incorporate Frew Street, Tech Street, and Margaret Morrison Street into a City of Pittsburgh Neighborway.
- Designate Hamerschlag Drive from Frew Street to Boundary Street as a bicycle boulevard, with vehicular traffic prohibited between Wean Hall and Frew Street.
- Reserve space in the Neville Parking Lot to connect to an eventual bicycle trail (by others) parallel to Boundary Street.

## 3.3 Pedestrian Access, Circulation and Safety

Refer to **Figure 3.1** for the pedestrian network through campus. Carnegie Mellon has a maintenance program for sidewalks, so they are kept in a state of good repair. Recent projects along Forbes Avenue and at the intersection of Fifth Avenue and Clyde Street installed new signalized crosswalks. Portions of sidewalks along Forbes Avenue, Fifth Avenue, and Morewood Avenue lack buffers between the sidewalk and the travel lanes. As Carnegie Mellon redevelops building sites, landscaped buffers are being installed between the sidewalk and travel lanes. Additionally, a shared use path is proposed along the Schenley Park side of Frew Street through these master plan projects.

## 3.4 Transit Routes to or Near Site

Carnegie Mellon is well served by transit. The campus is accessed by several Port Authority and university-run shuttle routes, listed in **Table 3.1**. Service will be increased in the master planning horizon as the Port Authority is planning bus rapid transit (BRT) along Forbes and Fifth avenues which will improve transit convenience and accessibility. Carnegie Mellon is committed to partnering with the Port Authority to help integrate the planned stops within campus, with proposed BRT stations along Forbes Avenue at Craig Street, Morewood Avenue, and Margaret Morrison Street, and along Fifth Avenue at Craig Street and Morewood Avenue. Refer to **Figure 3.2** for a map of proposed stations.

The university has an agreement with the Port Authority in which the university funds systemwide transit passes to all students, faculty, and staff. This results in high ridership levels. The university is committed to keeping this program throughout the master planning horizon, as it has been in place for decades. Refer to **Figure 3.3** for a map of transit routes and headways in the campus area, as well as the university's shuttle routes. Discussed in Section 6.5, the university is looking to expand shuttle routes to consolidate with other Oakland area operators (University of Pittsburgh and Carlow University) and is currently working on a combined feasibility study.

# 4.0 Trip Generation

Trip generation has been performed for the proposed master planning projects listed in **Table 1.1** using *ITE Trip Generation Manual, 10th Edition*. Trips were estimated using Land Use 550, University/College; Land Use 170, Utility; and Land Use 225, Off-Campus Student Apartment. The independent variable selected was 1,000 Sq. Ft., GFA for Land Use 550 and 170, and Residents for Land Use 225. Refer to **Appendix C** for trip generation calculations.

Refer to **Table 4.1** for the maximum trip generation for the master planning horizon for full buildout of all potential master plan projects without TDM. Refer to **Table 4.2** for trip generation without TDM if 50 percent of full buildout is realized. Refer to **Table 4.3** for trip generation for the master planning horizon for full buildout of all potential master plan projects assuming TDM will be successfully implemented. Refer to **Table 4.4** for trip generation for the master planning horizon for 50 percent of full buildout is realized, assuming TDM measures are successful and mode share targets are met. As the university is intending to create and implement TDM measures to further their mobility targets and goals, including no net new parking, and 50 percent of full buildout is conservative, trip generation is anticipated to correspond to **Table 4.4** target forecasts.

## 4.1 Trip Removals

Shown in **Appendix D**, the results of Carnegie Mellon University's 2018 parking study by Ayers Saint Gross, Brailsford & Dunlavey (survey data collected by Fehr & Peers) for faculty and staff, 38 percent parked, 29 percent took transit (22 percent by bus and seven percent by university shuttle), 19 percent walked, seven percent biked, five percent were dropped-off (including rideshare), and two percent other. Results are summarized in **Figure 4.0**. These mode shares were used to calculate trip removals for conditions without TDM. Mode share targets to be achieved through TDM are detailed in the Mobility Master Plan and in Section 6.3 Transportation Demand Management and are as follows: 30 percent single occupant vehicle use (driving alone and parking), seven percent multi occupant vehicle use (carpooling, being dropped off and ridesharing), 30 percent taking transit, nine percent biking, 19 percent walking, and five percent other. These targets are used for conditions with TDM.

The existing student mode share was reported to be two percent driving, 45 percent taking transit (35 percent bus and 10 percent shuttle), 29 percent walking, 12 percent biking, six percent being dropped off (including rideshare), and six percent other. These mode share splits are assumed to be maintained, though they are assumed for student housing land uses only.

## 4.2 Trip Adjustment Factors

No additional trip adjustment factors for internal trips, shared trips, and pass-by-trips are assumed, as mode share reductions take these into account.

# 5.0 Roadway Network and Operations Analysis

## 5.1 Area of Impact – Required Data Collection

Due to ongoing Covid-19 pandemic impacts, regular traffic patterns have not been observed during the 2020-2022 timeframe when this traffic study was prepared. Instead, historical turning movement counts adjusted from 2010 to 2015 are used for the following intersections within the area of impact (**Figure 5.0**), all of which are signalized:

- Fifth Avenue at Bellefield Street, Dithridge Street, Craig Street, Neville Street, Clyde Street, and Morewood Avenue
- Forbes Avenue at Craig Street, CIC/Tepper Drive, Morewood Avenue, Beeler Street, and Margaret Morrison Street

Peak period (7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM) turning movement counts were conducted along Forbes Avenue in 2015 for the Forbes Avenue Reconfiguration traffic study and along Fifth Avenue at Neville Street and Clyde Street for the Dearden Hall Renovation and North of Fifth Residence Hall Traffic Impact Study. Turning movement counts were conducted along the other Fifth Avenue intersections for the 2010 PCTI study. Since the approved Forbes Avenue Reconfiguration Study's background traffic growth rate was 0.25% per year linear, and the background traffic growth rate is not anticipated to grow more steeply during or after the Covid-19 pandemic, 0.25% per year linear was used to adjust all background traffic volumes except at driveways to the 2022 existing year and 2032 master planning horizon year. Please refer to **Figure 5.1** for a summary of turning movement counts from previous studies in **Appendix E:** Figure 14 "Design Year (2021) Peak Hour Volumes" from the Forbes Avenue Reconfiguration Study, Figure 16 "Forecasted Opening Year (2018) Full Buildout with Development Peak Hour Volumes" from the Dearden Center/North of Fifth Traffic Impact Study, and Figure 2 "September 2010 AM Peak Intersection Operations" and Figure 3 "September 2010 PM Peak Intersection Operations" from the Oakland/CMU Pedestrian Safety Mobility (PCTI) Study. Refer to **Figure 5.2** for the turning movement counts all adjusted to the 2022 current year.

## 5.2 ATR

Due to the inability to count typical traffic volumes, automated traffic recorder (ATR) counts were not performed. Instead, shown in **Figure 5.3**, average daily traffic volumes from PennDOT's Traffic Information Repository (TIRe) are shown, ranging from 2015 to 2020.

## 5.3 Study Periods

Traffic volumes used in the capacity analysis represent the individual peak hours within the typical AM peak hour (7:00 AM to 9:00 AM) and PM peak hour (4:00 PM to 6:00 PM) period.

## 5.4 Trip Distribution and Assignment

Trip distribution and assignment for vehicles entering the study area is based on existing traffic data. Refer to **Figure 5.4.1** for a summary of existing traffic distribution.

Parking is a system on the Carnegie Mellon campus, with parking rates and locations organized into five different parking tiers based on demand and proximity to campus. Parking locations are spread throughout the various campus areas, generally with larger facilities in structured locations and smaller facilities in surface lots. Detailed in Section 6.0, the university's parking master plan includes the goal

of removing the remaining surface lots and replacing them with new underground parking as part of each applicable development project. However, pursuant to the university's mobility goal of mitigating demand to provide no net new parking, TDM will be used to help reduce demand from the current parking supply. Therefore, parking reassignment trips will impact future trip distribution, especially in cases where TDM mitigates any trip increases. Entering parking trip reassignments are shown in **Figure 5.4.2** and exiting parking trip reassignments in **Figure 5.4.3** based on full (100 percent) lot occupancy changes, with trips rerouted using the distribution in **Figure 5.4.1** and the assumption that users will typically park at locations convenient to their commuting direction.

## 5.5 Background Traffic / Future Conditions

### 5.5.1 Future Year Conditions

Adjusted current year (2022) background traffic volumes from **Figure 5.2** were grown to Master Plan Horizon Year (2032) volumes in **Figure 5.5** using a linear growth rate of 0.25% per year linear.

### 5.5.2 Trip Removals

Noted in Section 5.4, anticipated parking lot changes will result in trip removals, as vehicles will be reassigned from one parking facility to another. Refer to **Figure 5.4.2** and **Figure 5.4.3** for anticipated parking trip changes based on full lot occupancy.

To meet the university's mobility goals discussed in Section 4.1, TDM will be used to reduce existing parking demand by a target eight percent reduction. With a current parking supply of 2,972 spaces, this corresponds to a demand reduction of 238 spaces. These spaces are anticipated to be backfilled by new parking demand with proposed IMP projects.

### 5.5.3 New Projects to be Added to Base Traffic

No new projects were determined to be applicable to be added to base traffic.

## 5.6 Capacity Analysis

Based on coordination with DOMI and DCP staff, and as approved in the scoping meeting application, network-wide capacity analysis cannot be reliably performed due to Covid-19 impacts. Due to Carnegie Mellon's commitment to mitigating trip increases through multimodal TDM strategies, overall university trips are not significantly anticipated to grow in the master-planning horizon. However, more localized impacts may occur as parking facilities shift from one neighborhood of campus to another. Two critical intersections most subject to localized impacts, which were not part of upgrades from the Forbes Avenue Reconfiguration (recommended in the 2012-2022 master plan), are the intersections of Fifth Avenue and Neville Street and Fifth Avenue and Morewood Avenue, shown in **Figure 5.0**. Both intersections are planned for signalization upgrades as part of the Port Authority's BRT project and the City's Smart Spines initiative. However, neither have capacity improvement projects planned. As a result, this study's detailed capacity analysis is limited to these two intersections.

Capacity analyses for the study intersections were performed using Trafficware's Synchro Version 10 analysis software, which performed capacity analyses based on methodologies published in the *2000 Highway Capacity Manual* by the Transportation Research Board. This methodology determines how well an intersection, approach to an intersection, or movement at an intersection operates, and assigns to it a level of service (LOS) A through F, with LOS A representing the best operating conditions and LOS F, the worst. The minimum satisfactory overall intersection LOS for urban conditions is considered LOS D. Detailed definitions of LOS are included in **Appendix F**. While the Transportation Research Board has updated its methodology in 2010, there are limitations to this update. Intersections with shared left/through movements with protected-permitted phasing cannot be analyzed, as is the case with both study intersections. As a result, 2000 methodology was used in this analysis.

### 5.6.1 Existing Conditions

A capacity analysis for adjusted current year (2022) background traffic volumes from **Figure 5.2** was performed. Intersections were modeled based on the existing traffic signal plans included in **Appendix G**, with intersection descriptions below. Based on the results of the capacity analysis, the intersection of Fifth Avenue and Neville Street currently operates at LOS C overall during the AM and PM peak hours, and the intersection of Fifth Avenue and Morewood Avenue currently operates at LOS B overall during the AM peak hour and at LOS C during the PM peak hour. All movements operate at LOS D or better, except during the AM peak hour when the Neville Street southbound approach operates at LOS E, and during the PM peak hour when the Neville Street southbound approach operates at LOS E (the left/through lane operates at LOS F). The Morewood Avenue northbound right turn operates at LOS E. Refer to **Table 5.1** for a summary of intersection capacity and **Appendix H** for capacity calculations.

Descriptions of study intersections' existing conditions are as follows:

#### 5.6.1.1 Fifth Avenue and Neville Street

The intersection of Fifth Avenue and Neville Street is controlled by a coordinated pretimed traffic signal with an 80 second peak hour cycle length. Fifth Avenue is posted at 35 mph and Neville Street at 25 mph. The Fifth Avenue eastbound approach consists of a shared left/through lane and a shared through/right lane. The left lane has an advance protected permitted left turn phase which creates a southbound right turn overlap. Cartway width approaching the intersection is 56 feet, though the eastbound lanes narrow to two 11-foot lanes approaching the intersection. The Fifth Avenue westbound approach also consists of a shared left/through lane and a shared through/right lane, with all turns permitted only. Cartway width is 44 feet, with two 11-foot lanes in each direction. Northbound Neville Street has a cartway width of 30 feet, with a single 11-foot northbound lane, an 11-foot southbound lane, and an 8-foot southbound parking lane. Southbound Neville Street has a cartway width of 36 feet, with an 11-foot southbound shared left/through lane and an 11-foot exclusive right turn lane, channelized by a painted island. All turn movements are permitted, except for the southbound right-turn that is signal-controlled with an exclusive right turn overlap. Turns on red are prohibited at all movements. There are crosswalks with pedestrian signals across each quadrant, though they lack countdown timers. Refer to **Appendix G** for the existing traffic signal plan.

#### 5.6.1.2 Fifth Avenue and Morewood Avenue

The intersection of Fifth Avenue and Morewood Street is controlled by a coordinated pretimed traffic signal with an 80 second peak hour cycle length. Fifth Avenue is posted at 35 mph and has a cartway width of 44 feet (11-foot lanes) and Morewood Avenue is posted at 25 mph and has a cartway width of 30 feet (10-foot lanes). The Fifth Avenue eastbound approach consists of a shared left/through lane and a shared through/right lane. All turns are permitted. The Fifth Avenue westbound approach also consists of a shared left/through lane and a shared through/right lane, though left turns have an advance protected-permitted left turn phase. Northbound Morewood Avenue has a shared left/through lane and an exclusive right turn lane. Southbound Morewood Avenue has an exclusive left turn lane and a shared through/right lane. The Morewood Avenue approaches are offset from each other by approximately 10 feet, so the northbound left lane lines up with the curb lane trailing the intersection. Southbound traffic must shift a lane through the intersection. Turns on red are prohibited from Morewood Avenue. There are crosswalks with pedestrian signals across each quadrant, though they lack countdown timers. Refer to **Appendix G** for the existing traffic signal plan.

### 5.6.2 Analysis Year without IMP Projects

A capacity analysis for analysis year (2032) background traffic volumes from **Figure 5.5** was performed. Since the BRT and the City of Pittsburgh's Smart Spines signalization project is anticipated

to be completed by 2032, the analysis assumed fully actuated and coordinated signals with optimized cycle lengths (80 seconds) and optimized timings. This results in improved intersection capacities. Additional phasing changes were not assumed, as the improvement project has not been finalized yet. Refer to **Appendix I** for anticipated intersection plans after BRT construction.

Based on the results of the capacity analysis, the intersection of Fifth Avenue and Neville Street will still operate at LOS C overall during the AM and PM peak hours, and the intersection of Fifth Avenue and Morewood Avenue will still operate at LOS B during the AM peak hour and at LOS C during the PM peak hour. All movements will operate at LOS D or better, except during the PM peak hour when the Neville Street southbound approach is anticipated to operate at LOS E (the left/through lane is anticipated to operate at LOS E) and the Morewood Avenue northbound exclusive right turn lane is anticipated to operate at LOS E. Refer to **Table 5.1** for a summary of intersection capacity. Complete capacity calculations are located in **Appendix J**.

### 5.6.3 Analysis Year with IMP Projects without TDM

Carnegie Mellon anticipates up to 50 percent of the maximum buildout of IMP projects to be completed through the 10-year master planning horizon. Discussed in Section 5.4, parking trip reassignment will impact forecasted volumes in the 2032 master-planning year, as various parking locations will be relocated during that timeframe so users will have different paths to reach their parking destination. Applying the **Figure 5.4.2** entering parking trip reassignments, **Figure 5.6.1** assumes all entering trip changes will occur in the AM peak hour and conservatively assumes half of those reassigned vehicles entering will also exit during the peak hour. Noted within **Figure 5.6.2**, the eight percent mode share target would reduce parking trips by up to 238 entering vehicles, which balances with the projected 174 new AM entering parking trips and 64 entering drop-off or rideshare trips. However, if TDM is not implemented, there would be an overage of 269 entering trips and 135 exiting trips. Therefore, **Figure 5.6.2** shows these additional AM peak hour trips without TDM.

Applying the **Figure 5.4.3** exiting parking trip reassignments, **Figure 5.6.3** assumes all exiting trip changes will occur in the PM peak hour and conservatively assumes half of those reassigned vehicles exiting will also enter during the PM peak hour. Noted with **Figure 5.6.4**, the eight percent mode share target would reduce parking trips by up to 238 exiting vehicles, which exceeds the projected 163 new PM exiting parking trips and 63 exiting drop-off or rideshare trips. However, if TDM is not implemented, there would be an overage of 255 exiting trips and 128 entering trips. Therefore, **Figure 5.6.4** shows these additional PM peak hour trips without TDM.

A capacity analysis was performed for the IMP horizon year (2032) assuming 50 percent maximum buildout and no TDM using the volumes shown in **Figure 5.6.5**. The analysis assumes the same fully actuated and coordinated signals as in the no-build condition, keeping 80-second cycle lengths and optimized timings.

Based on the results of the capacity analysis, the intersection of Fifth Avenue and Neville Street is still anticipated to operate at LOS C overall during the AM peak hour but degrade to LOS D overall during the PM peak hour. Most individual movements are still anticipated to operate at LOS D or better, except during the AM peak hour where the Neville Street southbound shared left/through lane degrades to LOS E, and during the PM peak hour where the Neville Street southbound shared left/through degrades to LOS F (the approach degrades to LOS E overall). The Neville Street northbound approach also degrades to LOS E.

The intersection of Fifth Avenue and Morewood Avenue is anticipated to degrade to LOS C overall during the AM peak hour and degrade to LOS D overall during the PM peak hour. Most individual movements are still anticipated to operate at LOS D or better, except during the PM peak hour where

the northbound approach is anticipated to degrade to LOS E. Refer to **Table 5.1** for a summary of intersection capacity. Complete capacity calculations are located in **Appendix K**.

### 5.6.4 Analysis Year with IMP Projects and TDM

To mitigate overall trip and parking increases, Carnegie Mellon is pursuing a TDM program to allow the university to achieve its mobility goals. As noted, this will result in AM entering trips and PM exiting trips balancing with parking facility reassignment trips, avoiding new peak hour trips. As drivers are anticipated to divert to new parking facilities, localized impacts are analyzed. To achieve no net new parking, a number of multimodal projects are proposed as mitigation. Refer to **Table 5.2** for a summary of these multimodal projects. The only proposed project that may impact vehicular travel lanes is the Morewood Avenue improvement project, as eliminating the intersection offset will help make the intersection safer for all users. This project requires Carnegie Mellon-owned right-of-way takes, and it could be achieved with or without lane reconfiguration. This Analysis Year with IMP Projects and TDM study condition assumes no lane changes or capacity improvements. Any additional widening or lane reconfiguration will be studied in Section 5.6.5 as additional capacity mitigation.

A capacity analysis was performed for the IMP horizon year (2032) assuming 50 percent maximum buildout and TDM using the volumes shown in **Figure 5.6.6**. The analysis assumes the same fully actuated and coordinated signals as in the 2032 no-build condition, keeping 80-second cycles and optimized timings.

Based on the results of the capacity analysis, the intersection of Fifth Avenue and Neville Street is still anticipated to operate at LOS C overall during the AM peak hour but degrade to LOS D overall during the PM peak hour. Most individual movements are still anticipated to operate at LOS D or better, except during the AM peak hour where the Neville Street southbound shared left/through lane degrades to LOS E, and during the PM peak hour where the Neville Street shared southbound left/through lane degrades to LOS E (the approach degrades to LOS E overall). The Neville Street northbound approach also degrades to LOS E. Additional capacity mitigation will be needed to mitigate the overall intersection delay increase, as it increases by over ten seconds, though the overall level of service will still be LOS D or better.

The intersection of Fifth Avenue and Morewood Avenue is anticipated to maintain the same levels of service as without development, operating at LOS B overall during the AM peak hour and at LOS C overall during the PM peak hour. Individual movements are anticipated to operate at LOS D or better. Therefore, additional roadway capacity mitigation is not required. Refer to **Table 5.1** for a summary of intersection capacity. Complete capacity calculations are located in **Appendix L**.

### 5.6.5 Analysis Year with New Project, TDM, and Mitigation

At the intersection of Fifth Avenue and Neville Street, even with TDM mitigation, the overall level of service is anticipated to degrade from LOS C to LOS D during the PM peak hour, with average delay increasing by 17.7 seconds. The Neville Street northbound approach is anticipated to drop from LOS D to LOS E. To mitigate this capacity degradation, given limited ability to make capacity improvements in a constrained urban setting, this study proposes reconfiguring the Neville Street northbound approach. Since the cartway width is 30 feet, prohibiting parking in the block between Henry Street and Fifth Avenue and using the existing parking lane as a proposed travel lane would allow room for three 10-foot lanes. Therefore, the northbound approach could be restriped to a shared left/through lane and an exclusive right turn lane. There is 160 feet between the existing stop bar and the Henry Street intersection, representing the maximum length for an exclusive right turn lane. No other changes to signalization are proposed, as adding advance left turn phases or split phases would increase the

existing 80-second cycle length, leading to more queuing and longer pedestrian wait times. This change would resolve traffic delay increases.

The northbound and southbound approaches of Morewood Avenue at Fifth Avenue are offset from each other, causing southbound traffic to shift a lane through the intersection while avoiding the sidewalk radius. This corner is well used by pedestrians since a busy transit stop is located there. As part of IMP Mobility Plan improvements proposed in **Table 5.2**, the first project listed involves widening Morewood Avenue onto Carnegie Mellon property at the intersection's southwest quadrant, with the lane shift starting 250 feet in advance of Fifth Avenue to eliminate the offset. The project will require a lateral width of up to 12 additional feet for the lane and cycle track, and considering sidewalk widening at the corner, a total right-of-way take of approximately 3,000 square feet. (Required right-of-way is exclusive of the "Morewood Avenue Cycle Track" project that proposes a new sidewalk on university-owned property).

Implementing this project could give space to add a northbound exclusive left turn lane, though due to space constraints with access to Mudge House and the need for the stop bar to be placed far back for turning vehicles, the length would be limited to 50 feet. Therefore, this project proposes reconfiguring the northbound approach to have an exclusive left turn lane, a through lane, and an exclusive right turn lane. The existing geometry of the through and right lanes would not be impacted. Since few vehicles make the northbound left turn, conflict factor analysis recommends a permissive left turn phase. Refer to **Figure 5.7** for a conceptual design for this intersection improvement.

A capacity analysis was performed for these conditions in the IMP horizon year (2032) assuming 50 percent maximum buildout, TDM, and this additional vehicular mitigation using the volumes shown in **Figure 5.6.6**. The analysis assumes 80-second cycles and optimized timings.

Based on the results of the capacity analysis, the intersection of Fifth Avenue and Neville Street is anticipated to operate at LOS C overall during both peak hours. All intersection approaches are still anticipated to operate at LOS D or better overall, though the Neville Street southbound left/through lane is anticipated to operate at LOS E during the AM and PM peak hours.

The Fifth Avenue and Morewood Avenue intersection is anticipated to maintain without development levels of service, operating at LOS B overall during the AM peak hour and at LOS C overall during the PM peak hour. Individual movements are anticipated to operate at LOS D or better. Refer to **Table 5.1** for a summary of intersection capacity. Complete capacity calculations are located in **Appendix M**.

## 5.7 Queuing Analysis

95$^{th}$ percentile queue length analysis was performed for all study movements for all conditions identified in Section 5.6. Analysis was performed using both Synchro methodology and SimTraffic simulations averaging five runs with 10 minutes of seeding. Refer to **Table 5.3** for queue length summaries, **Appendix M** for Synchro output, and **Appendix N** for SimTraffic output. Results of the queuing analysis indicate that some 95$^{th}$ percentile queues currently spill back beyond left and right turn lanes, but only by a few vehicles which is typical for urban conditions. During the 2032 without development scenario, the 95$^{th}$ percentile queue in the Neville Street southbound right turn lane will exceed its storage bay during the AM peak hour. During the PM peak hour, the 95$^{th}$ percentile queue in the Morewood Avenue right turn lane will also exceed its storage bay.

Additional with development traffic would create queue length increases especially in the PM peak hour, most notably along eastbound Fifth Avenue approaching Neville Street and westbound Fifth Avenue approaching Morewood Avenue. Performing the proposed TDM and capacity mitigation would limit these increases, with the eastbound Synchro-calculated queues increasing by about two car lengths (42 feet) and the westbound Synchro-calculated queues increasing by about five car lengths

(95 feet). At left and right turn lanes, this proposed mitigation will mitigate queue length increases, with any additional spillback limited to a single vehicle.

## 5.8 Traffic Signal Warrant Analysis

IMP projects are not anticipated to require a new signalized intersection, so traffic signal warrant analysis was not performed.

## 5.9 Crash History/Analysis

Five-year crash experience was reviewed for the study area delineated in **Figure 5.0**. Reportable crashes were obtained from the Pennsylvania Crash Information Tool (PCIT) from January 2016 through December 2020 and summarized in **Table 5.4** and **Figure 5.8**. Refer to **Appendix O** for the boundary of the crash query area, specific crash locations, and a detailed summary of the findings. Reportable and nonreportable crashes were obtained from the Carnegie Mellon University Police Department (CMUPD) from January 2018 through June 2021 and reported in **Table 5.5**, though only general locations were given.

Crashes were reviewed to identify crash clusters (a minimum of five crashes with similar causation factors occurring in a one-year period), pedestrian collisions, bicycle crashes, and fatalities. PCIT reported 169 crashes within the study area including 26 pedestrian crashes. The pedestrian crash at Fifth Avenue and Dithridge Street was the one reported fatality. Only the intersection of Fifth Avenue and Morewood Avenue had more than five crashes of the same type within a year, experiencing six angle crashes both in 2017 and 2018. However, crashes occurred in varying directions of travel.

According to the PCIT reports, only two intersections experienced more than an average of two crashes per year: Fifth Avenue and Morewood Avenue with 44 crashes and Fifth Avenue and Neville Street with 21 crashes. These are the two intersections modeled in the capacity analysis. In addition to having the highest total number of crashes (44), the intersection of Fifth Avenue and Morewood Avenue had the highest number of pedestrian crashes with seven. One possible causation factor is that the Morewood Avenue intersection approaches are offset from each other. Northbound movements have a shared left/through lane and an exclusive right turn lane. This configuration is difficult for bicycles to maneuver and challenging for left turning vehicles without a dedicated turn lane. Southbound movements have the more typical exclusive left turn lane and shared through/right lane arrangement, though drivers shift over a lane in the middle of the intersection, as the sidewalk lines up with approaching southbound vehicles. All turns are permissive to oncoming vehicular and pedestrian traffic. Left turn lanes are not present along Fifth Avenue, though this is consistent with most Fifth Avenue intersections. This study proposes improving the Fifth Avenue and Morewood Avenue intersection as part as an IMP Mobility Plan project to eliminate the Morewood Avenue intersection offset and to add a 50-foot northbound exclusive left turn lane. Refer to **Figure 5.7** for a conceptual intersection reconfiguration design drawing.

At Fifth Avenue and Neville Street, this study's capacity analysis mitigation proposes delineating a northbound exclusive right turn lane. This improvement would help make traffic flow more orderly and could also help improve driver compliance yielding to conflicting pedestrians.

Upgrades are planned by other agencies at all Fifth Avenue intersections, including at Dithridge Street, Neville Street, and Morewood Avenue. Improvements are to be included within DOMI's Smart Spines project and Port Authority's BRT project. Existing pretimed traffic signals will be replaced with ones that are actuated and coordinated, and they will include modern accessible pedestrian signals. Upgrades will add highly visible crosswalks and update all curb ramps to be ADA compliant.

CMUPD reported 215 crashes, including one involving a bicycle, though its location on Forbes Avenue was not specified. According to the CMUPD, other than incidents reported at the police station or

within parking facilities, Frew Street experiences the highest number of vehicular incidents throughout the campus roadway network. There were 21 collision or vehicular damage reports along Frew Street between Schenley Drive and Tech Street, as the perpendicular parking configuration lacks a maneuvering area to buffer the parking spaces with through traffic. The IMP proposes improving this roadway within the Mobility Plan by converting two-way Frew Street to a one-way facility with parallel parking and a shared use path. Tech Street and Margaret Morrison Street also have parallel parking.

# 6.0 Parking

## 6.1 Existing Conditions

Shown in **Figure 6.0** and summarized in **Table 6.1**, Carnegie Mellon University has 34 parking facilities for a total existing parking inventory of 2,972 spaces. Of these parking spaces, 1,093 are in surface lots, 1,795 are in garages, and 84 are in remote lots served by university shuttle routes.

In 2017 and 2018, Carnegie Mellon consulted with Chance Parking Advisors and Ayers Saint Gross to create a Parking Master Plan. Parking surveys conducted in 2017 recorded an overall lot occupancy of 88 percent, with larger facilities filling to capacity and smaller facilities underutilized. Individual lot capacities are shown in **Figure 6.1** occupancies are shown in **Appendix P**. New parking surveys for this master plan are not feasible due to working from home programs during the pandemic. When parking utilization counts were performed, they included 20 spaces at the former Doherty Apartments residence hall. Upon its demolition in 2020 to build the Forbes Beeler project, these spaces were removed. However, the Forbes Beeler project is to include 20 new spaces to come online when the project is completed in 2023. Factoring in those spaces, and not considering some of the remote lots, the 2017 report showed a parking supply of 2,908 spaces. That study also included the 144 city-owned metered parking spaces on Frew Street for a total parking supply of 3,081 spaces. Proposed changes to parking along Frew Street may occur through the IMP mobility project, though that project will require a separate study that will look to reaccommodate parking elsewhere on Schenley Drive.

Based on data provided by the university's Parking and Transportation Services in February 2020 (the last month before pandemic impacts reduced demand), there were 2,267 five-day permits and 95 three-day permits offered. There were also 56 permits reserved for university-owned vehicles and four for zip cars. Therefore, about 82 percent of total lot occupancy was reserved for permit holders. Non-permit holders typically park in the East Campus garage, along the Frew/Tech/Margaret Morrison Street or Circuit Drive metered spaces, or in various free parking locations in Schenley Park. Parking along almost all other on-street spaces on streets bordering or otherwise near campus require parking permits through the city's Residential Parking Program. Refer to **Figure 6.1** for a map of permit parking areas.

## 6.2 Proposed Parking

Carnegie Mellon is an urban campus surrounded by residential areas with a supply of rental apartments. First-year undergraduates are required to live on or near campus in university-provided housing. While the university does not provide graduate student housing, almost all graduate students live in nearby apartments. Few parking passes are made available to undergraduate or graduate students. Instead, the university provides transit passes and has invested in bicycle infrastructure to provide auto alternatives. Employees can take advantage of car-free commuting options as they also receive transit passes. As a result, parking demand has been determined based on survey data from Carnegie Mellon's parking master plan and from historical parking trend data.

Through the institutional master planning process and Carnegie Mellon's commitment to the Pittsburgh 2030 district, the university is committed to their mobility goal of providing no net new parking, using

TDM to mitigate future parking increases. The IMP's mobility plan presents the goal that "Existing Parking - Removals + Replacement + Leased + TDM = 0 at 90 percent efficiency." Master planning projects also aim to eliminate surface lots, consolidating parking in underground facilities beneath future development sites. Therefore, Carnegie Mellon proposes to maintain the existing 2,972-space parking supply and use TDM to mitigate demand for new parking. Refer to **Figure 6.2** for anticipated parking reassignment due to master planning projects and **Table 6.2** for a summary proposed parking for each IMP development project.

## 6.3 Transportation Demand Management

The goal of transportation demand management (TDM) is to provide an implementable plan to provide alternatives to single-occupant vehicles that are tied to realistic targets and to monitor the plan to ensure its success. As it will reduce vehicular use, TDM will also reduce parking demand. TDM at Carnegie Mellon will be administered and monitored by the university's Parking and Transportation Services. Discussed in Section 4.1, TDM mode share goals have been proposed through correspondence with DCP and DOMI and based on the results of Carnegie Mellon University's Parking Master Plan. That plan, completed in 2018 by Ayers Saint Gross, Brailsford & Dunlavey, with survey data collected by Fehr & Peers, (**Appendix D**), included an employee commuter survey conducted from March through May of 2018. The employee survey had 2,263 participants, though responses to individual questions varied. From coordination with DCP and DOMI, Carnegie Mellon's TDM mode share targets for faculty and staff are proposed as follows:

- 30 percent mode share for driving alone and parking (decrease of eight percent)
- 7 percent mode share for carpooling and ride sharing (increase of two percent)
- 30 percent transit (increase of one percent)
- 9 percent biking (increase of two percent)
- 19 percent walking (no change)
- 5 percent other, such as working from home (increase of four percent)

Of note, Question 36 of the employee survey asked participants (1,949 respondents) if they would consider alternative modes of transportation if parking rates continued to rise. Six percent indicated a willingness to switch to walking, six percent to switch to biking, three percent to start carpooling, six percent to start getting dropped off, 23 percent switching transit, three percent switching to a university shuttle, and two percent starting to use rideshare. 44 percent of respondents indicated that they would continue to drive. While these percentages are assumedly from the existing auto commuters, the responses show employees do have some willingness to switch modes, indicating that a TDM program that aims to reduce driving alone by eight percent can realistically be implemented.

The survey concluded with an open-ended question, which 824 participants used to discuss their thoughts on commuting. Common themes emerged, and these responses formed the basis of the study's TDM recommendations. Key findings to be implemented are as follows:

- Expanding transit passes to employees of contracted services, such as dining and janitorial services.
- Expanding transit passes beyond Allegheny County to include transit operators in surrounding counties.
- Coordinating with other Oakland area shuttle operators to improve and expand shared shuttle routes and frequencies.

- Building additional bicycle infrastructure.
- Improving on-campus bicycle amenities.
- Developing a carpool/vanpool program.
- Improving sidewalk accessibility, connectivity, and safety.
- Providing three-day or flexible parking passes.
- Coordinating with the Port Authority to improve transit route coverage and efficiency.
- Implementing work from home programs.

Refer to **Table 6.3** for a summary of survey results, possible implementation timeframes, and their potential single occupant vehicle commuting reduction and associated parking reduction. Based on these strategies, at least two percent of commuters may switch to carpooling and ride sharing, six percent to transit, two percent to biking, one percent to walking, and five percent to working from home. Parking demand is also anticipated to decrease by eight percent. Since the survey was conducted before the pandemic, virtual and hybrid commuting options have become more commonplace and acceptable, so survey results may underreport their future mode share. The proposed five percent mode share target may underestimate demand, though it is a more conservative assumption.

As part of a Traffic Impact Study, DOMI includes TDM Checklist items and Site Plan strategies. Refer to **Tables 6.4** and **6.5** respectively for a summary of these strategies, their ongoing incorporation into TDM planning at the university, and additional comments. As a TDM plan includes ongoing monitoring and tweaking these strategies, blank fields for strategy results and strategy revisions are also included in these tables for future updates. Refer to **Table 5.2** for a summary of the multimodal projects included in Carnegie Mellon's mobility section of the master plan to help achieve these TDM targets.

## 6.4 Parking Demand Analysis

Refer to **Table 6.2** for a summary of parking demand analysis for each proposed development project. This table is supported by the calculation in **Appendix Q** which estimates new parking demand based on net assignable square footage (nasf). As shown, Carnegie Mellon's population has grown from 12,058 students and employees in the fall of 2000 to 19,029 students and employees in the fall of 2019. During that same time, net assignable square footage declined from 249 nasf/person to 211 nasf/person. Part of the campus growth goal for projects proposed in this master plan is to provide space to return to the previous target of 250 nasf/person. Therefore, a portion of each development project will be filled by existing demand, estimated at 742,131 nasf of space to be shifted from existing university buildings to proposed university buildings. Assuming 50 percent of full buildout from the master plan projects, parking demand calculations are based on 456,169 nasf of new space. Detailed in the next section, TDM is planned to reduce parking demand by eight percent. With an existing parking occupancy of 88 percent, TDM would free 210 spaces. With the drive alone mode share target of 30 percent, master plan projects will result 262 new parking spaces demanded. Backfilling parking spaces made available by TDM is anticipated to achieve an overall parking occupancy of 90 percent, which is the target utilization for campus. Therefore, this parking demand analysis justifies the IMP mobility goal, "Existing – Removals + Replacement + Leased + TDM = 0 at 90 percent efficiency."

## 6.5 Other Transportation

Carnegie Mellon's Parking and Transportation Services offers shuttle and escort services. Shuttle service operates on fixed routes with specific stops. Escort Service helps to fill gaps in transit services

by operating in evening and overnight hours to provide on-demand transportation. Refer to **Table 3.1** and **Figure 3.3** for routes, stop locations, and operational frequency.

Per the TDM proposal, Carnegie Mellon is looking to coordinate with other Oakland-area shuttle operators (University of Pittsburgh and Carlow University) to combine and consolidate routes. This would allow the universities to expand shuttle service coverage and decrease headways, allowing riders with their college IDs to use each other's shuttles. The universities are currently partnering on an ongoing study, with a pilot program expected to start in the next few years.

# 7.0 Recommendations/Conclusion

This traffic impact study demonstrates Carnegie Mellon's commitment to sustainable growth by proposing multimodal capacity upgrades to support its 2022-2032 Institutional Master Plan projects. As each individual development site included in the IMP represents the largest possible massing on each site, 50 percent of the total development square footage has been evaluated within this study. Conducted from 2020 through 2022 during the years most impacted by the pandemic, this report's analysis reflects pre-pandemic conditions. Though pandemic modal shifts suggest increased post-pandemic workplace flexibility will become typical, this study conservatively limits working from home programs to five percent of commuters. Findings are anticipated to be conservative. Since the land development project has not been completed or the exact size or configuration of any of the IMP development projects known, each development may require a separate traffic impact assessment or comparison with its expectations within this study. Deviations from assumptions presented in this study may also result in the need for future studies and amendments.

Final recommendations proposed by this traffic impact study are as follows:

- Implement a Transportation Demand Management Program that invests in multimodal programs to achieve the following mode share targets:
    - 30 percent mode share for driving alone and parking (decrease of eight percent)
    - 7 percent mode share for carpooling and ride sharing (increase of two percent)
    - 30 percent transit (increase of one percent)
    - 9 percent biking (increase of two percent)
    - 19 percent walking (no change)
    - 5 percent other, such as working from home (increase of four percent)
- Use Transportation Demand Management to successfully mitigate parking demand increases so the existing 2,972-space parking supply is maintained at 90 percent capacity.
- Perform the projects identified in the master plan's mobility proposal (**Table 5.2**) and strategies identified through the Transportation Demand Management study (**Table 6.3**) to achieve the master plan's mobility goals.
- Maintain existing vehicular levels of service through the following two capacity improvement projects:
    - Restripe the northbound Neville Street approach to Fifth Avenue from Henry Street to have a shared left/through lane and an exclusive right turn lane.
    - Reconfigure the northbound Morewood Avenue approach to Fifth Avenue to eliminate the intersection offset by adding a 50-foot (minimum) left turn lane alongside the existing through lane and exclusive right turn lane.

- Partner with the City of Pittsburgh and the Port Authority to implement these mobility projects along with their roadway improvement projects (including Oakland Neighborhood Plan implementation) and BRT projects.

Enacting these mitigative strategies will improve the safety and mobility for all users while allowing Carnegie Mellon to sustainability grow throughout the ten-year master planning horizon.

# TABLES

**Table 1.1**
**Development Description**
**Carnegie Mellon University 2022-2032 Institutional Master Plan Traffic Impact Study**
**City of Pittsburgh, Pennsylvania**

| Project Component | | | | Existing On-Site Conditions | | | Maximum Future On-Site Conditions | | | Net Difference (Max.) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | Type | Description | Proposed Use | Size (Sq. Ft.) | # of Beds | # of Parking | Size (Sq. Ft.) | # of Beds | # of Parking | Size (Sq. Ft.) | # of Beds | # of Parking |
| 1 | Facilities Operations Center | S Neville along Railroad | Parking, Utility, Office | | | 96 | 40,000 sf | | 135 | 40,000 sf | | 39 |
| 2 | New Academic Building | FMS Building | Education, Laboratory / Research, Office, Restaurant, Utility | 48,000 sf | | | 300,000 sf | | | 252,000 sf | | 0 |
| 3 | Academic Building Expansion | Hamburg & Smith Halls | Education, Laboratory / Research, Office, Restaurant | 22,000 sf | | | 100,000 sf | | | 78,000 sf | | 0 |
| 4 | New Academic Building | Cyert & Warner Halls | Education, Laboratory / Research, Office, Parking, Restaurant | 110,000 sf | | | 250,000 sf | | | 140,000 sf | | 0 |
| 5 | Academic Building Expansion | Purnell Center for the Arts | Education, Laboratory / Research, Office, Public Assembly | | | 16 | 30,000 sf | | | 30,000 sf | | -16 |
| 6 | Student Support Expansion | West Wing Addition | Education, Laboratory / Research, Office, Restaurant | | | | 5,000 sf | | | 5,000 sf | | 0 |
| 7 | Academic Building Expansion | Margaret Morrison Carnegie Hall | Education, Laboratory / Research, Office | | | 14 | 110,000 sf | | | 110,000 sf | | -14 |
| 8 | New Mixed Use Building | Donner Hall | Education, Laboratory / Research, Office, Parking, Restaurant / Student Housing | | 241 | 23 | 266,000 sf | 735 | 200 | 266,000 sf | 494 | 177 |
| 9 | Student Support Expansion | Hamerschlag House | Office, Restaurant | | | | 6,000 sf | | | 6,000 sf | | 0 |
| 10 | New Academic Building | Tepper School Expansion Site | Education, Laboratory / Research, Office, Parking, Public Assembly, Restaurant | | | | 180,000 sf | | 400 | 180,000 sf | | 400 |
| 11 | New Mixed Use Building | Morewood Lot | Laboratory / Research, Office, Restaurant / Student Housing | | | 285 | 220,000 sf | 500 | 200 | 220,000 sf | 500 | -85 |
| 12 | E Tower Commons | Morewood E Tower | Office, Restaurant | | | | 6,000 sf | | | 6,000 sf | | 0 |
| 13 | New Mixed Use Building | Capstone site at Forbes & Morewood | Education, Laboratory / Research, Office, Parking, Student Housing, Restaurant | | | 69 | 200,000 sf | 300 | 150 | 200,000 sf | 300 | 81 |
| 14 | New Residential Building(s) | Greek Quad | Office, Parking, Student Housing | | 384 | | 250,000 sf | 720 | | 250,000 sf | 336 | 0 |
| 15 | New Residential Building | Forbes & Devon | Office, Student Housing | | | | 40,000 sf | 180 | | 40,000 sf | 180 | 0 |
| 16 | Shirley Apartments | Shirley Apartments | Office, Parking, Student Housing | | 20 | | 20,000 sf | | | 20,000 sf | -20 | 0 |
| 17 | New Residential Building | Whitfield Hall | Office, Parking, Student Housing | 4,000 sf | | 61 | 160,000 sf | 165 | 55 | 156,000 sf | 165 | -6 |
| 18 | Academic Building Expansion | Mellon Institute | Education, Laboratory / Research | | | | 30,000 sf | | | 30,000 sf | | 0 |
| 19 | New Academic Building | North of Forbes @ S Craig | Education, Laboratory / Research, Office, Parking, Restaurant, Retail | 49,000 sf | | 72 | 230,000 sf | | 200 | 181,000 sf | | 128 |
| 20 | New Academic Building | South of Forbes @ S Craig | Education, Laboratory / Research, Office, Parking, Public Assembly, Restaurant, Retail | 2,700 sf | | 126 | 425,000 sf | | 500 | 422,300 sf | | 374 |
| **Total** | | | | **235,700 sf** | **645** | **762** | **2,868,000 sf** | **2600** | **1840** | **2,632,300 sf *** | **1955 *** | **1078**** |

* Size reflects maximum buildout. Approximately 1/3 of development square footage realized from 2012-2022 master plan; 1/3 to 1/2 expected to be realized for the 2022-2032 master plan, so 1/2 used in TIS calculations.

** Additional campus surface lots will be removed and replaced with green space, and new parking spaces, which are based on maximum building massing in this table, will be reduced. The University is pursuing a goal of no net new parking so the final number of new proposed parking spaces will be less. Refer to Table 6.2.

**Table 1.2**
**Status of 2012-2022 IMP Projects**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Number | Name | Proposed Size | Constructed Size | Completed? |
|---|---|---|---|---|
| 1 | Scott Hall | 120,000 | 105,000 | Yes |
| 2 | South Wing Wean Hall | 10,000 | | No |
| 3 | New Scaife Hall | 120,000 | 85,000 | Ongoing |
| 4 | ANSYS Hall | 50,000 | 36,000 | Yes |
| 5 | New Academic Building (Beach) | 125,000 | | No |
| 6 | Below-Grade Academic Facility | 40,000 | | No |
| 7 | Margaret Morrison Extension | 110,000 | | No |
| 8 | Skibo Gym | 200,000 | 165,000 | Ongoing |
| 9 | Cohon University Center Addition | 75,000 | 68,000 | Yes |
| 10 | West Wing Addition | 7,500 | | No |
| 11 | South of Forbes Site | 425,000 | | No |
| 12 | FMS Expansion/Addition | 100,000 | | No |
| 13 | Hamburg Hall Addition | 60,000 | 6,000 | Yes |
| 14 | Warner Hall & Loggia Expansion | 70,000 | | No |
| 15 | Below Ground Purnell Expansion | 100,000 | | No |
| 16 | Capstone Building | 200,000 | | No |
| 17 | Relocation of Greek House | 25,000 | | No |
| 18 | Garage Relocations | 10,000 | | No |
| 19 | Doherty Apartments Site | 120,000 | 118,000 | Ongoing |
| 20 | Morewood Gardens Addition | 80,000 | | No |
| 21 | North of Forbes (TCS) | 385,000 | 75,000 | Yes |
| 22 | Tepper School of Business | 400,000 | 315,000 | Yes |
| 23 | New Academic Building (Tepper 2) | 180,000 | | No |
| 24 | New Adacemic Building South | 200,000 | | No |
| 25 | New Academic Building North | 200,000 | | No |
| 26 | S Neville Support Facility & Parking | 50,000 | 8,000 | Yes |
| 27 | Mellon Institute Entry & Infills | 30,000 | | No |
| 28 | The Residence on Fifth | 70,000 | 65,000 | Yes |
| 29 | North of Fifth Multi-Use Renovation | 25,000 | 22,000 | Yes |
| 30 | North of Fifth Multi-Use Building | 120,000 | 98,000 | Yes |
| **Total** | | **3,707,500** | **1,166,000** | **31%** |

**Table 2.1**
**Vehicular Site Access**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Proposed Conditions (Project Entry/Exit Points) | Signalized | Unsignalized | Proposed Access (Full or Restricted) | Notes |
|---|---|---|---|---|
| Frew Street and Hamerschlag Drive | | X | Full Access (to be Restricted to Service Vehicles, Bicycles, and Pedestrians) | Hamerschlag Drive entrance permanently closed to all but service vehicles, bicycles, and pedestrians as part of Scaife Hall project |
| Tech Street, Margaret Morrison Street, and Fine Arts Lot Driveway | | X | Full Access (Parking use to be restricted to event-only parking) | Fine Arts Lot to become special event parking only |
| Margaret Morrison Street and Donner/Margaret Morrison Driveway | | X | Full Access | Donner Driveway will be modified as part of Donner Site or Margaret Morrison Expansion projects with existing surface parking replaced with underground parking |
| Margaret Morrison Street and Hill Dorms Driveway | | X | Full Access | No changes anticipated to existing |
| Forbes Avenue at Beeler Street & East Campus Garage | X | | Full Access | No changes anticipated to existing; garage capacity to be maintained |
| Forbes Avenue & Forbes-Beeler Driveway | | X | Full Access | Forbes-Beeler residence hall project to be completed in 2023. Existing driveway will be reopened to serve 20 parking spaces |
| Forbes Avenue & Devon Rd / East Campus Garage | | X | Restricted (No cross traffic, existing) | No changes anticipated to existing; garage capacity to be maintained in long-term condition |
| Forbes Avenue & Morewood Place / Greek Quad Driveway | | X | Restricted (Entering only, existing) | Greek Quad redevelopment project may result in parking and circulation changes, though entry-only configuration from Forbes anticipated |
| Morewood Avenue & Morewood Place | | X | Full Access | Reconfiguration of Morewood Lot; exit-only driveway assumed from Greek Quad redevelopment to match existing but full access may be considered |
| Forbes Avenue & Cyert Driveway | | X | Full Access (to be Restricted to Service Vehicles, Bicycles, and Pedestrians) | Warner Hall Lot to be eliminated, driveway to be restricted to service vehicles |
| Forbes Avenue & Tepper Driveway | X | | Full Access | Capacity of Tepper parking facilities to be increased with IMP project, driveway changes not anticipated |
| Forbes Avenue & Craig Street / Museum Driveway | X | | Full Access | Planned redevelopment of CMU-owned Carnegie Museum and III lots as part of South of Forbes project |
| Neville Street, South Neville, and South of Forbes Proposed Driveway | | X | Full Access | Proposed new driveway from Neville Street to future South of Forbes Garage; location to be determined but likely opposite South Neville Lot driveway. South Neville Lot to be reduced in capacity for FMS project. |
| Neville Street, Boundary Street, CIC Driveway | | X | Full Access | Parking may be eliminated from Hamerschlag Drive (West Campus parking); railroad crossing improvements proposed |
| Filmore Street and Zebina Way | | X | Full Access | Surface lot to be replaced with lower level structured parking in proposed academic building |
| Clyde Street at Fifth Clyde Residence Hall Driveway | | X | Restricted (Left in Left Out) | Previous parking lot reduced to 20 spaces |
| Clyde Street at Clyde and Highlands Apartments Driveway | | X | Restricted (Left in Left Out) | No changes proposed to existing |
| Craig Street & Whitfield Hall Driveway | | X | Full Access | Potential driveway updates when existing building is to be updated or replaced |

**Table 3.1**
**Transit Routes**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Route | Operator | Peak Headway | Notes |
|---|---|---|---|
| P3 | Port Authority | 15 minutes | |
| 28X | Port Authority | 30 minutes | |
| 58 | Port Authority | 1 hour | |
| 61A, B, C, D | Port Authority | 15 minutes | |
| 71B, D | Port Authority | 15 minutes | |
| 75 | Port Authority | 25 minutes | |
| A | CMU | 45 minutes | Morning hours |
| B | CMU | 1 hour | Morning hours |
| AB | CMU | 45 minutes | Afternoon hours |
| C | CMU | 45 minutes | |
| PTC/MILL 19 | CMU | 1 hour | Mill 19 Shuttle does not run on weekends |
| Escort (On Demand) | CMU | 45 minutes | Replaces shuttle routes for late night hours |

**Table 4.1**
**Trip Generation without TDM Mitigation (Full Buildout, 100% of Master Plan)**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Project Component | | | | Trip Generation[3] | | | Existing On-Site Conditions | | Future On-Site Conditions | | | Anticipated Trip Generation without TDM Mitigation, Maximum Buildout[1,2] | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Total Trips | | Entering Trips | | | | | | | Exiting Trips | | | | | | | |
| Number | Type | Description | Proposed Use | Land Use Code | Land Use Description | Independent Variable | Size (Sq. Ft.) | # of Beds | Max. Size (Sq. Ft.) | Max. # of Beds | Max Size, Net (Sq. Ft.) or Residents | Trip Type | Total (ITE) | Drive and Park<br>*38% Academic*<br>*2% Residential* | Drop-off & Rideshare<br>*5% Academic*<br>*6% Residential* | Transit<br>*29% Academic*<br>*45% Residential* | Walk<br>*19% Academic*<br>*29% Residential* | Bike<br>*7% Academic*<br>*12% Residential* | Other<br>*2% Academic*<br>*6% Residential* | Total Entering | Drive and Park<br>*38% Academic*<br>*2% Residential* | Drop-off & Rideshare<br>*5% Academic*<br>*6% Residential* | Transit<br>*29% Academic*<br>*45% Residential* | Walk<br>*19% Academic*<br>*29% Residential* | Bike<br>*7% Academic*<br>*12% Residential* | Other<br>*2% Academic*<br>*6% Residential* | Total Exiting |
| 1 | Facilities Operations Center | S Neville along Railroad | Parking, Utility, Office | 170 | Utility | 1000 Sq. Ft. GFA | | | 40,000 sf | | 40,000 sf | Weekday[4] | 277 | 52 | 7 | 40 | 26 | 10 | 3 | 138 | 53 | 7 | 40 | 26 | 10 | 3 | 139 |
| | | | | | | | | | | | | AM Peak Hour | 92 | 28 | 4 | 21 | 14 | 5 | 2 | 74 | 7 | 1 | 5 | 3 | 1 | 1 | 18 |
| | | | | | | | | | | | | PM Peak Hour | 53 | 4 | 0 | 3 | 2 | 1 | 0 | 10 | 16 | 2 | 12 | 8 | 3 | 2 | 43 |
| 2 | New Academic Building | FMS Building | Education, Laboratory / Research, Office, Restaurant, Utility | 550 | University/College | 1000 Sq. Ft. GFA | 48,000 sf | | 300,000 sf | | 252,000 sf | Weekday[4] | 6,562 | 1,247 | 164 | 951 | 623 | 230 | 66 | 3,281 | 1,247 | 164 | 951 | 623 | 230 | 66 | 3,281 |
| | | | | | | | | | | | | AM Peak Hour | 275 | 81 | 11 | 61 | 40 | 15 | 4 | 212 | 24 | 3 | 18 | 12 | 4 | 2 | 63 |
| | | | | | | | | | | | | PM Peak Hour | 295 | 36 | 5 | 27 | 18 | 7 | 1 | 94 | 76 | 10 | 58 | 38 | 14 | 5 | 201 |
| 3 | Academic Building Expansion | Hamburg & Smith Halls | Education, Laboratory / Research, Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | 22,000 sf | | 100,000 sf | | 78,000 sf | Weekday[4] | 2,031 | 386 | 51 | 294 | 193 | 71 | 20 | 1,015 | 386 | 51 | 295 | 193 | 71 | 20 | 1,016 |
| | | | | | | | | | | | | AM Peak Hour | 85 | 25 | 3 | 19 | 12 | 5 | 1 | 65 | 8 | 1 | 6 | 4 | 1 | 0 | 20 |
| | | | | | | | | | | | | PM Peak Hour | 91 | 11 | 1 | 8 | 6 | 2 | 1 | 29 | 24 | 3 | 18 | 12 | 4 | 1 | 62 |
| 4 | New Academic Building | Cyert & Warner Halls | Education, Laboratory / Research, Office, Parking, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | 110,000 sf | | 250,000 sf | | 140,000 sf | Weekday[4] | 3,646 | 693 | 91 | 529 | 346 | 128 | 36 | 1,823 | 693 | 91 | 529 | 346 | 128 | 36 | 1,823 |
| | | | | | | | | | | | | AM Peak Hour | 153 | 45 | 6 | 34 | 22 | 8 | 3 | 118 | 13 | 2 | 10 | 7 | 2 | 1 | 35 |
| | | | | | | | | | | | | PM Peak Hour | 164 | 20 | 3 | 15 | 10 | 4 | 0 | 52 | 43 | 6 | 32 | 21 | 8 | 2 | 112 |
| 5 | Academic Building Expansion | Purnell Center for the Arts | Education, Laboratory / Research, Office, Public Assembly | 550 | University/College | 1000 Sq. Ft. GFA | | | 30,000 sf | | 30,000 sf | Weekday[4] | 781 | 148 | 20 | 113 | 74 | 27 | 8 | 390 | 149 | 20 | 113 | 74 | 27 | 8 | 391 |
| | | | | | | | | | | | | AM Peak Hour | 33 | 10 | 1 | 7 | 5 | 2 | 0 | 25 | 3 | 0 | 2 | 2 | 1 | 0 | 8 |
| | | | | | | | | | | | | PM Peak Hour | 35 | 4 | 1 | 3 | 2 | 1 | 0 | 11 | 9 | 1 | 7 | 5 | 2 | 0 | 24 |
| 6 | Student Support Expansion | West Wing Addition | Education, Laboratory / Research, Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 5,000 sf | | 5,000 sf | Weekday[4] | 130 | 25 | 3 | 19 | 12 | 5 | 1 | 65 | 25 | 3 | 19 | 12 | 5 | 1 | 65 |
| | | | | | | | | | | | | AM Peak Hour | 5 | 2 | 0 | 1 | 1 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | | | | | | | | | | | | PM Peak Hour | 6 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 4 |
| 7 | Academic Building Expansion | Margaret Morrison Carnegie Hall | Education, Laboratory / Research, Office | 550 | University/College | 1000 Sq. Ft. GFA | | | 110,000 sf | | 110,000 sf | Weekday[4] | 2,864 | 544 | 72 | 415 | 272 | 100 | 29 | 1,432 | 544 | 72 | 415 | 272 | 100 | 29 | 1,432 |
| | | | | | | | | | | | | AM Peak Hour | 120 | 35 | 5 | 27 | 17 | 6 | 2 | 92 | 11 | 1 | 8 | 5 | 2 | 1 | 28 |
| | | | | | | | | | | | | PM Peak Hour | 129 | 16 | 2 | 12 | 8 | 3 | 0 | 41 | 33 | 4 | 26 | 17 | 6 | 2 | 88 |
| 8 | New Mixed Use Building | Donner Hall | Education, Laboratory / Research, Office, Parking, Restaurant / Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | 241 | 266,000 sf | 735 | 266,000 sf | Weekday[4] | 6,927 | 69 | 208 | 1,558 | 1,004 | 416 | 208 | 3,463 | 69 | 208 | 1,559 | 1,005 | 416 | 207 | 3,464 |
| | | | | | | | | | | | | AM Peak Hour | 290 | 4 | 13 | 100 | 65 | 27 | 14 | 223 | 1 | 4 | 30 | 19 | 8 | 5 | 67 |
| | | | | | | | | | | | | PM Peak Hour | 311 | 2 | 6 | 45 | 29 | 12 | 5 | 99 | 4 | 13 | 95 | 61 | 25 | 14 | 212 |
| 9 | Student Support Expansion | Hamerschlag House | Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 6,000 sf | | 6,000 sf | Weekday[4] | 156 | 30 | 4 | 23 | 15 | 5 | 1 | 78 | 30 | 4 | 23 | 15 | 5 | 1 | 78 |
| | | | | | | | | | | | | AM Peak Hour | 7 | 2 | 0 | 1 | 1 | 0 | 1 | 5 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| | | | | | | | | | | | | PM Peak Hour | 7 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 2 | 0 | 1 | 1 | 0 | 1 | 5 |
| 10 | New Academic Building | Tepper School Expansion Site | Education, Laboratory / Research, Office, Parking, Public Assembly, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 180,000 sf | | 180,000 sf | Weekday[4] | 4,687 | 890 | 117 | 679 | 445 | 164 | 48 | 2,343 | 891 | 117 | 680 | 445 | 164 | 47 | 2,344 |
| | | | | | | | | | | | | AM Peak Hour | 196 | 57 | 8 | 44 | 29 | 11 | 2 | 151 | 17 | 2 | 13 | 9 | 3 | 1 | 45 |
| | | | | | | | | | | | | PM Peak Hour | 211 | 25 | 3 | 19 | 13 | 5 | 2 | 67 | 55 | 7 | 42 | 27 | 10 | 3 | 144 |
| 11 | New Mixed Use Building | Morewood Lot | Laboratory / Research, Office, Restaurant / Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | | 220,000 sf | 500 | 220,000 sf | Weekday[4] | 5,729 | 57 | 172 | 1,289 | 831 | 344 | 171 | 2,864 | 57 | 172 | 1,289 | 831 | 344 | 172 | 2,865 |
| | | | | | | | | | | | | AM Peak Hour | 240 | 4 | 11 | 83 | 54 | 22 | 11 | 185 | 1 | 3 | 25 | 16 | 7 | 3 | 55 |
| | | | | | | | | | | | | PM Peak Hour | 257 | 2 | 5 | 37 | 24 | 10 | 4 | 82 | 4 | 11 | 79 | 51 | 21 | 9 | 175 |
| 12 | E Tower Commons | Morewood E Tower | Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 6,000 sf | | 6,000 sf | Weekday[4] | 156 | 30 | 4 | 23 | 15 | 5 | 1 | 78 | 30 | 4 | 23 | 15 | 5 | 1 | 78 |
| | | | | | | | | | | | | AM Peak Hour | 7 | 2 | 0 | 1 | 1 | 0 | 1 | 5 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| | | | | | | | | | | | | PM Peak Hour | 7 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 2 | 0 | 1 | 1 | 0 | 1 | 5 |
| 13 | New Mixed Use Building | Capstone site at Forbes & Morewood | Education, Laboratory / Research, Office, Parking, Student Housing, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 200,000 sf | 300 | 200,000 sf | Weekday[4] | 5,208 | 52 | 156 | 1,172 | 755 | 312 | 157 | 2,604 | 52 | 156 | 1,172 | 755 | 312 | 157 | 2,604 |
| | | | | | | | | | | | | AM Peak Hour | 218 | 3 | 10 | 76 | 49 | 20 | 10 | 168 | 1 | 3 | 23 | 15 | 6 | 2 | 50 |
| | | | | | | | | | | | | PM Peak Hour | 234 | 2 | 5 | 34 | 22 | 9 | 3 | 75 | 3 | 10 | 72 | 46 | 19 | 9 | 159 |
| 14 | New Residential Building(s) | Greek Quad | Office, Parking, Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | 384 | 250,000 sf | 720 | 250,000 sf | Weekday[4] | 6,510 | 65 | 195 | 1,465 | 944 | 391 | 195 | 3,255 | 65 | 195 | 1,465 | 944 | 391 | 195 | 3,255 |
| | | | | | | | | | | | | AM Peak Hour | 273 | 4 | 13 | 95 | 61 | 25 | 12 | 210 | 1 | 4 | 28 | 18 | 8 | 4 | 63 |
| | | | | | | | | | | | | PM Peak Hour | 293 | 2 | 6 | 42 | 27 | 11 | 6 | 94 | 4 | 12 | 90 | 58 | 24 | 11 | 199 |
| 15 | New Residential Building | Forbes & Devon | Office, Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | | 40,000 sf | 180 | 40,000 sf | Weekday[4] | 1,042 | 10 | 31 | 234 | 151 | 63 | 32 | 521 | 10 | 31 | 234 | 151 | 63 | 32 | 521 |
| | | | | | | | | | | | | AM Peak Hour | 44 | 1 | 2 | 15 | 10 | 4 | 2 | 34 | 0 | 1 | 5 | 3 | 1 | 0 | 10 |
| | | | | | | | | | | | | PM Peak Hour | 47 | 0 | 1 | 7 | 4 | 2 | 1 | 15 | 1 | 2 | 14 | 9 | 4 | 2 | 32 |
| 16 | Shirley Apartments | Shirley Apartments | Office, Parking, Student Housing | 225 | Off-Campus Student Apartment | Residents | | 20 | 20,000 sf | 20 | 20 | Weekday[4] | 221 | 2 | 7 | 50 | 32 | 13 | 6 | 110 | 2 | 7 | 50 | 32 | 13 | 7 | 111 |
| | | | | | | | | | | | | AM Peak Hour | 6 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 2 | 1 | 0 | 1 | 4 |
| | | | | | | | | | | | | PM Peak Hour | 31 | 0 | 1 | 7 | 4 | 2 | 1 | 15 | 0 | 1 | 7 | 5 | 2 | 1 | 16 |
| 17 | New Residential Building | Whitfield Hall | Office, Parking, Student Housing | 225 | Off-Campus Student Apartment | Residents | 4,000 sf | | 160,000 sf | 165 | 165 | Weekday[4] | 857 | 9 | 26 | 193 | 124 | 51 | 25 | 428 | 9 | 26 | 193 | 124 | 51 | 26 | 429 |
| | | | | | | | | | | | | AM Peak Hour | 28 | 0 | 1 | 5 | 3 | 1 | 1 | 11 | 0 | 1 | 8 | 5 | 2 | 1 | 17 |
| | | | | | | | | | | | | PM Peak Hour | 63 | 1 | 2 | 14 | 9 | 4 | 1 | 31 | 1 | 2 | 14 | 9 | 4 | 2 | 32 |
| 18 | Academic Building Expansion | Mellon Institute | Education, Laboratory / Research | 550 | University/College | 1000 Sq. Ft. GFA | | | 30,000 sf | | 30,000 sf | Weekday[4] | 781 | 148 | 20 | 113 | 74 | 27 | 8 | 390 | 149 | 20 | 113 | 74 | 27 | 8 | 391 |
| | | | | | | | | | | | | AM Peak Hour | 33 | 10 | 1 | 7 | 5 | 2 | 0 | 25 | 3 | 0 | 2 | 2 | 1 | 0 | 8 |
| | | | | | | | | | | | | PM Peak Hour | 35 | 4 | 1 | 3 | 2 | 1 | 0 | 11 | 9 | 1 | 7 | 5 | 2 | 0 | 24 |
| 19 | New Academic Building | North of Forbes @ S Craig | Education, Laboratory / Research, Office, Parking, Restaurant, Retail | 550 | University/College | 1000 Sq. Ft. GFA | 49,000 sf | | 230,000 sf | | 181,000 sf | Weekday[4] | 4,713 | 895 | 118 | 683 | 448 | 165 | 47 | 2,356 | 896 | 118 | 684 | 448 | 165 | 46 | 2,357 |
| | | | | | | | | | | | | AM Peak Hour | 197 | 58 | 8 | 44 | 29 | 11 | 2 | 152 | 17 | 2 | 13 | 9 | 3 | 1 | 45 |
| | | | | | | | | | | | | PM Peak Hour | 212 | 26 | 3 | 20 | 13 | 5 | 1 | 68 | 55 | 7 | 42 | 27 | 10 | 3 | 144 |
| 20 | New Academic Building | South of Forbes @ S Craig | Education, Laboratory / Research, Office, Parking, Public Assembly, Restaurant, Retail | 550 | University/College | 1000 Sq. Ft. GFA | 2,700 sf | | 425,000 sf | | 422,300 sf | Weekday[4] | 10,997 | 2,089 | 275 | 1,594 | 1,045 | 385 | 110 | 5,498 | 2,090 | 275 | 1,595 | 1,045 | 385 | 109 | 5,499 |
| | | | | | | | | | | | | AM Peak Hour | 460 | 135 | 18 | 103 | 67 | 25 | 6 | 354 | 40 | 5 | 31 | 20 | 7 | 3 | 106 |
| | | | | | | | | | | | | PM Peak Hour | 494 | 60 | 8 | 46 | 30 | 11 | 3 | 158 | 128 | 17 | 97 | 64 | 24 | 6 | 336 |
| **Total** | | | | | | | **235,700 sf** | **645** | **2,868,000 sf** | **2620** | **2,456,485 sf** | **Total Weekday[4]** | **64275** | **7,441** | **1,741** | **11,437** | **7,429** | **2,912** | **1,172** | **32,132** | **7,447** | **1,741** | **11,442** | **7,430** | **2,912** | **1,171** | **32,143** |
| | | | | | | | | | | | | **Total AM** | **2,762** | **506** | **115** | **745** | **486** | **189** | **74** | **2,115** | **149** | **33** | **231** | **150** | **57** | **27** | **647** |
| | | | | | | | | | | | | **Total PM** | **2,975** | **218** | **53** | **345** | **223** | **90** | **29** | **958** | **471** | **109** | **715** | **466** | **182** | **74** | **2,017** |

1. Trip generation based on maximum buildout of all projects proposed in the 2022-2032 Institutional Master Plan.
2. Mode share based on 2018 Parking Master Plan survey results for Employee and Student trips. Residence hall trips are based on student mode share and all other mode share based on employee trips.
3. All on-campus buildings estimated with the University/College ITE land use code, except for the Facilities Operation Center and the campus-owned apartments beyond the contiguous EMI District.
4. ITE-calculated weekday trip generation numbers are not representative of anticipated conditions, since ITE data was based on only one data collection sample.

**Table 4.2**
**Trip Generation without TDM Mitigation (Anticipated Buildout, 50% of Master Plan)**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Project Component | | | | Trip Generation[3] | | | Existing On-Site Conditions | | Future On-Site Conditions | | | | Anticipated Trip Generation without TDM Mitigation, 50% Buildout[1,2] | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Total Trips | | Entering Trips | | | | | | | Exiting Trips | | | | | | | |
| Number | Type | Description | Proposed Use | Land Use Code | Land Use Description | Independent Variable | Size (Sq. Ft.) | # of Beds | Max. Size (Sq. Ft.) | 50% Size (Sq. Ft.) | Max. # of Beds | Max Size, Net (Sq. Ft.) or Residents | Trip Type | Total (ITE) | Drive and Park *38% Academic 2% Residential* | Drop-off & Rideshare *5% Academic 6% Residential* | Transit *29% Academic 45% Residential* | Walk *19% Academic 29% Residential* | Bike *7% Academic 12% Residential* | Other *2% Academic 6% Residential* | Total Entering | Drive and Park *38% Academic 2% Residential* | Drop-off & Rideshare *5% Academic 6% Residential* | Transit *29% Academic 45% Residential* | Walk *19% Academic 29% Residential* | Bike *7% Academic 12% Residential* | Other *2% Academic 6% Residential* | Total Exiting |
| 1 | Facilities Operations Center | S Neville along Railroad | Parking, Utility, Office | 170 | Utility | 1000 Sq. Ft. GFA | | | 40,000 sf | 20,000 sf | | 20,000 sf | Weekday[4] | 160 | 30 | 4 | 23 | 15 | 6 | 2 | 80 | 30 | 4 | 23 | 15 | 6 | 2 | 80 |
| | | | | | | | | | | | | | AM Peak Hour | 46 | 14 | 2 | 11 | 7 | 3 | 0 | 37 | 3 | 0 | 3 | 2 | 1 | 0 | 9 |
| | | | | | | | | | | | | | PM Peak Hour | 30 | 2 | 0 | 2 | 1 | 0 | 1 | 6 | 9 | 1 | 7 | 5 | 2 | 0 | 24 |
| 2 | New Academic Building | FMS Building | Education, Laboratory / Research, Office, Restaurant, Utility | 550 | University/College | 1000 Sq. Ft. GFA | 48,000 sf | | 300,000 sf | 150,000 sf | | 102,000 sf | Weekday[4] | 2,656 | 505 | 66 | 385 | 252 | 93 | 27 | 1,328 | 505 | 66 | 385 | 252 | 93 | 27 | 1,328 |
| | | | | | | | | | | | | | AM Peak Hour | 111 | 32 | 4 | 25 | 16 | 6 | 2 | 85 | 10 | 1 | 8 | 5 | 2 | 0 | 26 |
| | | | | | | | | | | | | | PM Peak Hour | 119 | 14 | 2 | 11 | 7 | 3 | 1 | 38 | 31 | 4 | 23 | 15 | 6 | 2 | 81 |
| 3 | Academic Building Expansion | Hamburg & Smith Halls | Education, Laboratory / Research, Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | 22,000 sf | | 100,000 sf | 50,000 sf | | 28,000 sf | Weekday[4] | 729 | 138 | 18 | 106 | 69 | 25 | 8 | 364 | 139 | 18 | 106 | 69 | 26 | 7 | 365 |
| | | | | | | | | | | | | | AM Peak Hour | 31 | 9 | 1 | 7 | 5 | 2 | 0 | 24 | 3 | 0 | 2 | 1 | 0 | 1 | 7 |
| | | | | | | | | | | | | | PM Peak Hour | 33 | 4 | 0 | 3 | 2 | 1 | 0 | 10 | 9 | 1 | 7 | 4 | 2 | 0 | 23 |
| 4 | New Academic Building | Cyert & Warner Halls | Education, Laboratory / Research, Office, Parking, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | 110,000 sf | | 250,000 sf | 125,000 sf | | 15,000 sf | Weekday[4] | 391 | 74 | 10 | 57 | 37 | 14 | 3 | 195 | 74 | 10 | 57 | 37 | 14 | 4 | 196 |
| | | | | | | | | | | | | | AM Peak Hour | 16 | 5 | 1 | 3 | 2 | 1 | 0 | 12 | 2 | 0 | 1 | 1 | 0 | 0 | 4 |
| | | | | | | | | | | | | | PM Peak Hour | 18 | 2 | 0 | 2 | 1 | 0 | 1 | 6 | 5 | 1 | 3 | 2 | 1 | 0 | 12 |
| 5 | Academic Building Expansion | Purnell Center for the Arts | Education, Laboratory / Research, Office, Public Assembly | 550 | University/College | 1000 Sq. Ft. GFA | | | 30,000 sf | 15,000 sf | | 15,000 sf | Weekday[4] | 391 | 74 | 10 | 57 | 37 | 14 | 3 | 195 | 74 | 10 | 57 | 37 | 14 | 4 | 196 |
| | | | | | | | | | | | | | AM Peak Hour | 16 | 5 | 1 | 3 | 2 | 1 | 0 | 12 | 2 | 0 | 1 | 1 | 0 | 0 | 4 |
| | | | | | | | | | | | | | PM Peak Hour | 18 | 2 | 0 | 2 | 1 | 0 | 1 | 6 | 5 | 1 | 3 | 2 | 1 | 0 | 12 |
| 6 | Student Support Expansion | West Wing Addition | Education, Laboratory / Research, Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 5,000 sf | 2,500 sf | | 2,500 sf | Weekday[4] | 65 | 12 | 2 | 9 | 6 | 2 | 1 | 32 | 13 | 2 | 10 | 6 | 2 | 0 | 33 |
| | | | | | | | | | | | | | AM Peak Hour | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | | | | | | | | | | | | | PM Peak Hour | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 7 | Academic Building Expansion | Margaret Morrison Carnegie Hall | Education, Laboratory / Research, Office | 550 | University/College | 1000 Sq. Ft. GFA | | | 110,000 sf | 55,000 sf | | 55,000 sf | Weekday[4] | 1,432 | 272 | 36 | 208 | 136 | 50 | 14 | 716 | 272 | 36 | 208 | 136 | 50 | 14 | 716 |
| | | | | | | | | | | | | | AM Peak Hour | 60 | 17 | 2 | 13 | 9 | 3 | 2 | 46 | 5 | 1 | 4 | 3 | 1 | 0 | 14 |
| | | | | | | | | | | | | | PM Peak Hour | 64 | 8 | 1 | 6 | 4 | 1 | 0 | 20 | 17 | 2 | 13 | 8 | 3 | 1 | 44 |
| 8 | New Mixed Use Building | Donner Hall | Education, Laboratory / Research, Office, Parking, Restaurant / Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | 241 | 266,000 sf | 133,000 sf | 735 | 133,000 sf | Weekday[4] | 3,463 | 35 | 104 | 779 | 502 | 208 | 103 | 1,731 | 35 | 104 | 779 | 502 | 208 | 104 | 1,732 |
| | | | | | | | | | | | | | AM Peak Hour | 145 | 2 | 7 | 50 | 32 | 13 | 8 | 112 | 1 | 2 | 15 | 10 | 4 | 1 | 33 |
| | | | | | | | | | | | | | PM Peak Hour | 156 | 1 | 3 | 23 | 15 | 6 | 2 | 50 | 2 | 6 | 48 | 31 | 13 | 6 | 106 |
| 9 | Student Support Expansion | Hamerschlag House | Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 6,000 sf | 3,000 sf | | 3,000 sf | Weekday[4] | 78 | 15 | 2 | 11 | 7 | 3 | 1 | 39 | 15 | 2 | 11 | 7 | 3 | 1 | 39 |
| | | | | | | | | | | | | | AM Peak Hour | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | | | | | | | | | | | | | PM Peak Hour | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 3 |
| 10 | New Academic Building | Tepper School Expansion Site | Education, Laboratory / Research, Office, Parking, Public Assembly, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 180,000 sf | 90,000 sf | | 90,000 sf | Weekday[4] | 2,344 | 445 | 59 | 340 | 223 | 82 | 23 | 1,172 | 445 | 59 | 340 | 223 | 82 | 23 | 1,172 |
| | | | | | | | | | | | | | AM Peak Hour | 98 | 29 | 4 | 22 | 14 | 5 | 1 | 75 | 9 | 1 | 7 | 4 | 2 | 0 | 23 |
| | | | | | | | | | | | | | PM Peak Hour | 105 | 13 | 2 | 10 | 6 | 2 | 0 | 33 | 27 | 4 | 21 | 14 | 5 | 1 | 72 |
| 11 | New Mixed Use Building | Morewood Lot | Laboratory / Research, Office, Restaurant / Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | | 220,000 sf | 110,000 sf | 500 | 110,000 sf | Weekday[4] | 2,864 | 29 | 86 | 644 | 415 | 172 | 86 | 1,432 | 29 | 86 | 644 | 415 | 172 | 86 | 1,432 |
| | | | | | | | | | | | | | AM Peak Hour | 120 | 2 | 6 | 41 | 27 | 11 | 5 | 92 | 1 | 2 | 13 | 8 | 3 | 1 | 28 |
| | | | | | | | | | | | | | PM Peak Hour | 129 | 1 | 2 | 18 | 12 | 5 | 3 | 41 | 2 | 5 | 40 | 26 | 11 | 4 | 88 |
| 12 | E Tower Commons | Morewood E Tower | Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 6,000 sf | 3,000 sf | | 3,000 sf | Weekday[4] | 78 | 15 | 2 | 11 | 7 | 3 | 1 | 39 | 15 | 2 | 11 | 7 | 3 | 1 | 39 |
| | | | | | | | | | | | | | AM Peak Hour | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | | | | | | | | | | | | | PM Peak Hour | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 3 |
| 13 | New Mixed Use Building | Capstone site at Forbes & Morewood | Education, Laboratory / Research, Office, Parking, Student Housing, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 200,000 sf | 100,000 sf | 300 | 100,000 sf | Weekday[4] | 2,604 | 26 | 78 | 586 | 378 | 156 | 78 | 1,302 | 26 | 78 | 586 | 378 | 156 | 78 | 1,302 |
| | | | | | | | | | | | | | AM Peak Hour | 109 | 2 | 5 | 38 | 24 | 10 | 5 | 84 | 1 | 2 | 11 | 7 | 3 | 1 | 25 |
| | | | | | | | | | | | | | PM Peak Hour | 117 | 1 | 2 | 17 | 11 | 4 | 2 | 37 | 2 | 5 | 36 | 23 | 10 | 4 | 80 |
| 14 | New Residential Building(s) | Greek Quad | Office, Parking, Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | 384 | 250,000 sf | 125,000 sf | 720 | 125,000 sf | Weekday[4] | 3,255 | 33 | 98 | 732 | 472 | 195 | 97 | 1,627 | 33 | 98 | 733 | 472 | 195 | 97 | 1,628 |
| | | | | | | | | | | | | | AM Peak Hour | 136 | 2 | 6 | 47 | 30 | 13 | 7 | 105 | 1 | 2 | 14 | 9 | 4 | 1 | 31 |
| | | | | | | | | | | | | | PM Peak Hour | 146 | 1 | 3 | 21 | 14 | 6 | 2 | 47 | 2 | 6 | 45 | 29 | 12 | 5 | 99 |
| 15 | New Residential Building | Forbes & Devon | Office, Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | | 40,000 sf | 20,000 sf | 180 | 20,000 sf | Weekday[4] | 521 | 5 | 16 | 117 | 75 | 31 | 16 | 260 | 5 | 16 | 117 | 76 | 31 | 16 | 261 |
| | | | | | | | | | | | | | AM Peak Hour | 22 | 0 | 1 | 8 | 5 | 2 | 1 | 17 | 0 | 0 | 2 | 1 | 1 | 1 | 5 |
| | | | | | | | | | | | | | PM Peak Hour | 23 | 0 | 0 | 3 | 2 | 1 | 1 | 7 | 0 | 1 | 7 | 5 | 2 | 1 | 16 |
| 16 | Shirley Apartments | Shirley Apartments | Office, Parking, Student Housing | 225 | Off-Campus Student Apartment | Residents | | 20 | 20,000 sf | 10,000 sf | 20 | 20 | Weekday[4] | 221 | 2 | 7 | 50 | 32 | 13 | 6 | 110 | 2 | 7 | 50 | 32 | 13 | 7 | 111 |
| | | | | | | | | | | | | | AM Peak Hour | 6 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 2 | 1 | 0 | 1 | 4 |
| | | | | | | | | | | | | | PM Peak Hour | 31 | 0 | 1 | 7 | 4 | 2 | 1 | 15 | 0 | 1 | 7 | 5 | 2 | 1 | 16 |
| 17 | New Residential Building | Whitfield Hall | Office, Parking, Student Housing | 225 | Off-Campus Student Apartment | Residents | 4,000 sf | | 160,000 sf | 80,000 sf | 165 | 165 | Weekday[4] | 857 | 9 | 26 | 193 | 124 | 51 | 25 | 428 | 9 | 26 | 193 | 124 | 51 | 26 | 429 |
| | | | | | | | | | | | | | AM Peak Hour | 28 | 0 | 1 | 5 | 3 | 1 | 1 | 11 | 0 | 1 | 8 | 5 | 2 | 1 | 17 |
| | | | | | | | | | | | | | PM Peak Hour | 63 | 1 | 2 | 14 | 9 | 4 | 1 | 31 | 1 | 2 | 14 | 9 | 4 | 2 | 32 |
| 18 | Academic Building Expansion | Mellon Institute | Education, Laboratory / Research | 550 | University/College | 1000 Sq. Ft. GFA | | | 30,000 sf | 15,000 sf | | 15,000 sf | Weekday[4] | 391 | 74 | 10 | 57 | 37 | 14 | 3 | 195 | 74 | 10 | 57 | 37 | 14 | 4 | 196 |
| | | | | | | | | | | | | | AM Peak Hour | 16 | 5 | 1 | 3 | 2 | 1 | 0 | 12 | 2 | 0 | 1 | 1 | 0 | 0 | 4 |
| | | | | | | | | | | | | | PM Peak Hour | 18 | 2 | 0 | 2 | 1 | 0 | 1 | 6 | 5 | 1 | 3 | 2 | 1 | 0 | 12 |
| 19 | New Academic Building | North of Forbes @ S Craig | Education, Laboratory / Research, Office, Parking, Restaurant, Retail | 550 | University/College | 1000 Sq. Ft. GFA | 49,000 sf | | 230,000 sf | 115,000 sf | | 66,000 sf | Weekday[4] | 1,719 | 326 | 43 | 249 | 163 | 60 | 18 | 859 | 327 | 43 | 249 | 163 | 60 | 18 | 860 |
| | | | | | | | | | | | | | AM Peak Hour | 72 | 21 | 3 | 16 | 10 | 4 | 1 | 55 | 6 | 1 | 5 | 3 | 1 | 1 | 17 |
| | | | | | | | | | | | | | PM Peak Hour | 77 | 9 | 1 | 7 | 5 | 2 | 0 | 24 | 20 | 3 | 15 | 10 | 4 | 1 | 53 |
| 20 | New Academic Building | South of Forbes @ S Craig | Education, Laboratory / Research, Office, Parking, Public Assembly, Restaurant, Retail | 550 | University/College | 1000 Sq. Ft. GFA | 2,700 sf | | 425,000 sf | 212,500 sf | | 209,800 sf | Weekday[4] | 5,442 | 1,034 | 136 | 789 | 517 | 190 | 55 | 2,721 | 1,034 | 136 | 789 | 517 | 190 | 55 | 2,721 |
| | | | | | | | | | | | | | AM Peak Hour | 228 | 67 | 9 | 51 | 33 | 12 | 3 | 175 | 20 | 3 | 15 | 10 | 4 | 1 | 53 |
| | | | | | | | | | | | | | PM Peak Hour | 245 | 30 | 4 | 23 | 15 | 5 | 1 | 78 | 63 | 8 | 48 | 32 | 12 | 4 | 167 |
| **Total** | | | | | | | **235,700 sf** | **645** | **2,868,000 sf** | **1,434,000 sf** | **2620** | **1,112,485 sf** | **Total Weekday[4]** | **29,661** | **3,153** | **813** | **5,403** | **3,504** | **1,382** | **570** | **14,825** | **3,156** | **813** | **5,405** | **3,505** | **1,383** | **574** | **14,836** |
| | | | | | | | | | | | | | **Total AM** | **1,269** | **215** | **54** | **347** | **222** | **88** | **36** | **962** | **66** | **16** | **112** | **72** | **28** | **13** | **307** |
| | | | | | | | | | | | | | **Total PM** | **1,403** | **91** | **23** | **171** | **110** | **42** | **21** | **458** | **203** | **52** | **343** | **224** | **91** | **32** | **945** |

1. Trip generation based on 50% of full buildout as proposed in the 2022-2032 Institutional Master Plan. Under 1/3 of full buildout development square footage was realized from the 2012-2022 master plan, as buildings were built below maximum massing and some projects deferred or cancelled. A 50% assumption is assumed to be a conservative estimate. (Off campus residence halls are excluded from the reduction).
2. Mode share based on 2018 Parking Master Plan survey results for Employee and Student trips. Residence hall trips are based on student mode share and all other mode share based on employee trips.
3. All on-campus buildings estimated with the University/College ITE land use code, except for the Facilities Operation Center and the campus-owned apartments beyond the contiguous EMI District.
4. ITE-calculated weekday trip generation numbers are not representative of anticipated conditions, since ITE data was based on only one data collection sample

**Table 4.3**
**Trip Generation with TDM Mitigation (Full Buildout, 100% of Master Plan)**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Project Component | | | | Trip Generation[3] | | | Existing On-Site Conditions | | Future On-Site Conditions | | | Anticipated Trip Generation with TDM Mitigation, Maximum Buildout[1,2] | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Total Trips | | Entering Trips | | | | | | | Exiting Trips | | | | | | | |
| Number | Type | Description | Proposed Use | Land Use Code | Land Use Description | Independent Variable | Size (Sq. Ft.) | # of Beds | Max. Size (Sq. Ft.) | Max. # of Beds | Max Size, Net (Sq. Ft.) or Residents | Trip Type | Total (ITE) | Drive and Park *30% Academic 2% Residential* | Drop-off & Rideshare *7% Academic 6% Residential* | Transit *30% Academic 45% Residential* | Walk *19% Academic 29% Residential* | Bike *9% Academic 12% Residential* | Other *5% Academic 6% Residential* | Total Entering | Drive and Park *30% Academic 2% Residential* | Drop-off & Rideshare *7% Academic 6% Residential* | Transit *30% Academic 45% Residential* | Walk *19% Academic 29% Residential* | Bike *9% Academic 12% Residential* | Other *5% Academic 6% Residential* | Total Exiting |
| 1 | Facilities Operations Center | S Neville along Railroad | Parking, Utility, Office | 170 | Utility | 1000 Sq. Ft. GFA | | | 40,000 sf | | 40,000 sf | Weekday[4] | 277 | 41 | 10 | 41 | 26 | 12 | 8 | 138 | 42 | 10 | 42 | 26 | 13 | 6 | 139 |
| | | | | | | | | | | | | AM Peak Hour | 92 | 22 | 5 | 22 | 14 | 7 | 4 | 74 | 5 | 1 | 5 | 3 | 2 | 2 | 18 |
| | | | | | | | | | | | | PM Peak Hour | 53 | 3 | 1 | 3 | 2 | 1 | 0 | 10 | 13 | 3 | 13 | 8 | 4 | 2 | 43 |
| 2 | New Academic Building | FMS Building | Education, Laboratory / Research, Office, Restaurant, Utility | 550 | University/College | 1000 Sq. Ft. GFA | 48,000 sf | | 300,000 sf | | 252,000 sf | Weekday[4] | 6,562 | 984 | 230 | 984 | 623 | 295 | 165 | 3,281 | 984 | 230 | 984 | 623 | 295 | 165 | 3,281 |
| | | | | | | | | | | | | AM Peak Hour | 275 | 64 | 15 | 64 | 40 | 19 | 10 | 212 | 19 | 4 | 19 | 12 | 6 | 3 | 63 |
| | | | | | | | | | | | | PM Peak Hour | 295 | 28 | 7 | 28 | 18 | 8 | 5 | 94 | 60 | 14 | 60 | 38 | 18 | 11 | 201 |
| 3 | Academic Building Expansion | Hamburg & Smith Halls | Education, Laboratory / Research, Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | 22,000 sf | | 100,000 sf | | 78,000 sf | Weekday[4] | 2,031 | 305 | 71 | 305 | 193 | 91 | 50 | 1,015 | 305 | 71 | 305 | 193 | 91 | 51 | 1,016 |
| | | | | | | | | | | | | AM Peak Hour | 85 | 20 | 5 | 20 | 12 | 6 | 2 | 65 | 6 | 1 | 6 | 4 | 2 | 1 | 20 |
| | | | | | | | | | | | | PM Peak Hour | 91 | 9 | 2 | 9 | 6 | 3 | 0 | 29 | 19 | 4 | 19 | 12 | 6 | 2 | 62 |
| 4 | New Academic Building | Cyert & Warner Halls | Education, Laboratory / Research, Office, Parking, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | 110,000 sf | | 250,000 sf | | 140,000 sf | Weekday[4] | 3,646 | 547 | 128 | 547 | 346 | 164 | 91 | 1,823 | 547 | 128 | 547 | 346 | 164 | 91 | 1,823 |
| | | | | | | | | | | | | AM Peak Hour | 153 | 35 | 8 | 35 | 22 | 11 | 7 | 118 | 11 | 2 | 11 | 7 | 3 | 1 | 35 |
| | | | | | | | | | | | | PM Peak Hour | 164 | 16 | 4 | 16 | 10 | 5 | 1 | 52 | 34 | 8 | 34 | 21 | 10 | 5 | 112 |
| 5 | Academic Building Expansion | Purnell Center for the Arts | Education, Laboratory / Research, Office, Public Assembly | 550 | University/College | 1000 Sq. Ft. GFA | | | 30,000 sf | | 30,000 sf | Weekday[4] | 781 | 117 | 27 | 117 | 74 | 35 | 20 | 390 | 117 | 27 | 117 | 74 | 35 | 21 | 391 |
| | | | | | | | | | | | | AM Peak Hour | 33 | 8 | 2 | 8 | 5 | 2 | 0 | 25 | 2 | 1 | 2 | 2 | 1 | 0 | 8 |
| | | | | | | | | | | | | PM Peak Hour | 35 | 3 | 1 | 3 | 2 | 1 | 1 | 11 | 7 | 2 | 7 | 5 | 2 | 1 | 24 |
| 6 | Student Support Expansion | West Wing Addition | Education, Laboratory / Research, Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 5,000 sf | | 5,000 sf | Weekday[4] | 130 | 20 | 5 | 20 | 12 | 6 | 2 | 65 | 20 | 5 | 20 | 12 | 6 | 2 | 65 |
| | | | | | | | | | | | | AM Peak Hour | 5 | 1 | 0 | 1 | 1 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | | | | | | | | | | | | PM Peak Hour | 6 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 4 |
| 7 | Academic Building Expansion | Margaret Morrison Carnegie Hall | Education, Laboratory / Research, Office | 550 | University/College | 1000 Sq. Ft. GFA | | | 110,000 sf | | 110,000 sf | Weekday[4] | 2,864 | 430 | 100 | 430 | 272 | 129 | 71 | 1,432 | 430 | 100 | 430 | 272 | 129 | 71 | 1,432 |
| | | | | | | | | | | | | AM Peak Hour | 120 | 28 | 6 | 28 | 17 | 8 | 5 | 92 | 8 | 2 | 8 | 5 | 3 | 2 | 28 |
| | | | | | | | | | | | | PM Peak Hour | 129 | 12 | 3 | 12 | 8 | 4 | 2 | 41 | 26 | 6 | 26 | 17 | 8 | 5 | 88 |
| 8 | New Mixed Use Building | Donner Hall | Education, Laboratory / Research, Office, Parking, Restaurant / Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | 241 | 266,000 sf | 735 | 266,000 sf | Weekday[4] | 6,927 | 69 | 208 | 1,558 | 1,004 | 416 | 208 | 3,463 | 69 | 208 | 1,559 | 1,005 | 416 | 207 | 3,464 |
| | | | | | | | | | | | | AM Peak Hour | 290 | 4 | 13 | 100 | 65 | 27 | 14 | 223 | 1 | 4 | 30 | 19 | 8 | 5 | 67 |
| | | | | | | | | | | | | PM Peak Hour | 311 | 2 | 6 | 45 | 29 | 12 | 5 | 99 | 4 | 13 | 95 | 61 | 25 | 14 | 212 |
| 9 | Student Support Expansion | Hamerschlag House | Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 6,000 sf | | 6,000 sf | Weekday[4] | 156 | 23 | 5 | 23 | 15 | 7 | 5 | 78 | 23 | 5 | 23 | 15 | 7 | 5 | 78 |
| | | | | | | | | | | | | AM Peak Hour | 7 | 2 | 0 | 2 | 1 | 0 | 0 | 5 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| | | | | | | | | | | | | PM Peak Hour | 7 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 2 | 0 | 2 | 1 | 0 | 0 | 5 |
| 10 | New Academic Building | Tepper School Expansion Site | Education, Laboratory / Research, Office, Parking, Public Assembly, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 180,000 sf | | 180,000 sf | Weekday[4] | 4,687 | 703 | 164 | 703 | 445 | 211 | 117 | 2,343 | 703 | 164 | 703 | 445 | 211 | 118 | 2,344 |
| | | | | | | | | | | | | AM Peak Hour | 196 | 45 | 11 | 45 | 29 | 14 | 7 | 151 | 14 | 3 | 14 | 9 | 4 | 1 | 45 |
| | | | | | | | | | | | | PM Peak Hour | 211 | 20 | 5 | 20 | 13 | 6 | 3 | 67 | 43 | 10 | 43 | 27 | 13 | 8 | 144 |
| 11 | New Mixed Use Building | Morewood Lot | Laboratory / Research, Office, Restaurant / Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | | 220,000 sf | 500 | 220,000 sf | Weekday[4] | 5,729 | 57 | 172 | 1,289 | 831 | 344 | 171 | 2,864 | 57 | 172 | 1,289 | 831 | 344 | 172 | 2,865 |
| | | | | | | | | | | | | AM Peak Hour | 240 | 4 | 11 | 83 | 54 | 22 | 11 | 185 | 1 | 3 | 25 | 16 | 7 | 3 | 55 |
| | | | | | | | | | | | | PM Peak Hour | 257 | 2 | 5 | 37 | 24 | 10 | 4 | 82 | 4 | 11 | 79 | 51 | 21 | 9 | 175 |
| 12 | E Tower Commons | Morewood E Tower | Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 6,000 sf | | 6,000 sf | Weekday[4] | 156 | 23 | 5 | 23 | 15 | 7 | 5 | 78 | 23 | 5 | 23 | 15 | 7 | 5 | 78 |
| | | | | | | | | | | | | AM Peak Hour | 7 | 2 | 0 | 2 | 1 | 0 | 0 | 5 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| | | | | | | | | | | | | PM Peak Hour | 7 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 2 | 0 | 2 | 1 | 0 | 0 | 5 |
| 13 | New Mixed Use Building | Capstone site at Forbes & Morewood | Education, Laboratory / Research, Office, Parking, Student Housing, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 200,000 sf | 300 | 200,000 sf | Weekday[4] | 5,208 | 52 | 156 | 1,172 | 755 | 312 | 157 | 2,604 | 52 | 156 | 1,172 | 755 | 312 | 157 | 2,604 |
| | | | | | | | | | | | | AM Peak Hour | 218 | 3 | 10 | 76 | 49 | 20 | 10 | 168 | 1 | 3 | 23 | 15 | 6 | 2 | 50 |
| | | | | | | | | | | | | PM Peak Hour | 234 | 2 | 5 | 34 | 22 | 9 | 3 | 75 | 3 | 10 | 72 | 46 | 19 | 9 | 159 |
| 14 | New Residential Building(s) | Greek Quad | Office, Parking, Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | 384 | 250,000 sf | 720 | 250,000 sf | Weekday[4] | 6,510 | 65 | 195 | 1,465 | 944 | 391 | 195 | 3,255 | 65 | 195 | 1,465 | 944 | 391 | 195 | 3,255 |
| | | | | | | | | | | | | AM Peak Hour | 273 | 4 | 13 | 95 | 61 | 25 | 12 | 210 | 1 | 4 | 28 | 18 | 8 | 4 | 63 |
| | | | | | | | | | | | | PM Peak Hour | 293 | 2 | 6 | 42 | 27 | 11 | 6 | 94 | 4 | 12 | 90 | 58 | 24 | 11 | 199 |
| 15 | New Residential Building | Forbes & Devon | Office, Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | | 40,000 sf | 180 | 40,000 sf | Weekday[4] | 1,042 | 10 | 31 | 234 | 151 | 63 | 32 | 521 | 10 | 31 | 234 | 151 | 63 | 32 | 521 |
| | | | | | | | | | | | | AM Peak Hour | 44 | 1 | 2 | 15 | 10 | 4 | 2 | 34 | 0 | 1 | 5 | 3 | 1 | 0 | 10 |
| | | | | | | | | | | | | PM Peak Hour | 47 | 0 | 1 | 7 | 4 | 2 | 1 | 15 | 1 | 2 | 14 | 9 | 4 | 2 | 32 |
| 16 | Shirley Apartments | Shirley Apartments | Office, Parking, Student Housing | 225 | Off-Campus Student Apartment | Residents | | 20 | 20,000 sf | 20 | 20 | Weekday[4] | 221 | 2 | 7 | 50 | 32 | 13 | 6 | 110 | 2 | 7 | 50 | 32 | 13 | 7 | 111 |
| | | | | | | | | | | | | AM Peak Hour | 6 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 2 | 1 | 0 | 1 | 4 |
| | | | | | | | | | | | | PM Peak Hour | 31 | 0 | 1 | 7 | 4 | 2 | 1 | 15 | 0 | 1 | 7 | 5 | 2 | 1 | 16 |
| 17 | New Residential Building | Whitfield Hall | Office, Parking, Student Housing | 225 | Off-Campus Student Apartment | Residents | 4,000 sf | | 160,000 sf | 165 | 165 | Weekday[4] | 857 | 9 | 26 | 193 | 124 | 51 | 25 | 428 | 9 | 26 | 193 | 124 | 51 | 26 | 429 |
| | | | | | | | | | | | | AM Peak Hour | 28 | 0 | 1 | 5 | 3 | 1 | 1 | 11 | 0 | 1 | 8 | 5 | 2 | 1 | 17 |
| | | | | | | | | | | | | PM Peak Hour | 63 | 1 | 2 | 14 | 9 | 4 | 1 | 31 | 1 | 2 | 14 | 9 | 4 | 2 | 32 |
| 18 | Academic Building Expansion | Mellon Institute | Education, Laboratory / Research | 550 | University/College | 1000 Sq. Ft. GFA | | | 30,000 sf | | 30,000 sf | Weekday[4] | 781 | 117 | 27 | 117 | 74 | 35 | 20 | 390 | 117 | 27 | 117 | 74 | 35 | 21 | 391 |
| | | | | | | | | | | | | AM Peak Hour | 33 | 8 | 2 | 8 | 5 | 2 | 0 | 25 | 2 | 1 | 2 | 2 | 1 | 0 | 8 |
| | | | | | | | | | | | | PM Peak Hour | 35 | 3 | 1 | 3 | 2 | 1 | 1 | 11 | 7 | 2 | 7 | 5 | 2 | 1 | 24 |
| 19 | New Academic Building | North of Forbes @ S Craig | Education, Laboratory / Research, Office, Parking, Restaurant, Retail | 550 | University/College | 1000 Sq. Ft. GFA | 49,000 sf | | 230,000 sf | | 181,000 sf | Weekday[4] | 4,713 | 707 | 165 | 707 | 448 | 212 | 117 | 2,356 | 707 | 165 | 707 | 448 | 212 | 118 | 2,357 |
| | | | | | | | | | | | | AM Peak Hour | 197 | 46 | 11 | 46 | 29 | 14 | 6 | 152 | 14 | 3 | 14 | 9 | 4 | 1 | 45 |
| | | | | | | | | | | | | PM Peak Hour | 212 | 20 | 5 | 20 | 13 | 6 | 4 | 68 | 43 | 10 | 43 | 27 | 13 | 8 | 144 |
| 20 | New Academic Building | South of Forbes @ S Craig | Education, Laboratory / Research, Office, Parking, Public Assembly, Restaurant, Retail | 550 | University/College | 1000 Sq. Ft. GFA | 2,700 sf | | 425,000 sf | | 422,300 sf | Weekday[4] | 10,997 | 1,649 | 385 | 1,649 | 1,045 | 495 | 275 | 5,498 | 1,650 | 385 | 1,650 | 1,045 | 495 | 274 | 5,499 |
| | | | | | | | | | | | | AM Peak Hour | 460 | 106 | 25 | 106 | 67 | 32 | 18 | 354 | 32 | 7 | 32 | 20 | 10 | 5 | 106 |
| | | | | | | | | | | | | PM Peak Hour | 494 | 47 | 11 | 47 | 30 | 14 | 9 | 158 | 101 | 24 | 101 | 64 | 30 | 16 | 336 |
| **Total** | | | | | | | **235,700 sf** | **645** | **2,868,000 sf** | **2620** | **2,456,485 sf** | **Total Weekday[4]** | **64275** | **5,930** | **2,117** | **11,627** | **7,429** | **3,289** | **1,740** | **32,132** | **5,932** | **2,117** | **11,630** | **7,430** | **3,290** | **1,744** | **32,143** |
| | | | | | | | | | | | | **Total AM** | **2,762** | **403** | **140** | **762** | **486** | **214** | **110** | **2,115** | **119** | **41** | **236** | **150** | **68** | **33** | **647** |
| | | | | | | | | | | | | **Total PM** | **2,975** | **173** | **66** | **350** | **223** | **99** | **47** | **958** | **375** | **134** | **729** | **466** | **205** | **108** | **2,017** |

1. Trip generation based on maximum buildout of all projects proposed in the 2022-2032 Institutional Master Plan.
2. Mode share based on IMP Mobility Goals for Employee trips and 2018 Parking Master Plan survey results for Student trips (On and off-campus residence hall trips).
3. All on-campus buildings estimated with the University/College ITE land use code, except for the Facilities Operation Center and the campus-owned apartments beyond the contiguous EMI District.
4. ITE-calculated weekday trip generation numbers are not representative of anticipated conditions, since ITE data was based on only one data collection sample.

**Table 4.4**
**Trip Generation with TDM Mitigation (Anticipated Buildout, 50% of Master Plan)**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Project Component | | | | Trip Generation[3] | | | Existing On-Site Conditions | | Future On-Site Conditions | | | | Anticipated Trip Generation with TDM Mitigation, 50% Buildout[1,2] | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Total Trips | | Entering Trips | | | | | | | Exiting Trips | | | | | | |
| Number | Type | Description | Proposed Use | Land Use Code | Land Use Description | Independent Variable | Size (Sq. Ft.) | # of Beds | Max. Size (Sq. Ft.) | 50% Size (Sq. Ft.) | Max. # of Beds | Max Size, Net (Sq. Ft.) or Residents | Trip Type | Total (ITE) | Drive and Park<br>*30% Academic*<br>*2% Residential* | Drop-off & Rideshare<br>*7% Academic*<br>*6% Residential* | Transit<br>*30% Academic*<br>*45% Residential* | Walk<br>*19% Academic*<br>*29% Residential* | Bike<br>*9% Academic*<br>*12% Residential* | Other<br>*5% Academic*<br>*6% Residential* | Total Entering | Drive and Park<br>*30% Academic*<br>*2% Residential* | Drop-off & Rideshare<br>*7% Academic*<br>*6% Residential* | Transit<br>*30% Academic*<br>*45% Residential* | Walk<br>*19% Academic*<br>*29% Residential* | Bike<br>*9% Academic*<br>*12% Residential* | Other<br>*5% Academic*<br>*6% Residential* | Total Exiting |
| 1 | Facilities Operations Center | S Neville along Railroad | Parking, Utility, Office | 170 | Utility | 1000 Sq. Ft. GFA | | | 40,000 sf | 20,000 sf | | 20,000 sf | Weekday[4] | 160 | 24 | 6 | 24 | 15 | 7 | 4 | 80 | 24 | 6 | 24 | 15 | 7 | 4 | 80 |
| | | | | | | | | | | | | | AM Peak Hour | 46 | 11 | 3 | 11 | 7 | 3 | 2 | 37 | 3 | 0 | 3 | 2 | 1 | 0 | 9 |
| | | | | | | | | | | | | | PM Peak Hour | 30 | 2 | 0 | 2 | 1 | 1 | 0 | 6 | 7 | 2 | 7 | 5 | 2 | 1 | 24 |
| 2 | New Academic Building | FMS Building | Education, Laboratory / Research, Office, Restaurant, Utility | 550 | University/College | 1000 Sq. Ft. GFA | 48,000 sf | | 300,000 sf | 150,000 sf | | 102,000 sf | Weekday[4] | 2,656 | 398 | 93 | 398 | 252 | 120 | 67 | 1,328 | 398 | 93 | 398 | 252 | 120 | 67 | 1,328 |
| | | | | | | | | | | | | | AM Peak Hour | 111 | 26 | 6 | 26 | 16 | 8 | 3 | 85 | 8 | 2 | 8 | 5 | 2 | 1 | 26 |
| | | | | | | | | | | | | | PM Peak Hour | 119 | 11 | 3 | 11 | 7 | 3 | 3 | 38 | 24 | 6 | 24 | 15 | 7 | 5 | 81 |
| 3 | Academic Building Expansion | Hamburg & Smith Halls | Education, Laboratory / Research, Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | 22,000 sf | | 100,000 sf | 50,000 sf | | 28,000 sf | Weekday[4] | 729 | 109 | 25 | 109 | 69 | 33 | 19 | 364 | 110 | 26 | 110 | 69 | 33 | 17 | 365 |
| | | | | | | | | | | | | | AM Peak Hour | 31 | 7 | 2 | 7 | 5 | 2 | 1 | 24 | 2 | 1 | 2 | 1 | 1 | 0 | 7 |
| | | | | | | | | | | | | | PM Peak Hour | 33 | 3 | 1 | 3 | 2 | 1 | 0 | 10 | 7 | 2 | 7 | 4 | 2 | 1 | 23 |
| 4 | New Academic Building | Cyert & Warner Halls | Education, Laboratory / Research, Office, Parking, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | 110,000 sf | | 250,000 sf | 125,000 sf | | 15,000 sf | Weekday[4] | 391 | 59 | 14 | 59 | 37 | 18 | 8 | 195 | 59 | 14 | 59 | 37 | 18 | 9 | 196 |
| | | | | | | | | | | | | | AM Peak Hour | 16 | 4 | 1 | 4 | 2 | 1 | 0 | 12 | 1 | 0 | 1 | 1 | 1 | 0 | 4 |
| | | | | | | | | | | | | | PM Peak Hour | 18 | 2 | 0 | 2 | 1 | 1 | 0 | 6 | 4 | 1 | 4 | 2 | 1 | 0 | 12 |
| 5 | Academic Building Expansion | Purnell Center for the Arts | Education, Laboratory / Research, Office, Public Assembly | 550 | University/College | 1000 Sq. Ft. GFA | | | 30,000 sf | 15,000 sf | | 15,000 sf | Weekday[4] | 391 | 59 | 14 | 59 | 37 | 18 | 8 | 195 | 59 | 14 | 59 | 37 | 18 | 9 | 196 |
| | | | | | | | | | | | | | AM Peak Hour | 16 | 4 | 1 | 4 | 2 | 1 | 0 | 12 | 1 | 1 | 1 | 1 | 0 | 0 | 4 |
| | | | | | | | | | | | | | PM Peak Hour | 18 | 2 | 0 | 2 | 1 | 1 | 0 | 6 | 4 | 1 | 4 | 2 | 1 | 0 | 12 |
| 6 | Student Support Expansion | West Wing Addition | Education, Laboratory / Research, Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 5,000 sf | 2,500 sf | | 2,500 sf | Weekday[4] | 65 | 10 | 2 | 10 | 6 | 3 | 1 | 32 | 10 | 2 | 10 | 6 | 3 | 2 | 33 |
| | | | | | | | | | | | | | AM Peak Hour | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| | | | | | | | | | | | | | PM Peak Hour | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 7 | Academic Building Expansion | Margaret Morrison Carnegie Hall | Education, Laboratory / Research, Office | 550 | University/College | 1000 Sq. Ft. GFA | | | 110,000 sf | 55,000 sf | | 55,000 sf | Weekday[4] | 1,432 | 215 | 50 | 215 | 136 | 64 | 36 | 716 | 215 | 50 | 215 | 136 | 64 | 36 | 716 |
| | | | | | | | | | | | | | AM Peak Hour | 60 | 14 | 3 | 14 | 9 | 4 | 2 | 46 | 4 | 1 | 4 | 3 | 1 | 1 | 14 |
| | | | | | | | | | | | | | PM Peak Hour | 64 | 6 | 1 | 6 | 4 | 2 | 1 | 20 | 13 | 3 | 13 | 8 | 4 | 3 | 44 |
| 8 | New Mixed Use Building | Donner Hall | Education, Laboratory / Research, Office, Parking, Restaurant / Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | 241 | 266,000 sf | 133,000 sf | 735 | 133,000 sf | Weekday[4] | 3,463 | 35 | 104 | 779 | 502 | 208 | 103 | 1,731 | 35 | 104 | 779 | 502 | 208 | 104 | 1,732 |
| | | | | | | | | | | | | | AM Peak Hour | 145 | 2 | 7 | 50 | 32 | 13 | 8 | 112 | 1 | 2 | 15 | 10 | 4 | 1 | 33 |
| | | | | | | | | | | | | | PM Peak Hour | 156 | 1 | 3 | 23 | 15 | 6 | 2 | 50 | 2 | 6 | 48 | 31 | 13 | 6 | 106 |
| 9 | Student Support Expansion | Hamerschlag House | Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 6,000 sf | 3,000 sf | | 3,000 sf | Weekday[4] | 78 | 12 | 3 | 12 | 7 | 4 | 1 | 39 | 12 | 3 | 12 | 7 | 4 | 1 | 39 |
| | | | | | | | | | | | | | AM Peak Hour | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| | | | | | | | | | | | | | PM Peak Hour | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 3 |
| 10 | New Academic Building | Tepper School Expansion Site | Education, Laboratory / Research, Office, Parking, Public Assembly, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 180,000 sf | 90,000 sf | | 90,000 sf | Weekday[4] | 2,344 | 352 | 82 | 352 | 223 | 105 | 58 | 1,172 | 352 | 82 | 352 | 223 | 105 | 58 | 1,172 |
| | | | | | | | | | | | | | AM Peak Hour | 98 | 23 | 5 | 23 | 14 | 7 | 3 | 75 | 7 | 2 | 7 | 4 | 2 | 1 | 23 |
| | | | | | | | | | | | | | PM Peak Hour | 105 | 10 | 2 | 10 | 6 | 3 | 2 | 33 | 22 | 5 | 22 | 14 | 6 | 3 | 72 |
| 11 | New Mixed Use Building | Morewood Lot | Laboratory / Research, Office, Restaurant / Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | | 220,000 sf | 110,000 sf | 500 | 110,000 sf | Weekday[4] | 2,864 | 29 | 86 | 644 | 415 | 172 | 86 | 1,432 | 29 | 86 | 644 | 415 | 172 | 86 | 1,432 |
| | | | | | | | | | | | | | AM Peak Hour | 120 | 2 | 6 | 41 | 27 | 11 | 5 | 92 | 1 | 2 | 13 | 8 | 3 | 1 | 28 |
| | | | | | | | | | | | | | PM Peak Hour | 129 | 1 | 2 | 18 | 12 | 5 | 3 | 41 | 2 | 5 | 40 | 26 | 11 | 4 | 88 |
| 12 | E Tower Commons | Morewood E Tower | Office, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 6,000 sf | 3,000 sf | | 3,000 sf | Weekday[4] | 78 | 12 | 3 | 12 | 7 | 4 | 1 | 39 | 12 | 3 | 12 | 7 | 4 | 1 | 39 |
| | | | | | | | | | | | | | AM Peak Hour | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| | | | | | | | | | | | | | PM Peak Hour | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 3 |
| 13 | New Mixed Use Building | Capstone site at Forbes & Morewood | Education, Laboratory / Research, Office, Parking, Student Housing, Restaurant | 550 | University/College | 1000 Sq. Ft. GFA | | | 200,000 sf | 100,000 sf | 300 | 100,000 sf | Weekday[4] | 2,604 | 26 | 78 | 586 | 378 | 156 | 78 | 1,302 | 26 | 78 | 586 | 378 | 156 | 78 | 1,302 |
| | | | | | | | | | | | | | AM Peak Hour | 109 | 2 | 5 | 38 | 24 | 10 | 5 | 84 | 1 | 2 | 11 | 7 | 3 | 1 | 25 |
| | | | | | | | | | | | | | PM Peak Hour | 117 | 1 | 2 | 17 | 11 | 4 | 2 | 37 | 2 | 5 | 36 | 23 | 10 | 4 | 80 |
| 14 | New Residential Building(s) | Greek Quad | Office, Parking, Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | 384 | 250,000 sf | 125,000 sf | 720 | 125,000 sf | Weekday[4] | 3,255 | 33 | 98 | 732 | 472 | 195 | 97 | 1,627 | 33 | 98 | 733 | 472 | 195 | 97 | 1,628 |
| | | | | | | | | | | | | | AM Peak Hour | 136 | 2 | 6 | 47 | 30 | 13 | 7 | 105 | 1 | 2 | 14 | 9 | 4 | 1 | 31 |
| | | | | | | | | | | | | | PM Peak Hour | 146 | 1 | 3 | 21 | 14 | 6 | 2 | 47 | 2 | 6 | 45 | 29 | 12 | 5 | 99 |
| 15 | New Residential Building | Forbes & Devon | Office, Student Housing | 550 | University/College | 1000 Sq. Ft. GFA | | | 40,000 sf | 20,000 sf | 180 | 20,000 sf | Weekday[4] | 521 | 5 | 16 | 117 | 75 | 31 | 16 | 260 | 5 | 16 | 117 | 76 | 31 | 16 | 261 |
| | | | | | | | | | | | | | AM Peak Hour | 22 | 0 | 1 | 8 | 5 | 2 | 1 | 17 | 0 | 0 | 2 | 1 | 1 | 1 | 5 |
| | | | | | | | | | | | | | PM Peak Hour | 23 | 0 | 0 | 3 | 2 | 1 | 1 | 7 | 0 | 1 | 7 | 5 | 2 | 1 | 16 |
| 16 | Shirley Apartments | Shirley Apartments | Office, Parking, Student Housing | 225 | Off-Campus Student Apartment | Residents | | 20 | 20,000 sf | 10,000 sf | 20 | 20 | Weekday[4] | 221 | 2 | 7 | 50 | 32 | 13 | 6 | 110 | 2 | 7 | 50 | 32 | 13 | 7 | 111 |
| | | | | | | | | | | | | | AM Peak Hour | 6 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 2 | 1 | 0 | 1 | 4 |
| | | | | | | | | | | | | | PM Peak Hour | 31 | 0 | 1 | 7 | 4 | 2 | 1 | 15 | 0 | 1 | 7 | 5 | 2 | 1 | 16 |
| 17 | New Residential Building | Whitfield Hall | Office, Parking, Student Housing | 225 | Off-Campus Student Apartment | Residents | 4,000 sf | | 160,000 sf | 80,000 sf | 165 | 165 | Weekday[4] | 857 | 9 | 26 | 193 | 124 | 51 | 25 | 428 | 9 | 26 | 193 | 124 | 51 | 26 | 429 |
| | | | | | | | | | | | | | AM Peak Hour | 28 | 0 | 1 | 5 | 3 | 1 | 1 | 11 | 0 | 1 | 8 | 5 | 2 | 1 | 17 |
| | | | | | | | | | | | | | PM Peak Hour | 63 | 1 | 2 | 14 | 9 | 4 | 1 | 31 | 1 | 2 | 14 | 9 | 4 | 2 | 32 |
| 18 | Academic Building Expansion | Mellon Institute | Education, Laboratory / Research | 550 | University/College | 1000 Sq. Ft. GFA | | | 30,000 sf | 15,000 sf | | 15,000 sf | Weekday[4] | 391 | 59 | 14 | 59 | 37 | 18 | 8 | 195 | 59 | 14 | 59 | 37 | 18 | 9 | 196 |
| | | | | | | | | | | | | | AM Peak Hour | 16 | 4 | 1 | 4 | 2 | 1 | 0 | 12 | 1 | 0 | 1 | 1 | 0 | 1 | 4 |
| | | | | | | | | | | | | | PM Peak Hour | 18 | 2 | 0 | 2 | 1 | 1 | 0 | 6 | 4 | 1 | 4 | 2 | 1 | 0 | 12 |
| 19 | New Academic Building | North of Forbes @ S Craig | Education, Laboratory / Research, Office, Parking, Restaurant, Retail | 550 | University/College | 1000 Sq. Ft. GFA | 49,000 sf | | 230,000 sf | 115,000 sf | | 66,000 sf | Weekday[4] | 1,719 | 258 | 60 | 258 | 163 | 77 | 43 | 859 | 258 | 60 | 258 | 163 | 77 | 44 | 860 |
| | | | | | | | | | | | | | AM Peak Hour | 72 | 17 | 4 | 17 | 10 | 5 | 2 | 55 | 5 | 1 | 5 | 3 | 2 | 1 | 17 |
| | | | | | | | | | | | | | PM Peak Hour | 77 | 7 | 2 | 7 | 5 | 2 | 1 | 24 | 16 | 4 | 16 | 10 | 5 | 2 | 53 |
| 20 | New Academic Building | South of Forbes @ S Craig | Education, Laboratory / Research, Office, Parking, Public Assembly, Restaurant, Retail | 550 | University/College | 1000 Sq. Ft. GFA | 2,700 sf | | 425,000 sf | 212,500 sf | | 209,800 sf | Weekday[4] | 5,442 | 816 | 190 | 816 | 517 | 245 | 137 | 2,721 | 816 | 190 | 816 | 517 | 245 | 137 | 2,721 |
| | | | | | | | | | | | | | AM Peak Hour | 228 | 53 | 12 | 53 | 33 | 16 | 8 | 175 | 16 | 4 | 16 | 10 | 5 | 2 | 53 |
| | | | | | | | | | | | | | PM Peak Hour | 245 | 23 | 5 | 23 | 15 | 7 | 5 | 78 | 50 | 12 | 50 | 32 | 15 | 8 | 167 |
| **Total** | | | | | | | **235,700 sf** | **645** | **2,868,000 sf** | **1,434,000 sf** | **2620** | **1,112,485 sf** | **Total Weekday[4]** | **29,661** | **2,522** | **971** | **5,484** | **3,504** | **1,542** | **802** | **14,825** | **2,523** | **972** | **5,486** | **3,505** | **1,542** | **808** | **14,836** |
| | | | | | | | | | | | | | **Total AM** | **1,269** | **174** | **64** | **356** | **222** | **98** | **48** | **962** | **55** | **21** | **113** | **72** | **32** | **14** | **307** |
| | | | | | | | | | | | | | **Total PM** | **1,403** | **76** | **27** | **171** | **110** | **50** | **24** | **458** | **163** | **63** | **351** | **224** | **98** | **46** | **945** |

1. Trip generation based on 50% of full buildout as proposed in the 2022-2032 Institutional Master Plan. Under 1/3 of full buildout development square footage was realized from the 2012-2022 master plan, as buildings were built below maximum massing and some projects deferred or cancelled. A 50% assumption is assumed to be a conservative estimate. (Off campus residence halls are excluded from the reduction).
2. Mode share based on IMP Mobility Goals for Employee trips and 2018 Parking Master Plan survey results for Student trips (On and off-campus residence hall trips).
3. All on-campus buildings estimated with the University/College ITE land use code, except for the Facilities Operation Center and the campus-owned apartments beyond the contiguous EMI District.
4. ITE-calculated weekday trip generation numbers are not representative of anticipated conditions, since ITE data was based on only one data collection sample

**Table 5.1**
**Level of Service and Delay**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Intersection/ Approach | Movement | Level of Service (Delay in Seconds) [1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AM Peak Hour | | | | | PM Peak Hour | | | | |
| | | 2022 | 2032 | | | | 2022 | | 2032 | | |
| | | Existing Conditions | Without Development[2] | With Development | With Development and TDM | With Development TDM and Mitigation | Existing Conditions | Without Development[2] | With Development | With Development and TDM | With Development TDM and Mitigation |
| **Fifth Avenue and Neville Street** | | | | | | | | | | | |
| Fifth Avenue Eastbound | Approach | A (7.6) | A (8.0) | A (8.9) | A (8.0) | A (7.1) | B (19.2) | B (18.4) | D (49.6) | D (41.4) | C (21.9) |
| Fifth Avenue Westbound | Approach | B (10.5) | B (15.6) | C (23.9) | B (18.6) | C (20.5) | B (11.3) | A (7.5) | A (6.8) | A (9.2) | A (8.4) |
| Neville Street Northbound | Left/Through | N/A | N/A | N/A | N/A | C (25.3) | N/A | N/A | N/A | N/A | C (26.2) |
| | Right | N/A | N/A | N/A | N/A | C (27.1) | N/A | N/A | N/A | N/A | D (41.7) |
| | Approach | C (30.7) | C (25.1) | C (21.9) | C (32.2) | C (26.2) | D (54.0) | D (47.3) | E (79.6) | E (79.6) | C (34.5) |
| Neville Street Southbound | Left/Through | E (66.9) | D (50.0) | E (62.3) | E (58.0) | E (55.7) | F (85.9) | E (72.9) | F (86.2) | E (77.4) | E (61.6) |
| | Right | E (68.7) | C (33.9) | D (39.2) | D (43.7) | D (43.2) | C (23.3) | C (20.7) | B (18.8) | B (18.4) | C (20.7) |
| | Approach | E (67.9) | D (40.5) | D (48.6) | D (49.6) | D (48.3) | E (57.7) | D (49.4) | E (59.3) | E (55.1) | D (46.1) |
| **Overall** | | **C (30.7)** | **C (23.3)** | **C (29.8)** | **C (27.9)** | **C (27.5)** | **C (27.7)** | **C (24.3)** | **D (45.8)** | **D (42.0)** | **C (24.5)** |
| **Fifth Avenue and Morewood Avenue** | | | | | | | | | | | |
| Fifth Avenue Eastbound | Approach | A (8.7) | A (6.1) | A (3.8) | A (5.6) | A (5.3) | C (26.4) | B (16.3) | B (17.1) | B (15.9) | B (16.0) |
| Fifth Avenue Westbound | Approach | B (17.8) | B (12.1) | B (14.9) | B (12.3) | B (12.3) | C (20.4) | B (18.2) | D (53.8) | C (22.7) | C (22.7) |
| Morewood Avenue Northbound | Left | N/A | N/A | N/A | N/A | C (25.2) | N/A | N/A | N/A | N/A | C (24.0) |
| | Through | N/A | N/A | N/A | N/A | C (29.3) | N/A | N/A | N/A | N/A | C (25.9) |
| | Left/Through | C (26.9) | C (33.2) | D (48.2) | D (36.8) | N/A | D (42.5) | D (40.7) | D (45.3) | D (46.3) | N/A |
| | Right | C (26.4) | C (28.3) | D (35.6) | C (29.9) | C (29.9) | E (58.9) | E (59.3) | E (74.5) | D (48.3) | D (48.3) |
| | Approach | C (26.8) | C (31.4) | D (43.1) | C (34.2) | C (29.4) | D (50.8) | D (50.1) | E (60.3) | D (47.3) | D (36.8) |
| Morewood Avenue Southbound | Left | C (25.4) | C (27.4) | C (29.3) | C (28.2) | C (27.5) | C (32.7) | C (25.7) | C (26.5) | C (26.8) | C (25.2) |
| | Through/Right | C (30.8) | D (40.0) | D (48.5) | D (41.1) | D (41.1) | C (34.1) | C (30.9) | C (33.5) | D (36.0) | D (36.0) |
| | Approach | C (29.8) | D (37.7) | D (45.1) | D (38.7) | D (38.6) | C (33.8) | C (29.8) | C (32.1) | C (34.1) | C (33.8) |
| **Overall** | | **B (19.5)** | **B (18.4)** | **C (22.6)** | **B (18.9)** | **B (18.0)** | **C (30.3)** | **C (25.3)** | **D (39.1)** | **C (26.0)** | **C (24.1)** |

Notes:
(1) Level of service and vehicular delay calculated using methodologies published in *Highway Capacity Manual 2000* by the Transportation Research Board, 2000 due to shared movements.
(2) Traffic signals anticipated to be upgraded to fully actuated and coordinated as part of the planned BRT project.

**Table 5.2**
**Institutional Master Plan Mobility Projects for Safety and Transportation Demand Management**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Project | Description | Implementation Timeframe | User Improvement |
|---|---|---|---|
| Morewood Avenue at Fifth Avenue Intersection Improvements | Realigning Morewood Avenue to eliminate the intersection offset approaching Fifth Avenue. | Mid-term to long-term | Pedestrians, Transit Users, Bikes, Autos |
| Morewood Avenue Cycle Track | Constructing a cycle track and installing a buffered sidewalk along Morewood Avenue from Forbes Avenue to Fifth Avenue. | Mid-term to long-term | Pedestrians, Transit Users, Bikes |
| Forbes Avenue and Margaret Morrison Street Intersection Improvement | Constructing curb extensions across Margaret Morrison Street. | Mid-term to long-term | Pedestrians, Transit Users |
| Forbes Avenue Bridge Sidewalk Improvement | Widening sidewalks on the Forbes Avenue Bridge over Junction Hollow. | Long-term | Pedestrians |
| Frew, Tech, and Margaret Morrison Street Neighborway Improvements | Incorporating Frew, Margaret Morrison, and Tech streets into a neighborway, with traffic calming, bicycle enhancements, and pedestrian safety elements like curb extensions and raised crosswalks. | Short-term to long-term | Pedestrians, Bikes |
| Margaret Morrison Street and Tech Street Intersection Improvements | Providing traffic calming such as a raised intersection or a gateway treatment. | Mid-term to long-term | Pedestrians |
| Frew Street, Tech Street, and Schenley Drive Intersection Improvements | Adding all-way stop control and improving sidewalks and crosswalks. | Short-term to long-term | Pedestrians, Autos |
| Cross Campus Cycle Track | Connecting Frew Street and Morewood Avenue with a cycle track through campus to separate bicycles and pedestrians. | Short-term to mid-term | Pedestrians, Bikes |
| Mid-campus Schenley Park Entrance | Creating a Schenley Park Entrance Opposite the North South Walkway by Hunt Library. | Mid-term to long-term | Pedestrians |
| Frew Street Reconfiguration | Converting Frew Street to one-way in the downhill direction with a contraflow shared use path in the uphill direction and parallel parking. | Mid-term to long-term | Pedestrians, Bikes |
| Junction Hollow Pedestrian Bridge | Constructing a pedestrian bridge from the Mall to the Craig Street area. | Long-term | Pedestrians |
| Hamerschlag Drive Bicycle Boulevard | Converting Hamerschlag Drive to a bicycle boulevard. | Short-term | Bikes |
| Boundary Street Railroad Crossing | Improving the Boundary Street railroad crossing. | Long-term | Pedestrians, Bikes |
| Craig Street Improvements | Making Craig Street more pedestrian friendly with safety improvements. | Long-term | Bikes |
| Fifth Avenue and Neville Street Intersection Improvements | Leverage Oakland Plan, BRT, and City of Pittsburgh Smart Spines projects to improve intersection safety. Reduce pedestrian and vehicular conflicts through designating a northbound exclusive right turn lane alongside a left turn/through lane. | Mid-term to long-term | Pedestrians, Autos |
| Mellon Institute Connectivity | Improving pedestrian connectivity to Mellon Institute. | Mid-term to long-term | Pedestrians |
| Fifth Avenue Sidewalk Improvements | Widening sidewalks and installing vegetative buffers alongside travel lanes. | Short-term to long-term | Pedestrians |
| Enhancing and Adding Bicycle Amenities and Infrastructure | Enhancing bicycle amenities and infrastructure towards the Bicycle Friendly University Gold Level award criteria. | Short-term to long-term | Bikes |

**Table 5.3**
**95th Percentile Vehicle Queue Length Summary**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Intersection / Approach | Movement | Available Storage (ft) [2] | 95th Percentile Queue Lengths (ft) [1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AM Peak Hour | | | | | PM Peak Hour | | | | |
| | | | 2022 | 2032 | | | | 2022 | 2032 | | | |
| | | | Existing Conditions | Without Development[2] | With Development | With Development and TDM | With Development TDM and Mitigation | Existing Conditions | Without Development[2] | With Development | With Development and TDM | With Development TDM and Mitigation |
| **Fifth Avenue and Neville Street** | | | | | | | | | | | | |
| Fifth Avenue Eastbound | Left/Through | 370 | 63 (129) | 72 (151) | 75 (160) | 70 (147) | 65 (132) | 253 (316) | 276 (325) | 427 (399) | 398 (416) | 318 (351) |
| | Through/Right | 370 | 63 (82) | 72 (99) | 75 (98) | 70 (97) | 65 (76) | 253 (271) | 276 (280) | 427 (359) | 398 (359) | 318 (304) |
| Fifth Avenue Westbound | Left/Through | 460 | 118 (150) | 313 (165) | 354 (194) | 334 (187) | 343 (175) | 95 (115) | 88 (95) | 66 (122) | 90 (127) | 94 (106) |
| | Through/Right | 460 | 118 (128) | 313 (151) | 354 (165) | 334 (169) | 343 (159) | 95 (112) | 88 (85) | 66 (95) | 90 (106) | 94 (86) |
| Neville Street Northbound | Left/Through | 160 | N/A | N/A | N/A | N/A | 106 (118) | N/A | N/A | N/A | N/A | 160 (183) |
| | Right | 570 | N/A | N/A | N/A | N/A | 115 (140) | N/A | N/A | N/A | N/A | 234 (499) |
| | Left/Through/Right | 570 | 153 (166) | 148 (155) | 204 (297) | 225 (277) | N/A | 317 (549) | 307 (560) | 437 (455) | 437 (459) | N/A |
| Neville Street Southbound | Left/Through | 1,130 | 298 (752) | 279 (615) | 312 (724) | 294 (720) | 292 (718) | 249 (254) | 241 (259) | 299 (515) | 293 (374) | 277 (369) |
| | Right | 160 | 331 (176) | 253 (189) | 298 (181) | 289 (186) | 265 (187) | 112 (168) | 109 (168) | 106 (189) | 97 (169) | 103 (197) |
| **Fifth Avenue and Morewood Avenue** | | | | | | | | | | | | |
| Fifth Avenue Eastbound | Left/Through | 730 | 48 (96) | 43 (102) | 38 (84) | 39 (90) | 39 (105) | 293 (277) | 319 (252) | 276 (670) | 283 (424) | 321 (567) |
| | Through/Right | 730 | 48 (98) | 43 (111) | 38 (85) | 39 (98) | 39 (110) | 293 (305) | 319 (268) | 276 (680) | 283 (450) | 321 (586) |
| Fifth Avenue Westbound | Left/Through | 890 | 223 (250) | 268 (261) | 311 (270) | 271 (260) | 271 (254) | 224 (310) | 302 (299) | 445 (954) | 397 (545) | 397 (516) |
| | Through/Right | 890 | 223 (213) | 268 (217) | 311 (233) | 271 (223) | 271 (224) | 224 (272) | 302 (268) | 445 (955) | 397 (515) | 397 (484) |
| Morewood Avenue Northbound | Left | 50 | N/A | N/A | N/A | N/A | 26 (57) | N/A | N/A | N/A | N/A | 41 (74) |
| | Through | 890 | N/A | N/A | N/A | N/A | 178 (189) | N/A | N/A | N/A | N/A | 185 (428) |
| | Left/Through | 890 | 168 (195) | 188 (203) | 264 (329) | 221 (235) | N/A | 288 (348) | 290 (355) | 309 (339) | 277 (334) | N/A |
| | Right | 280 | 111 (140) | 121 (155) | 179 (432) | 131 (237) | 131 (177) | 317 (483) | 317 (506) | 348 (478) | 274 (438) | 274 (323) |
| Morewood Avenue Southbound | Left | 85 | 63 (103) | 70 (116) | 78 (126) | 72 (112) | 70 (112) | 85 (120) | 85 (111) | 96 (122) | 86 (113) | 82 (117) |
| | Through/Right | 1,180 | 217 (274) | 263 (324) | 301 (477) | 266 (295) | 266 (314) | 266 (309) | 266 (297) | 302 (377) | 289 (306) | 289 (337) |

Notes:

(1) 95th percentile queue lengths calculated using methodologies published in *Highway Capacity Manual 2000* by the Transportation Research Board, 2000, with an average length of 20 feet per vehicle for unsignalized intersections. 95th percentile queue lengths calculated by SimTraffic are shown in (parentheses) by averaging 5 runs with 10 minutes of seeding.

(2) Reported available storage is the distance to the nearest traffic signal / stop sign or the physical length of the turn bay.

**Table 5.4**
**Reportable Five-Year Crash Experience 2016-2020**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Year | Crash Type | Severity | Number of Occurrences | Year | Crash Type | Severity | Number of Occurrences |
|---|---|---|---|---|---|---|---|
| **Fifth Avenue and Bellefield Avenue (11 Crashes Including 4 Pedestrian Crashes)** | | | | | | | |
| 2016 | Pedestrian | Injury / Unknown Severity | 1 | 2019 | Same Direction Sideswipe | Property Damage Only | 1 |
| 2018 | Rear-End | Unknown | 1 | 2020 | Pedestrian | Minor Injury | 1 |
| 2018 | Pedestrian | Injury / Unknown Severity | 1 | 2020 | Hit Fixed Object | Unknown or Property Damage Only | 2 |
| 2018 | Pedestrian | Serious Injury | 1 | 2020 | Rear-End | Injury / Unknown Severity | 1 |
| 2018 | Same Direction Sideswipe | Property Damage Only | 2 | | | | |
| **Fifth Avenue and Dithridge Street (5 Crashes including 1 Pedestrian Fatality)** | | | | | | | |
| 2016 | Angle | Property Damage Only | 1 | 2020 | Angle | Property Damage Only | 1 |
| 2017 | Angle | Injury / Unknown Severity | 1 | 2020 | Pedestrian | Fatality | 1 |
| 2019 | Rear-End | Injury / Unknown Severity | 1 | | | | |
| **Fifth Avenue and Craig Street (5 Crashes)** | | | | | | | |
| 2017 | Same Direction Sideswipe | Possible Injury | 1 | 2020 | Same Direction Sideswipe | Property Damage Only | 1 |
| 2019 | Angle | Property Damage Only | 1 | 2020 | Angle | Property Damage Only | 2 |
| **Fifth Avenue and Neville Street (21 Crashes Including 6 Pedestrian Crashes)** | | | | | | | |
| 2016 | Hit Fixed Object | Injury / Unknown Severity | 1 | 2018 | Pedestrian | Injury / Unknown Severity | 1 |
| 2016 | Pedestrian | Injury / Unknown Severity | 1 | 2018 | Angle | Injury / Unknown Severity | 1 |
| 2016 | Angle | Injury / Unknown Severity | 1 | 2019 | Rear-End | Minor Injury | 1 |
| 2016 | Same Direction Sideswipe | Injury / Unknown Severity | 1 | 2019 | Hit Fixed Object | Minor Injury | 1 |
| 2017 | Pedestrian | Unknown or Possible Injury | 2 | 2019 | Angle | Property Damage Only | 1 |
| 2017 | Rear-End | Property Damage Only | 1 | 2019 | Angle | Possible or Minor Injury | 3 |
| 2017 | Angle | Property Damage Only | 2 | 2019 | Pedestrian | Injury / Unknown Severity | 1 |
| 2017 | Opposite Direction Sideswipe | Property Damage Only | 1 | 2019 | Pedestrian | Serious Injury | 1 |
| | | | | 2020 | Angle | Property Damage Only | 1 |
| **Fifth Avenue and Clyde Street (3 Crashes Including 2 Pedestrian Crashes)** | | | | | | | |
| 2016 | Head-On | Possible Injury | 1 | 2018 | Pedestrian | Possible Injury | 1 |
| 2016 | Pedestrian | Minor Injury | 1 | | | | |
| **Fifth Avenue and Devonshire Street (12 Crashes)** | | | | | | | |
| 2016 | Opposite Direction Sideswipe | Property Damage Only | 1 | 2018 | Rear-End | Property Damage Only | 1 |
| 2016 | Rear-End | Property Damage Only | 1 | 2019 | Angle | Property Damage Only | 3 |
| 2017 | Angle | Injury / Unknown Severity | 1 | 2020 | Angle | Serious Injury | 1 |
| 2018 | Angle | Property Damage Only | 2 | 2020 | Head-On | Property Damage Only | 1 |
| 2018 | Angle | Injury / Unknown Severity | 1 | | | | |
| **Fifth Avenue and Morewood Avenue (44 Crashes Including 7 Pedestrian Crashes)** | | | | | | | |
| 2016 | Rear-End | Property Damage Only | 1 | 2018 | Rear-to-Rear | Minor Injury | 1 |
| 2016 | Rear-End | Possible Injury or Unknown Severity | 2 | 2018 | Angle | Property Damage Only | 3 |
| 2016 | Angle | Possible Injury | 1 | 2018 | Angle | Minor Injury or Unknown Severity | 3 |
| 2016 | Angle | Property Damage Only | 2 | 2018 | Pedestrian | Minor Injury | 1 |
| 2016 | Same Direction Sideswipe | Property Damage Only | 1 | 2018 | Pedestrian | Serious Injury | 1 |
| 2017 | Head-On | Minor Injury | 1 | 2019 | Pedestrian | Minor Injury | 1 |
| 2017 | Rear-End | Property Damage Only | 2 | 2019 | Pedestrian | Serious Injury | 1 |
| 2017 | Rear-End | Minor Injury | 1 | 2019 | Angle | Property Damage Only | 3 |
| 2017 | Hit Fixed Object | Property Damage Only | 1 | 2019 | Angle | Minor Injury | 1 |
| 2017 | Pedestrian | Injury / Unknown Severity | 1 | 2019 | Rear-End | Property Damage Only | 1 |
| 2017 | Angle | Property Damage Only | 5 | 2020 | Angle | Property Damage Only | 1 |
| 2017 | Angle | Injury / Unknown Severity | 1 | 2020 | Angle | Possible Injury or Minor Injury | 3 |
| 2018 | Rear-End | Property Damage Only or Possible Injury | 2 | 2020 | Pedestrian | Minor Injury or Unknown Severity | 2 |
| 2018 | Hit Fixed Object | Property Damage Only | 1 | | | | |
| **Forbes Avenue and Bellefield Avenue (5 Crashes)** | | | | | | | |
| 2017 | Rear-End | Property Damage Only | 1 | 2018 | Same Direction Sideswipe | Property Damage Only | 1 |
| 2017 | Angle | Possible Injury | 1 | 2020 | Same Direction Sideswipe | Property Damage Only | 1 |
| 2017 | Rear-End | Property Damage Only | 1 | | | | |
| **Forbes Avenue and Dithridge Street (4 Crashes Including 1 Pedestrian Crash)** | | | | | | | |
| 2016 | Pedestrian | Possible Injury | 1 | 2019 | Same Direction Sideswipe | Property Damage Only | 1 |
| 2018 | Same Direction Sideswipe | Property Damage Only | 1 | 2020 | Rear-End | Property Damage Only | 1 |
| **Forbes Avenue and Craig Street (5 Crashes)** | | | | | | | |
| 2016 | Rear-End | Property Damage Only | 1 | 2018 | Angle | Property Damage Only | 1 |
| 2017 | Rear-End | Possible Injury | 1 | 2018 | Hit Fixed Object | Property Damage Only | 1 |
| | | | | 2019 | Same Direction Sideswipe | Possible Injury | 1 |
| **Forbes Avenue and CIC Drive (2 Crashes Including 1 Pedestrian Crash)** | | | | | | | |
| 2018 | Angle | Injury / Unknown Severity | 1 | 2019 | Pedestrian | Injury / Unknown Severity | 1 |
| **Forbes Avenue and Morewood Avenue (8 Crashes Including 2 Pedestrian Crashes)** | | | | | | | |
| 2017 | Same Direction Sideswipe | Minor Injury | 1 | 2019 | Head-On | Property Damage Only | 1 |
| 2018 | Pedestrian | Injury / Unknown Severity | 1 | 2019 | Head-On | Injury / Unknown Severity | 1 |
| 2018 | Rear-End | Minor Injury | 1 | 2019 | Angle | Property Damage Only | 1 |
| 2019 | Pedestrian | Minor Injury | 1 | 2020 | Rear-End | Possible Injury | 1 |
| **Forbes Avenue and Devon Road (3 Crashes Including 1 Pedestrian Crash)** | | | | | | | |
| 2017 | Rear-End | Property Damage Only | 1 | 2020 | Pedestrian | Minor Injury | 1 |
| 2017 | Angle | Minor Injury | 1 | | | | |
| **Forbes Avenue and Beeler Street (5 Crashes)** | | | | | | | |
| 2017 | Angle | Minor Injury | 1 | 2020 | Rear-End | Property Damage Only | 1 |
| 2019 | Same Direction Sideswipe | Property Damage Only | 1 | 2020 | Hit Fixed Object | Property Damage Only | 1 |
| | | | | 2020 | Hit Fixed Object | Injury / Unknown Severity | 1 |
| **Forbes Avenue and Margaret Morrison Street (4 Crashes)** | | | | | | | |
| 2016 | Rear-End | Minor Injury or Unknown Severity | 2 | 2020 | Angle | Serious Injury | 1 |
| 2016 | Angle | Minor Injury | 1 | | | | |
| **Frew Street at Schenley Drive (3 Crashes)** | | | | | | | |
| 2016 | Angle | Minor Injury | 1 | | | | |
| **Frew Street at Schenley Drive (3 Crashes)** | | | | | | | |
| 2016 | Angle | Injury / Unknown Severity | 1 | 2017 | Angle | Minor Injury | 1 |
| 2016 | Head-On | Injury / Unknown Severity | 1 | | | | |
| **Frew Street Midblock (3 Crashes)** | | | | | | | |
| 2016 | Rear-to-Rear | Property Damage Only | 1 | 2019 | Hit Fixed Object | Minor Injury | 1 |
| 2018 | Angle | Property Damage Only | 1 | | | | |
| **Tech Street Midblock (1 Crash)** | | | | | | | |
| 2020 | Rear-End | Property Damage Only | 1 | | | | |
| **Craig Street North of Fifth Avenue (2 Crashes)** | | | | | | | |
| 2018 | Rear-End | Property Damage Only | 1 | 2019 | Angle | Property Damage Only | 1 |
| **Craig Street and Winthrop Street (3 Crashes)** | | | | | | | |
| 2016 | Angle | Property Damage Only | 1 | 2018 | Angle | Property Damage Only | 1 |
| 2016 | Same Direction Sideswipe | Property Damage Only | 1 | | | | |
| **Craig Street and Filmore Street (5 Crashes Including 1 Pedestrian Crash)** | | | | | | | |
| 2016 | Angle | Injury / Unknown Severity | 1 | 2018 | Pedestrian | Injury / Unknown Severity | 1 |
| 2016 | Hit Fixed Object | Property Damage Only | 1 | 2019 | Same Direction Sideswipe | Property Damage Only | 1 |
| 2017 | Same Direction Sideswipe | Property Damage Only | 1 | | | | |
| **Schenley Drive West of Schenley Bridge (2 Crashes)** | | | | | | | |
| 2017 | Angle | Minor Injury | 1 | 2017 | Rear-End | Property Damage Only | 1 |
| **Schenley Drive West at Phipps Parking (1 Crash)** | | | | | | | |
| 2018 | Angle | Property Damage Only | 1 | | | | |
| **Schenley Drive at Tech Street (4 Crashes)** | | | | | | | |
| 2016 | Hit Fixed Object | Property Damage Only | 1 | 2018 | Rear-End | Property Damage Only | 1 |
| 2018 | Hit Fixed Object | Minor Injury | 1 | 2020 | Hit Fixed Object | Property Damage Only | 1 |
| **Neville Street and Ellsworth Avenue (1 Crash)** | | | | | | | |
| 2016 | Rear-End | Property Damage Only | 1 | | | | |
| **Neville Street and Henry Street (1 Crash)** | | | | | | | |
| 2017 | Same Direction Sideswipe | Property Damage Only | 1 | | | | |
| **Neville Street and Winthrop Street (1 Crash)** | | | | | | | |
| 2017 | Angle | Property Damage Only | 1 | | | | |
| **Neville Street and Filmore Street (1 Crash)** | | | | | | | |
| 2018 | Rear-End | Possible Injury | 1 | | | | |
| **Boundary Street South of Schenley Bridge (1 Crash)** | | | | | | | |
| 2016 | Hit Fixed Object | Property Damage Only | 1 | | | | |
| **Devonshire Road North of Fifth Avenue (1 Crash)** | | | | | | | |
| 2018 | Hit Fixed Object | Property Damage Only | 1 | | | | |
| **Ellsworth Avenue and Clyde Street (2 Crashes)** | | | | | | | |
| 2018 | Hit Fixed Object | Injury / Unknown Severity | 1 | 2020 | Head-On | Property Damage Only | 1 |

**Table 5.5**
**Reportable and Non-Reportable Crashes from Campus Police, January 2018 - June 2021**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Location | Crash Type | Number of Occurrences | | | | |
|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | Total |
| N Dithridge Street between Forbes Ave & Fifth Ave | Vehicle Collision/Damage | | | | 1 | 1 |
| Forbes Avenue (Unspecified Location) | Vehicle Collision/Crash | | 6 | | | 6 |
| | Vehicle Collision/Damage | | 2 | | | 2 |
| | Vehicular and Bicycle Collision | | | 1 | | 1 |
| Forbes Avenue & Schenley Drive Ext | Vehicle Collision/Crash | 1 | | | | 1 |
| | Vehicle Collision/Damage | 5 | | | | 5 |
| | Property Damage by Vehicle | 1 | | | | 1 |
| Forbes Avenue & GATF Lot (Craig Street) | Vehicle Collision/Crash | 1 | 1 | | | 2 |
| Forbes Avenue & CIC Drive/Newell-Simon Hall | Vehicle Collision/Crash | 1 | | | | 1 |
| | Vehicle Collision/Damage | 1 | 4 | | | 5 |
| | Property Damage by Vehicle | 1 | | | | 1 |
| Forbes Avenue & Gates/Hillman/Cyert | Vehicle Collision/Damage | 1 | | 1 | 1 | 3 |
| Forbes Avenue & Tepper Quad | Vehicle Collision/Damage | 3 | 2 | | | 5 |
| Forbes Avenue & Morewood Avenue | Vehicle Collision/Crash | | | 1 | | 1 |
| Forbes Avenue & Doherty Apartments | Vehicle Collision/Damage | | 1 | | | 1 |
| Forbes Avenue & Intramural Field | Vehicle Collision/Damage | | 1 | | | 1 |
| Beeler Street near Forbes Avenue | Vehicle Collision/Crash | | | 2 | | 2 |
| | Vehicle Collision/Damage | | | | 1 | 1 |
| Fifth Avenue (Unspecified Location) | Vehicle Collision/Crash | 2 | 3 | 2 | | 7 |
| | Vehicle Collision/Damage | 1 | 1 | | | 2 |
| Fifth Avenue at Neville Street / Residence on Fifth | Vehicular Collision | 1 | 1 | 1 | | 3 |
| | Vehicle Collision/Damage | | 1 | | | 1 |
| Fifth Avenue & Devonshire Road | Vehicle Collision/Crash | 1 | 5 | 1 | | 7 |
| | Vehicle Collision/Damage | 1 | | | | 1 |
| South Craig Street between Forbes Avenue and Fifth Avenue | Vehicle Collision/Crash | | 1 | | 1 | 2 |
| | Vehicle Collision/Damage | 2 | 1 | | | 3 |
| Filmore Street at Zebina Way | Vehicle Collision/Crash | | 1 | | | 1 |
| | Vehicle Collision/Damage | 1 | 1 | | | 2 |
| Morewood Avenue (Unspecified Location) | Vehicle Collision/Crash | 2 | | 2 | | 4 |
| | Vehicle Collision/Damage | 2 | 1 | | | 3 |
| Morewood Avenue at Morewood Gardens | Vehicle Collision/Crash | 2 | | | | 2 |
| | Vehicle Collision/Damage | | 1 | 1 | | 2 |
| Morewood Avenue at Stever House | Vehicle Collision/Damage | | | 1 | | 1 |
| Morewood Avenue at Mudge House | Vehicle Collision/Damage | | 1 | | | 1 |
| Margaret Morrison Street (Unspecified Location) | Vehicle Collision/Crash | 1 | | | | 1 |
| | Vehicle Collision/Damage | 3 | 1 | | | 4 |
| Margaret Morrison Street at Donner House | Vehicle Collision/Damage | 1 | | | | 1 |
| Tech Street | Vehicle Collision/Damage | 2 | | | | 2 |
| Frew Street (Unspecified Location) | Vehicle Collision/Crash | 2 | | | | 2 |
| | Vehicle Collision/Damage | 6 | 3 | 2 | | 11 |
| Frew Street & Hunt Library | Vehicle Collision/Crash | 2 | | | | 2 |
| | Vehicle Collision/Damage | 1 | | | | 1 |
| Frew Street & Baker Hall | Vehicle Collision/Damage | | 1 | | | 1 |
| Frew Street & Porter Hall | Vehicle Collision/Damage | | | 1 | 1 | 2 |
| Frew Street & Scaife Hall | Vehicle Collision/Damage | 1 | | 1 | | 2 |
| Schenley Drive (Unspecified Location) | Vehicle Collision/Crash | 1 | | | | 1 |
| Hamerschlag Drive & Roberts Hall | Vehicle Collision/Damage | 1 | | | | 1 |
| Hamerschlag Drive at Wean Hall | Vehicle Collision/Damage | 1 | | | | 1 |
| Hamerschlag Drive at Doherty Hall | Vehicle Collision/Damage | | 1 | | | 1 |
| Hamerschlag Drive at FMS | Vehicle Collision/Damage | 4 | 1 | 1 | | 6 |
| Neville Street (Unspecified Location) | Vehicle Collision/Damage | | | 1 | | 1 |
| Winthrop Street (Unspecified Location) | Vehicle Collision/Damage | | 2 | | | 2 |
| CMU Police Department | Vehicle Collision/Crash | | | 1 | | 1 |
| | Vehicle Collision/Damage | 6 | 12 | 4 | 1 | 23 |
| | Property Damage by Vehicle | | | | 2 | 2 |
| East Campus Garage Area | Vehicle Collision/Crash | 1 | 2 | 5 | 1 | 9 |
| | Vehicle Collision/Damage | 6 | 12 | | 2 | 20 |
| | Property Damage by Vehicle | 1 | | | | 1 |
| Dearden Center / North of Fifth Residence Hall | Vehicle Collision/Damage | | 1 | | | 1 |
| CFA Lot | Vehicle Collision/Damage | 1 | | | | 1 |
| SEI / Dithridge Garage | Vehicle Collision/Damage | 1 | 1 | 1 | | 3 |
| Whitfield Hall Lot | Vehicle Collision/Damage | | 1 | 1 | | 2 |
| Donner Hall Lot | Vehicle Collision/Damage | 1 | | | | 1 |
| CIC Garage | Property Damage by Vehicle | 1 | 1 | | | 2 |
| Fraternities Lot | Vehicle Collision/Damage | 1 | | | | 1 |
| Information Network Institute | Vehicle Collision/Damage | | 1 | | | 1 |
| Morewood Lot | Vehicle Collision/Damage | 6 | 1 | | 1 | 8 |
| Warner Hall Lot | Vehicle Collision/Damage | | 1 | | | 1 |
| University Center | Vehicle Collision/Crash | 1 | | | | 1 |
| | Vehicle Collision/Damage | 1 | 1 | | 1 | 3 |
| Margaret Morrison Hall Lot | Vehicle Collision/Damage | | | 1 | | 1 |
| Fifth Avenue & WQED | Vehicle Collision/Damage | 2 | | | | 2 |
| Mellon Institute & Fifth Avenue | Vehicle Collision/Damage | | 1 | | | 1 |
| Morewood Gardens Circle | Vehicle Collision/Damage | 1 | | | | 1 |
| Unspecified Location | Vehicle Collision/Crash | 1 | | | | 1 |
| | Vehicle Collision/Damage | 1 | 1 | | | 2 |
| | Property Damage by Vehicle | | | | 2 | 2 |
| **Total** | | 88 | 80 | 32 | 15 | 215 |

**Table 6.1**
**Parking Inventory and Anticipated Changes**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| IMP Number | Parking Facility | Existing Parking Capacity | Anticipated Future Parking Capacity | Maximum Future Parking Capacity | Anticipated Change | Notes |
|---|---|---|---|---|---|---|
| 1 | Zebina Way Lot | 32 | 32 | 32 | 0 | |
| 2 | Henry Street Lot | 13 | 13 | 13 | 0 | |
| 3 | Fairfax Lot | 55 | 55 | 55 | 0 | |
| 4 | Whitfield Hall Lot | 61 | 55 | 43 | -18 | Assume 80% of units to have one space |
| 5 | 300 South Craig Lot | 22 | 22 | 22 | 0 | |
| 6 | Hamburg Hall Lot (CIC Drive) | 12 | 12 | 12 | 0 | |
| 7 | GATF Lot | 72 | 200 | 100 | 28 | Assume 50% of maximum capacity |
| 8 | Frew Street Disabled | 10 | 10 | 10 | 0 | |
| 9 | West Campus Lot | 14 | 0 | 0 | -14 | Parking to be removed for bicycle boulevard |
| 10 | Morewood Lot | 285 | 200 | 150 | -135 | Assume 75% of maximum capacity |
| 11 | Warner Hall Lot | 16 | 0 | 0 | -16 | |
| 12 | Fine Arts Lot | 61 | 0 | 0 | -61 | |
| 13 | Donner House Lot | 23 | 200 | 50 | 27 | Assume 25% of maximum capacity |
| 14 | Tech Street (Margaret Morrison) | 14 | 0 | 0 | -14 | |
| 15 | Bramer House Lot | 5 | 5 | 5 | 0 | |
| 16 | Fraternities Lot | 69 | 150 | 50 | -19 | Assume 1/3 of capacity; parking under F/M building |
| 17 | Fifth and Neville Lot | 16 | 16 | 16 | 0 | |
| 18 | Clyde Street Lot | 90 | 6 | 15 | -75 | Parking for Clyde House and Highlands Apartments |
| 19 | III Lot | 17 | 0 | 0 | -17 | |
| 20 | South Neville Lot | 96 | 135 | 50 | -46 | FMCS parking only; assume 50% of current capacity |
| 21 | Forbes Beeler Lot | | 20 | 20 | 20 | |
| 22 | Carnegie Museum Lots | 110 | 500 | 325 | 215 | 325 spaces, per CMU |
| 23 | 5th and Craig Street Garage | 40 | 40 | 40 | 0 | |
| 24 | Dithridge Garage | 370 | 370 | 370 | 0 | |
| 25 | CIC Garage | 226 | 226 | 226 | 0 | |
| 26 | Gates Garage | 138 | 138 | 138 | 0 | |
| 27 | East Campus Garage | 780 | 780 | 780 | 0 | |
| 28 | East Campus Garage Motorcycle | 14 | 14 | 14 | 0 | |
| 29 | Residence at Fifth Garage | 37 | 37 | 37 | 0 | |
| 30 | TCS Garage | 35 | 35 | 35 | 0 | |
| 31 | Tepper Quad | 126 | 126 | 126 | 0 | |
| 32 | Fifth Neville Garage | 29 | 29 | 29 | 0 | |
| IMP #10 | New Academic Building | | 400 | 125 | 125 | Assume similar capacity to Tepper |
| Shuttle | 6555 Penn Ave | 54 | 54 | 54 | 0 | |
| Shuttle | Melwood | 30 | 30 | 30 | 0 | |
| **Total** | | **2972** | **3910** | **2972** | **0** | **No net change in parking supply anticipated** |

**Table 6.2**
**Parking Supply and Demand Analysis**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| Project Component | | | | Existing On-Site Conditions | | Anticipated Parking Generation[1] | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Maximum Buildout Parking Generation | | | | | | | 50% of Maximum Size[2] | | | | | |
| Number | Type | Description | Proposed Use | Size (Sq. Ft.) | # of Beds | Max. Size (Total) (Sq. Ft.) | Max. # of Beds | Max Size (Net) (Sq. Ft.) | Proposed Parking Demand (250 nasf/person) | Existing Parking Demand Shifted from Existing to New Building[4] | Net New Parking Demand | Net New Parking Demand and TDM[3] | 50% Size (Sq. Ft.) | 50% Size (Net) (Sq. Ft.) | Proposed Parking Demand (250 nasf/person) | Parking Demand Shifted from Existing to New Building[4] | Net New Parking Demand | Net New Parking Demand and TDM[3] |
| 1 | Facilities Operations Center | S Neville along Railroad | Parking, Utility, Office | | | 40,000 sf | | 40,000 sf | 25 | 7 | 18 | 17 | 20,000 sf | 20,000 sf | 12 | 8 | 4 | 4 |
| 2 | New Academic Building | FMS Building | Education, Laboratory / Research, Office, Restaurant, Utility | 48,000 sf | | 300,000 sf | | 252,000 sf | 157 | 44 | 113 | 104 | 150,000 sf | 102,000 sf | 64 | 39 | 25 | 23 |
| 3 | Academic Building Expansion | Hamburg & Smith Halls | Education, Laboratory / Research, Office, Restaurant | 22,000 sf | | 100,000 sf | | 78,000 sf | 49 | 14 | 35 | 32 | 50,000 sf | 28,000 sf | 17 | 11 | 6 | 6 |
| 4 | New Academic Building | Cyert & Warner Halls | Education, Laboratory / Research, Office, Parking, Restaurant | 110,000 sf | | 250,000 sf | | 140,000 sf | 87 | 25 | 62 | 57 | 125,000 sf | 15,000 sf | 9 | 6 | 3 | 3 |
| 5 | Academic Building Expansion | Purnell Center for the Arts | Education, Laboratory / Research, Office, Public Assembly | | | 30,000 sf | | 30,000 sf | 19 | 5 | 14 | 13 | 15,000 sf | 15,000 sf | 9 | 6 | 3 | 3 |
| 6 | Student Support Expansion | West Wing Addition | Education, Laboratory / Research, Office, Restaurant | | | 5,000 sf | | 5,000 sf | 3 | 1 | 2 | 2 | 2,500 sf | 2,500 sf | 2 | 1 | 1 | 1 |
| 7 | Academic Building Expansion | Margaret Morrison Carnegie Hall | Education, Laboratory / Research, Office | | | 110,000 sf | | 110,000 sf | 69 | 19 | 50 | 46 | 55,000 sf | 55,000 sf | 34 | 21 | 13 | 12 |
| 8 | New Mixed Use Building | Donner Hall | Office, Parking, Restaurant / Student Housing | | 241 | 266,000 sf | 735 | 266,000 sf | 166 | 47 | 119 | 109 | 133,000 sf | 133,000 sf | 83 | 51 | 32 | 29 |
| 9 | Student Support Expansion | Hamerschlag House | Office, Restaurant | | | 6,000 sf | | 6,000 sf | 4 | 1 | 3 | 3 | 3,000 sf | 3,000 sf | 2 | 1 | 1 | 1 |
| 10 | New Academic Building | Tepper School Expansion Site | Office, Parking, Public Assembly, Restaurant | | | 180,000 sf | | 180,000 sf | 112 | 32 | 80 | 74 | 90,000 sf | 90,000 sf | 56 | 35 | 21 | 19 |
| 11 | New Mixed Use Building | Morewood Lot | Laboratory / Research, Office, Restaurant / Student Housing | | | 220,000 sf | 500 | 220,000 sf | 137 | 39 | 98 | 90 | 110,000 sf | 110,000 sf | 69 | 43 | 26 | 24 |
| 12 | E Tower Commons | Morewood E Tower | Office, Restaurant | | | 6,000 sf | | 6,000 sf | 4 | 1 | 3 | 3 | 3,000 sf | 3,000 sf | 2 | 1 | 1 | 1 |
| 13 | New Mixed Use Building | Capstone site at Forbes & Morewood | Office, Parking, Student Housing, Restaurant | | | 200,000 sf | 300 | 200,000 sf | 125 | 35 | 90 | 83 | 100,000 sf | 100,000 sf | 62 | 39 | 23 | 21 |
| 14 | New Residential Building(s) | Greek Quad | Office, Parking, Student Housing | | 384 | 250,000 sf | 720 | 250,000 sf | 156 | 44 | 112 | 103 | 125,000 sf | 125,000 sf | 78 | 48 | 30 | 28 |
| 15 | New Residential Building | Forbes & Devon | Office, Student Housing | | | 40,000 sf | 180 | 40,000 sf | 25 | 7 | 18 | 17 | 20,000 sf | 20,000 sf | 12 | 8 | 4 | 4 |
| 16 | Shirley Apartments | Shirley Apartments | Office, Parking, Student Housing | | 20 | 20,000 sf | | 20,000 sf | 12 | 4 | 8 | 7 | 10,000 sf | 10,000 sf | 6 | 4 | 2 | 2 |
| 17 | New Residential Building | Whitfield Hall | Office, Parking, Student Housing | 4,000 sf | | 160,000 sf | 165 | 156,000 sf | 97 | 27 | 70 | 64 | 80,000 sf | 76,000 sf | 47 | 29 | 18 | 17 |
| 18 | Academic Building Expansion | Mellon Institute | Education, Laboratory / Research | | | 30,000 sf | | 30,000 sf | 19 | 5 | 14 | 13 | 15,000 sf | 15,000 sf | 9 | 6 | 3 | 3 |
| 19 | New Academic Building | North of Forbes @ S Craig | Education, Laboratory / Research, Office, Parking, Restaurant, Retail | 49,000 sf | | 230,000 sf | | 181,000 sf | 113 | 32 | 81 | 75 | 115,000 sf | 66,000 sf | 41 | 25 | 16 | 15 |
| 20 | New Academic Building | South of Forbes @ S Craig | Office, Parking, Public Assembly, Restaurant, Retail | 2,700 sf | | 425,000 sf | | 422,300 sf | 264 | 74 | 190 | 175 | 212,500 sf | 209,800 sf | 131 | 81 | 50 | 46 |
| **Total** | | | | **235,700 sf** | **645** | **2,868,000 sf** | **2600** | **2,632,300 sf** | **1643** | **463** | **1180** | **1087** | **1,434,000 sf** | **1,198,300 sf** | **745** | **463** | **282** | **262** |

1. Existing parking supply is 2,972 spaces and existing demand is 2,621 spaces (Source: CMU, February 2020). Existing campus assignable size is 4,015,119 nasf (211 nasf/person for 19,029 total population). Existing parking demand averages 0.074% per NASF. Proposed parking demand is 0.062% per NASF at 250 nasf/person
2. Under 1/3 of development square footage was realized from the 2012-2022 master plan, as buildings were built below maximum massing and some projects deferred or cancelled. Assume up to 50% of 2022-2032 master plan will be realized.
3. Mobility goal in IMP is to reduce parking by 8 percent.
4. Per CMU's goal of increasing nasf/person from 211 to 250, 250 nasf/person used for future parking demand. 742,131 nasf of space within new development projects will reaccommodate existing users, so the equivalent demand of 463 spaces before TDM will be maintained by existing users shifting to new building

**Table 6.3**
**Transportation Demand Management Reduction Strategies**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| TDM Strategy | Implementation Timeframe | 2018 Commuter Survey Response Rate | TDM Max. Anticipated Commuting Reduction |
|---|---|---|---|
| Increasing Transit Pass Program Eligibility | Short-term | 2% | 2% (Shift to Transit) |
| Improving and Expanding Shuttle Program | Mid-term | 4% | 2% (Shift to Transit) |
| Providing Improved Bicycle Amenities | Short-term | 1% | 1% (Shift to Biking) |
| Improving Sidewalk Accessibility, Connectivity, and Safety | Short- to Long-term | 1% | 1% (Shift to Walking) |
| Developing a Carpool/Vanpool Program | Mid-term | 2% | 2% (Shift to Carpooling) |
| Enhancing Electric Car Charging | Short- to Long-term | 1% | 0% |
| Improving Shared Parking Options with Flexible, Limited-use Parking Passes | Mid-term | 7% | 3% (Shift to Transit, Biking, Walking, Carpooling) |
| Coordinating with the Port Authority for Improved Transit Routes and Options | Long-term | 8% | 4% (Shift to Transit) |
| Implement Work from Home Options | Short- to Long-term | 1% | 5% (Shift to Other) |
| Build Bicycle Infrastructure | Mid- to Long-term | N/A | 1% (Shift to Biking) |

1) Mode share target is to reduce single vehicle commuter use by 8% from 2022 to 2032

2) Survey data based on 824 participant comments from Employee Commuter Survey, 2018

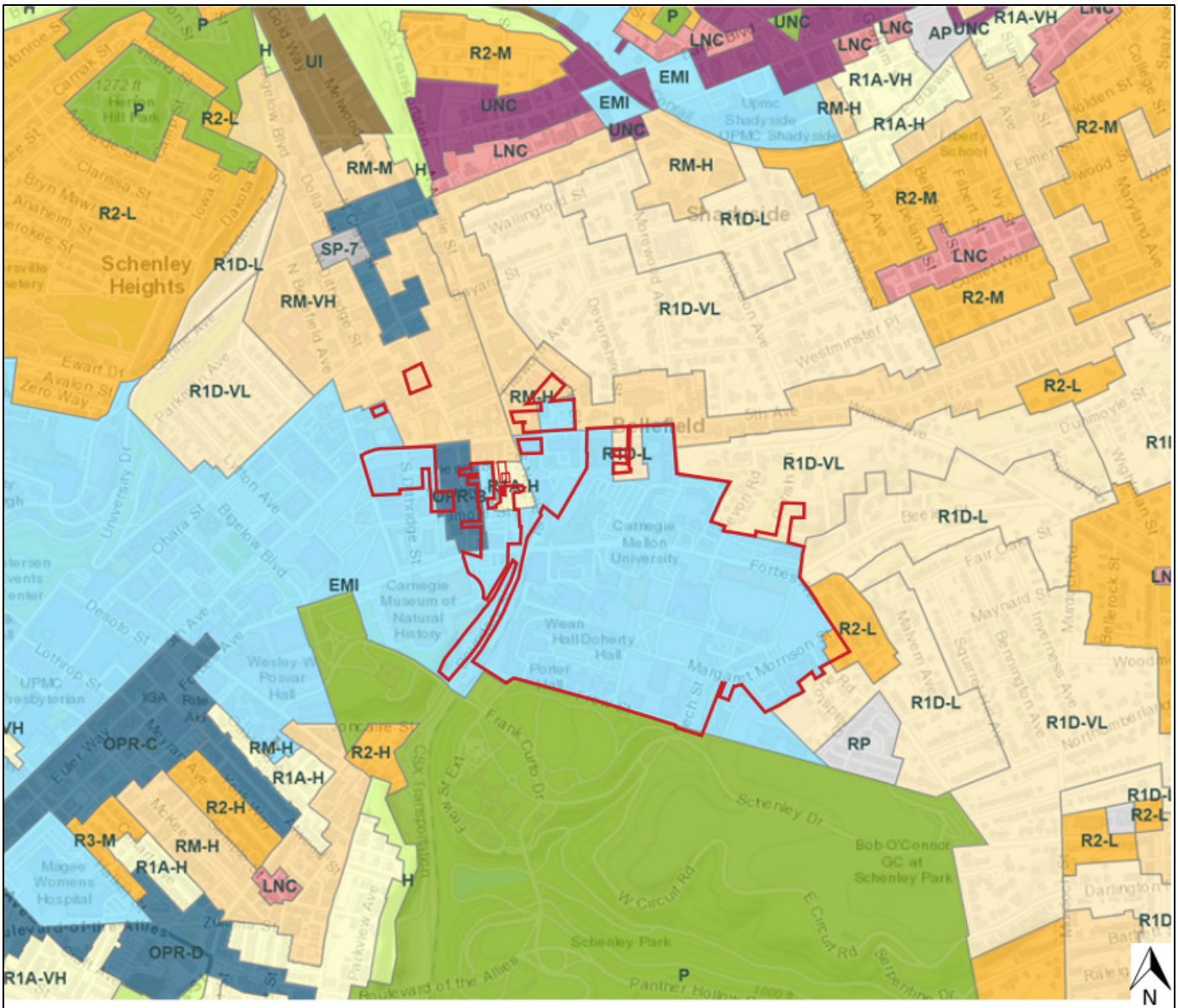
**Table 6.4**
**Transportation Demand Management Checklist**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| TDM Strategy | Status | Results | Revised Strategy | Comments |
|---|---|---|---|---|
| Meet with the Transportation Management Association (TMA) | Ongoing | | | Coordination with OTMA is ongoing. |
| Set mode split goals and commitment to creating a survey. Goals should be consistent with relevant adopted neighborhood master plans | Included in IMP | | | Surveying is part of CMU's parking master plan. Goals are intended to be compatible with upcoming Oakland and Squirrel Hill neighborhood plans. |
| Identify responsible party or dedicated staff assigned to administer TDM program and report on this progress | Complete | | | CMU's Parking and Transportation Services will administer this program. |
| Payback incentives for using non-motorized and carpool incentives | To be Developed in TDM Plan | | | A formal carpool incentive program will be included in the University's TDM plan. |
| Provide transit passes or subsidies to employees or residents | Complete; to be Expanded in TDM | | | Transit passes are currently provided to employees and students. A TDM plan will consider expanding the program to subcontractors and to transit operators beyond Allegheny County. |
| Offer employees or residents free or discount bikeshare membership through the Healthy Ride Corporate Membership Program | To be Developed in TDM Plan | | | A formal incentive program for wheeled mobility programs will be included in the University's TDM plan. |
| Membership in the 2030 District | Complete | | | Carnegie Mellon is a member of the 2030 district. |
| Parking policies that unbundle the cost of parking lease from rent | Complete | | | Parking is an additional charge for all employees. |
| Promotion of SPC Commuter Connects programs | To be Developed in TDM Plan | | | Coordination with SPC programs will be included in the University's TDM plan. |
| Flexible work hours and/or telecommute program | In Progress | | | Carnegie Mellon will adopt a formal flexible work location program. |
| Real time transportation displays internal to development | To be Developed in TDM Plan | | | Transit information will be included in the University's TDM plan. Options include displays in the Cohon University Center or investing in smartphone apps. |

**Table 6.5**
**Site Plan Strategies**
**Carnegie Mellon University 2022-2032 Institutional Master Plan**
**City of Pittsburgh, Pennsylvania**

| TDM Strategy | Status | Results | Revised Strategy | Comments |
|---|---|---|---|---|
| Adequate sidewalk widths and ADA ramps along all building frontages | Ongoing | | | Carnegie Mellon continues to invest in widening sidewalks, replacing ADA ramps, and building buffers to vehicular traffic. |
| Bicycle parking required by code. A mix of bicycle parking should include convenient short-term parking and secure, covered parking accessible from the ground floor for long-term bicycle parking or storage | Ongoing | | | Covered bicycle parking is provided on the ground floor in the East Campus Garage, and individual bike racks are placed throughout campus at building entrances. Additional bicycle racks are added based on demand. |
| When impacting a bus stop; work with the city and Port Authority to relocate during construction and restore amenities | Ongoing | | | Carnegie Mellon has also been working with the Port Authority to integrate planned BRT stations. |
| When providing public easement or public access to privately owned open space; wayfinding | Complete | | | Carnegie Mellon has recently installed new campus wayfinding. The general public is welcome to use campus outdoor space. |
| Upgrades and enhancements for pedestrian safety at site access and intersections | Ongoing | | | Carnegie Mellon continues to invest in pedestrian safety, as demonstrated by the proposed projects the IMP's mobility plan. |
| Consistency with improvements identified in City plans or policy | Included in IMP | | | The IMP mobility plan was prepared in accordance with the City's best practices and includes projects consistent with city improvement strategies. |
| Identify how existing space can be repurposed as part of reducing SOV trips | Included in IMP | | | The IMP identifies how existing surface lots will be repurposed to flexible space or replaced with development projects, eliminating on-campus surface parking. |
| Enhancements to pedestrian facilities that address the last mile problem from transit stops and desired pedestrian paths | Ongoing | | | The IMP mobility plan includes projects to improve pedestrian paths. Carnegie Mellon is working with the Port Authority to integrate BRT stations. |
| Bicycle storage that exceed zoning code requirements | In Progress | | | Carnegie Mellon continues to invest in bicycle amenities to exceed city requirements. |
| Bikeshare station on site | Complete | | | Bikeshare stations are located near campus, including along Frew Street, Schenley Drive, and Ellsworth Avenue. |
| Shower rooms or shower passes for employees who bike to work | Complete | | | Carnegie Mellon offers shower rooms. |
| Unbundled parking | Complete | | | Parking is unbundled for all employees. |
| Shared parking | Complete | | | Permit parking is in tiers, not individual reserved spaces. |
| Priority carpool parking | To be Developed in TDM Plan | | | Priority carpool parking will be considered for the University's TDM plan. |
| Dedicated car share parking | Complete | | | Dedicated car share parking is provided in university-owned parking facilities. |
| Sponsored car share or bikeshare memberships for employees or residents (annual or intro membership) | To be Developed in TDM Plan | | | A formal incentive program for wheeled mobility programs will be included in the University's TDM plan. |
| Real time arrival transit screens in publicly accessible space | To be Developed in TDM Plan | | | Transit information will be included in the University's TDM plan. Options include displays in the Cohon University Center or investing in smartphone apps. |
| Transit station enhancements or improvements | Ongoing | | | Carnegie Mellon is working with the Port Authority to integrate planned BRT stations. |
| Pedestrian enhancements between proposed buildings and nearby transit stations, such as adding pedestrian scale lighting, emergency call boxes, street trees, and seating | Ongoing | | | Carnegie Mellon continues to invest in improving the pedestrian experience, including creating vegetated buffers between sidewalks and travel lanes. Emergency call boxes are provided. |
| Electric vehicle charging | Ongoing | | | Electric vehicle charging is currently provided on campus. Level one charging spaces will be expanded to all new campus parking facilities. |
| Tandem parking | Ongoing | | | Tandem space use will continue to be expanded to reduce the size of parking facilities. |
| Personal mobility (scooter) parking on campus | To be Developed in TDM Plan | | | Carnegie Mellon is developing a wheeled mobility plan and will investigate personal mobility parking as part of the TDM plan. |

# FIGURES




(Map by City of Pittsburgh)

| | | | | | |
|---|---|---|---|---|---|
| | Carnegie Mellon University Property in 2022 IMP | | RM | Residential Multi-Unit |
| | Planned Development Space | | LNC | Local Neighborhood Commercial |
| EMI | Educational Medical Institutional | | UNC | Urban Neighborhood Commercial |
| OPR | Oakland Public Realm | | UI | Urban Industrial |
| P | Park | | | |
| H | Hillside | | | |
| R1D | Residential Single-Unit | | | |
| R2 | Residential Two-Unit | | | |

gai consultants

PROJECT NO/CLIENT R200398.00 / Carnegie Mellon University

PROJECT
2032 Carnegie Mellon Institutional Master Plan
City of Pittsburgh, Allegheny County

TITLE
# Carnegie Mellon EMI District Location

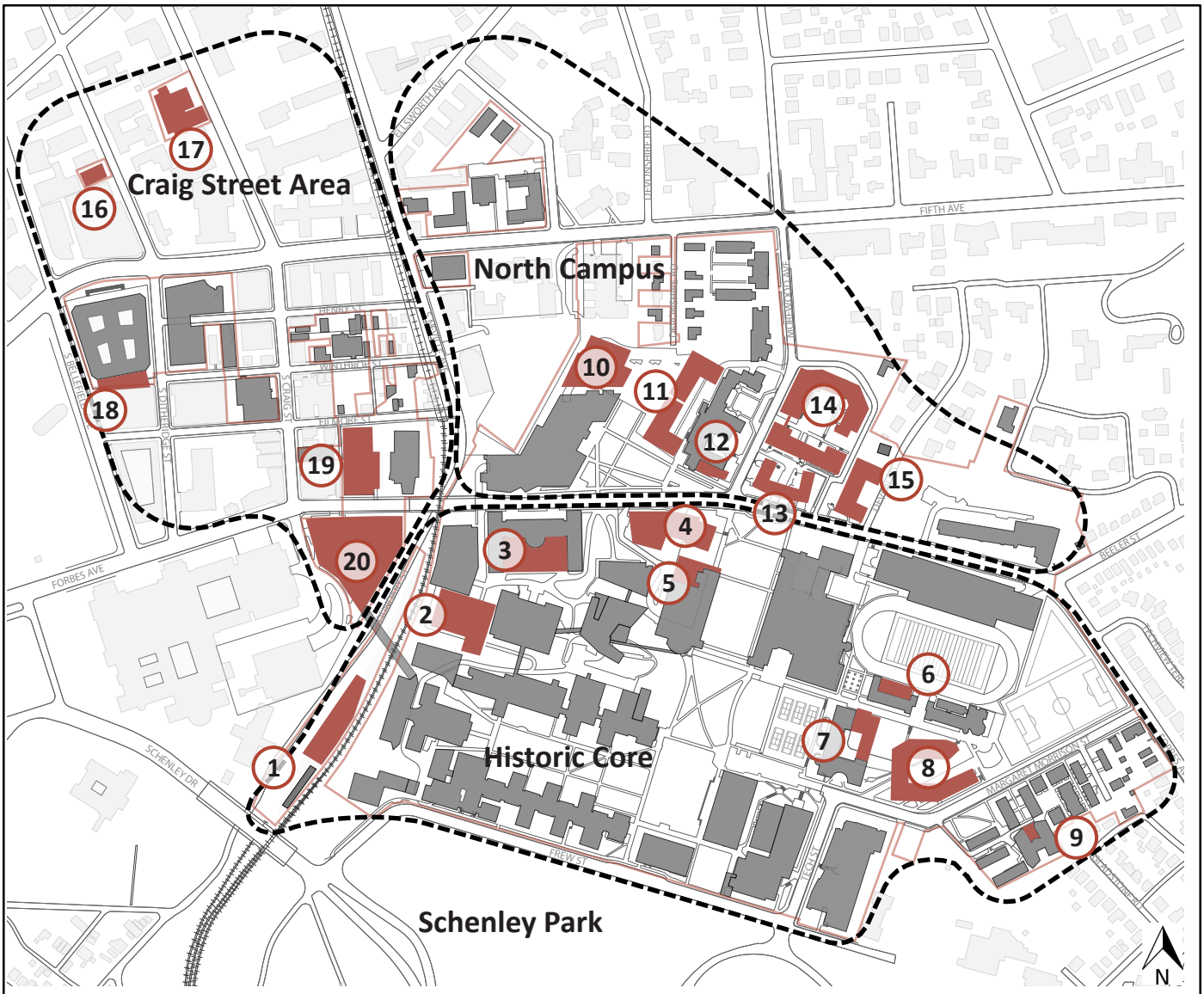
SCALE: N.T.S.

DWN. TMW
CHKD. RAK

FIGURE
1.0

PLOTTED: 2/2/2022

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn




| | | | |
|---|---|---|---|
| | Carnegie Mellon University Property in 2022 IMP | 9 | Student Commons |
| | Carnegie Mellon University Existing Buildings | 10 | Academic Building |
| | Campus District Boundaries | 11 | Mixed Use Building |
| | Development Sites | 12 | Student Commons |
| 1 | Facilities Operations Center | 13 | Mixed Use Building |
| 2 | Academic Building | 14 | Student Housing |
| 3 | Hamburg Expansion | 15 | Student Housing |
| 4 | Mixed Use | 16 | Shirley Apartments Renovation |
| 5 | Purnell Center Expansion | 17 | Student Apartments |
| 6 | West Wing Addition | 18 | Mellon Institute Entrance |
| 7 | Margaret Morrison Carnegie Hall Expansion | 19 | Mixed Use Building |
| 8 | Academic/Student Housing Complex | 20 | South of Forbes Site |

gai consultants

PROJECT NO/CLIENT R200398.00 / Carnegie Mellon University

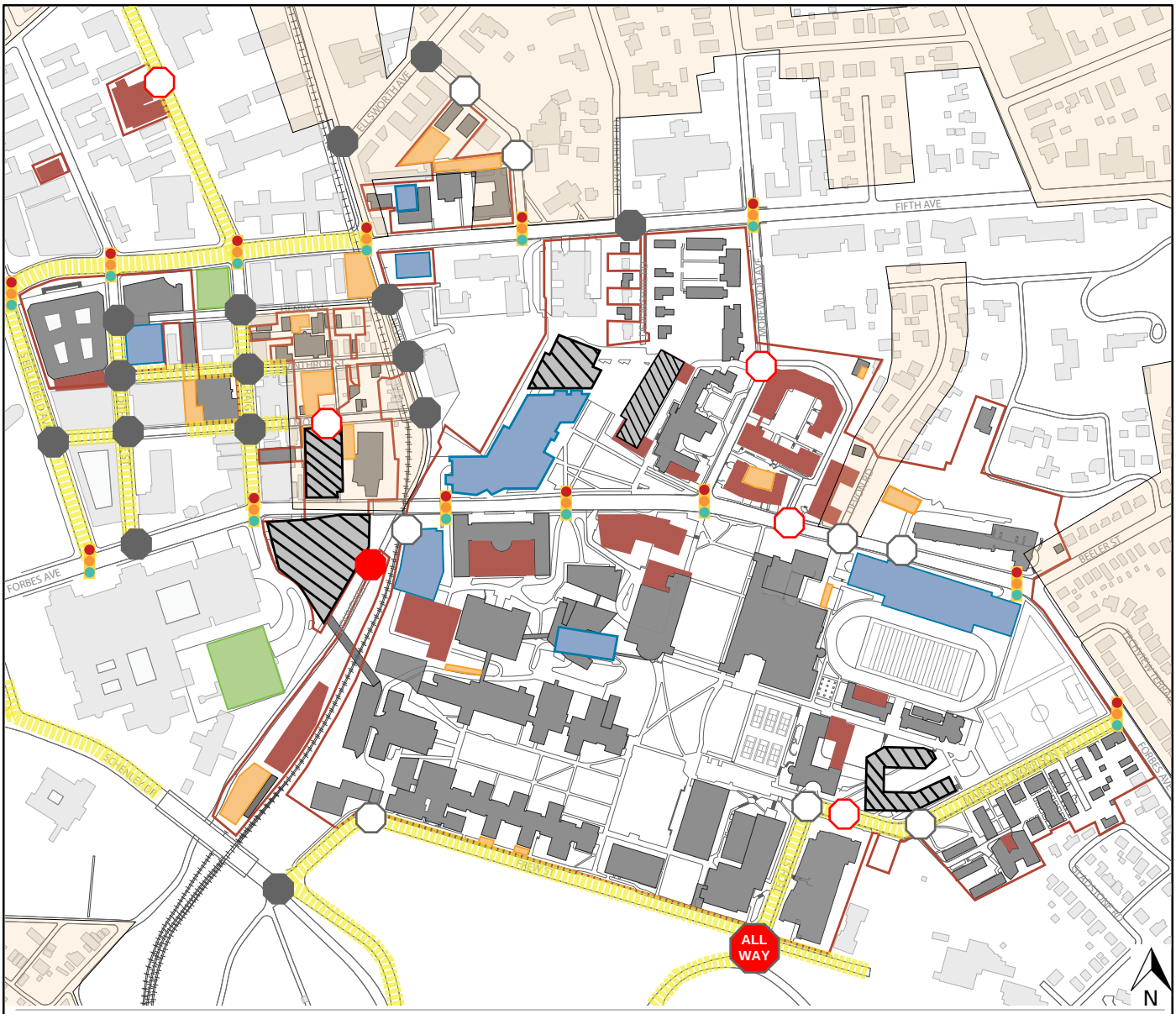
PROJECT
2032 Carnegie Mellon Institutional Master Plan
City of Pittsburgh, Allegheny County

TITLE
Site Plan

SCALE: N.T.S.

DWN. TMW
CHKD. RAK
FIGURE
2.0

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn
PLOTTED: 2/2/2022




- Carnegie Mellon University Property in 2022 IMP
- Carnegie Mellon University Existing Buildings
- Development Sites
- CMU Structured Parking
- CMU Surface Lot
- New CMU Parking
- CMU Leased Parking
- Metered Street Parking
- Residential Permit Parking
- Unsignalized Driveway to Remain
- Unsignalized Driveway to be Modified
- Unsignalized Driveway to be Added
- Unsignalized Intersection to become All Way Stop
- Existing Unsignalized Intersection
- Existing Signalized Intersection

gai consultants

PROJECT NO/CLIENT R200398.00 / Carnegie Mellon University

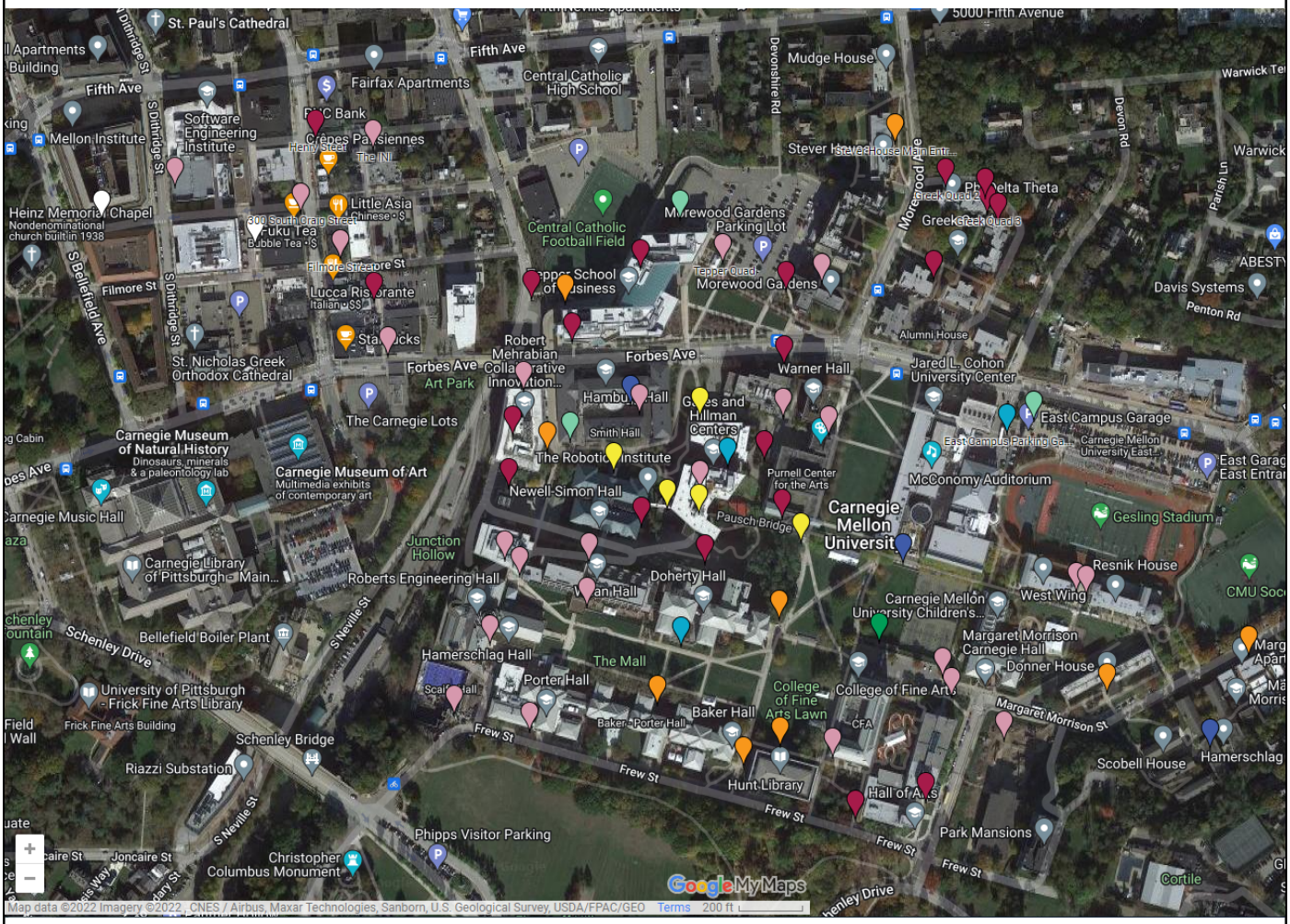
PROJECT
2032 Carnegie Mellon Institutional Master Plan
City of Pittsburgh, Allegheny County

TITLE
# Vehicular Site Access

SCALE: N.T.S.

DWN. TMW
CHKD. RAK
FIGURE
2.1

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn
PLOTTED: 2/2/2022




Source: https://www.cmu.edu/environment/transportation/index.html

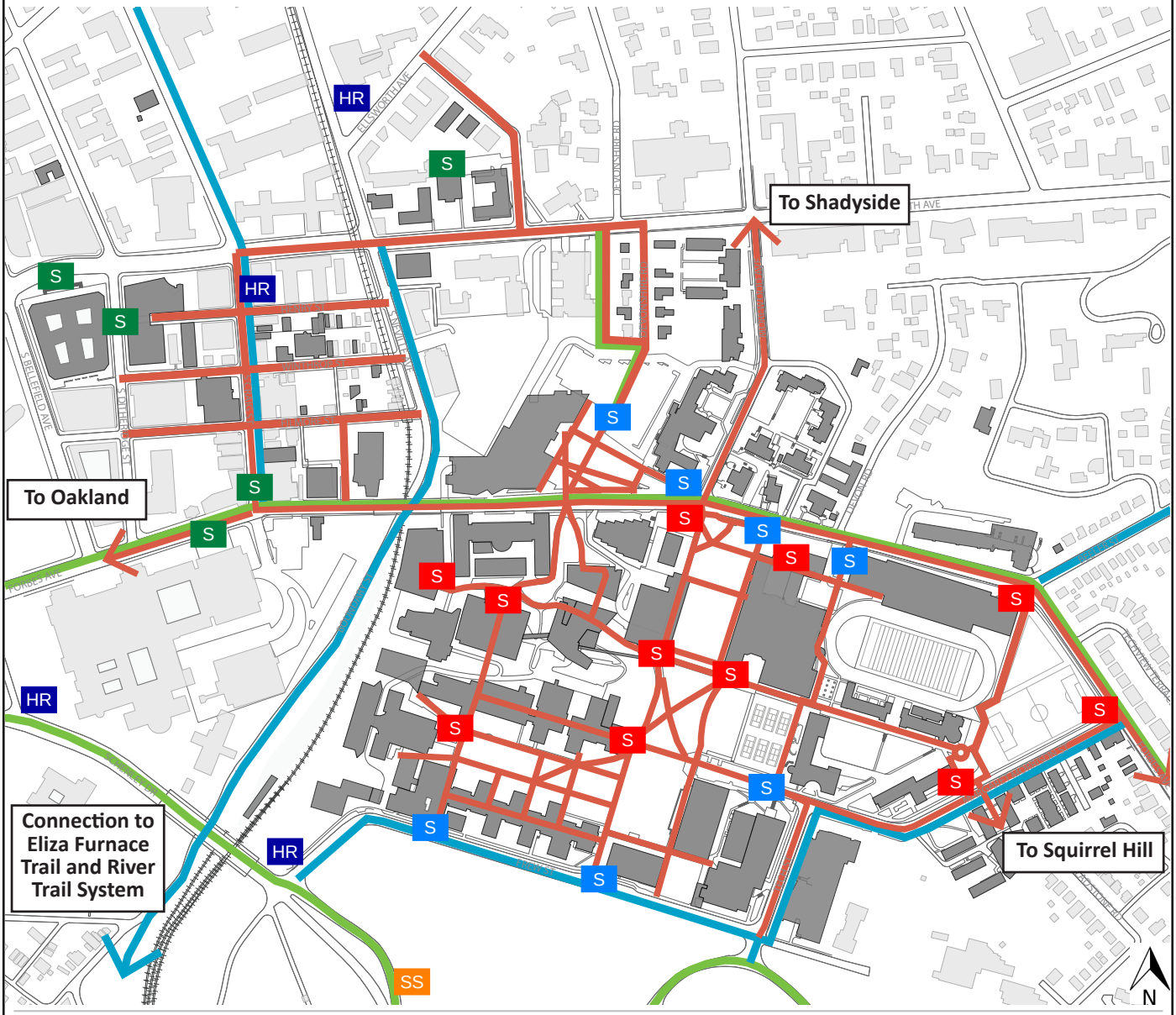
Number of Bike Racks in Each Location

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 10
- Other / No data

| | | | |
|---|---|---|---|
| gai consultants | PROJECT NO/CLIENT R200398.00 / Carnegie Mellon University | | DWN. TMW |
| | PROJECT 2032 Carnegie Mellon Institutional Master Plan City of Pittsburgh, Allegheny County | | CHKD. RAK |
| | TITLE On-campus Bicycle Parking | SCALE: N.T.S. | FIGURE 3.0 |

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn

PLOTTED: 2/2/2022




Carnegie Mellon University Existing Buildings

Major Pedestrian Network

Bike Network

Bike Friendly Streets

HR Healthy Ride (POGOH) Bikeshare Stations (Winter 2022)

SS Existing Spin Scooter Stations (Winter 2022)

S Proposed Scooter Parking (June 2022)

S Proposed Scooter Parking (Fall 2022)

S Proposed Scooter Parking (2023)

gai consultants

PROJECT NO/CLIENT R200398.00 / Carnegie Mellon University

PROJECT
2032 Carnegie Mellon Institutional Master Plan
City of Pittsburgh, Allegheny County

TITLE
# Pedestrian and Bicycle Network

SCALE: N.T.S.

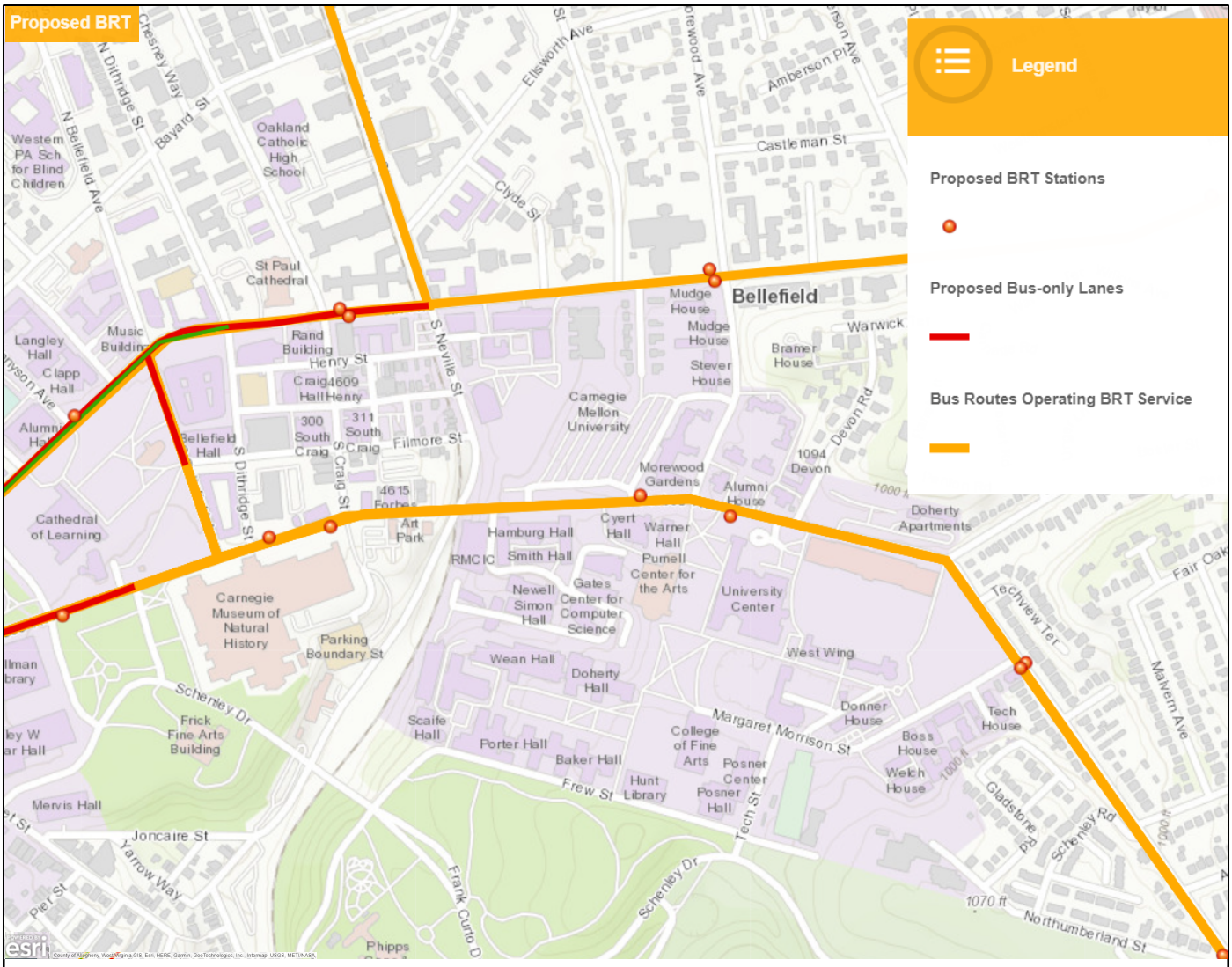
DWN. TMW

CHKD. RAK

FIGURE
# 3.1

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn

PLOTTED: 2/2/2022

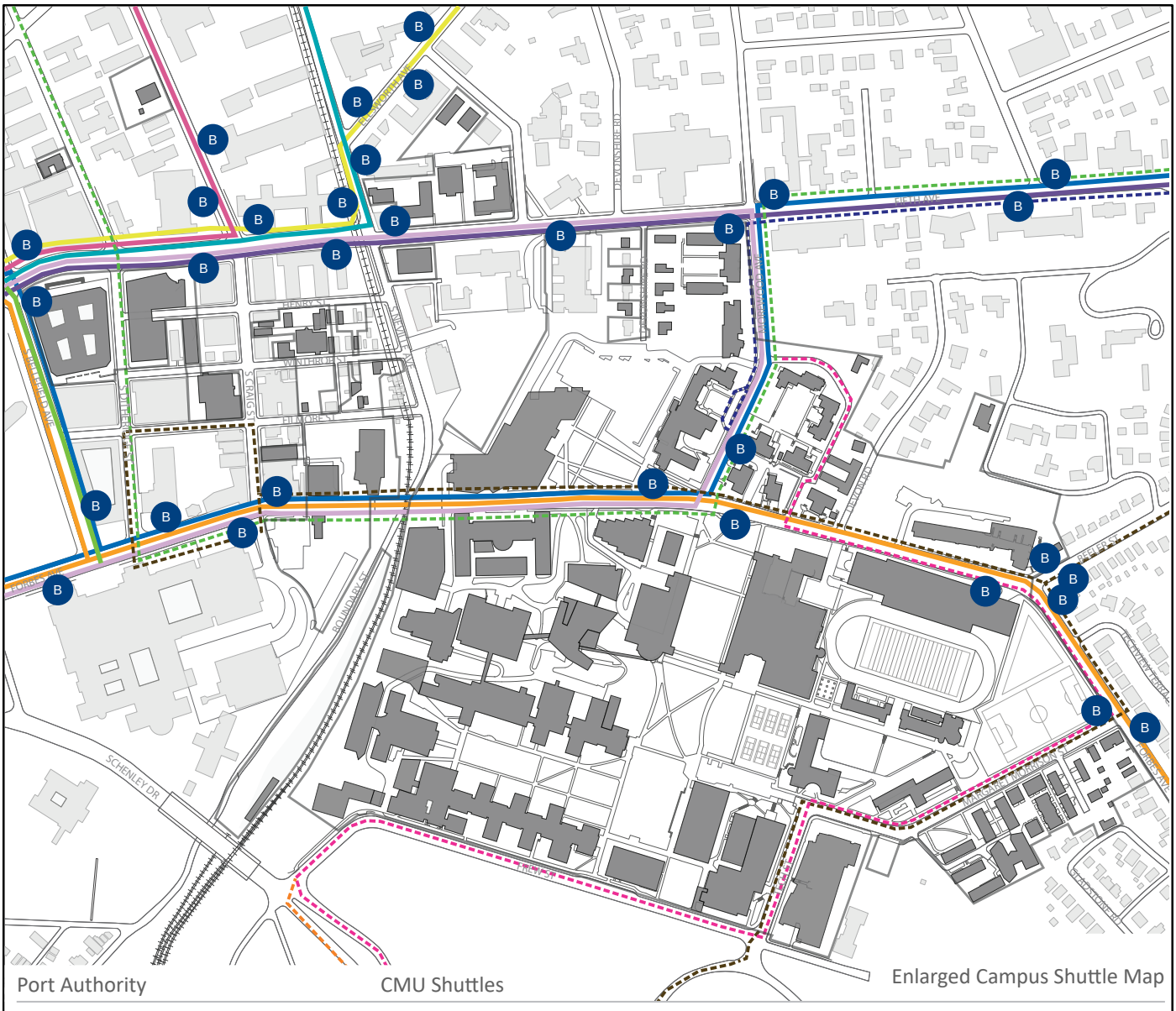



FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn

PLOTTED: 2/2/2022

gai consultants

| | |
|---|---|
| PROJECT NO/CLIENT | R200398.00 / Carnegie Mellon University |
| PROJECT | 2032 Carnegie Mellon Institutional Master Plan<br>City of Pittsburgh, Allegheny County |
| TITLE | Planned BRT Service |
| SCALE: N.T.S. | |
| DWN. | TMW |
| CHKD. | RAK |
| FIGURE | 3.2 |




Enlarged Campus Shuttle Map

| Port Authority | | CMU Shuttles | |
|---|---|---|---|
| P3 (15 min Peak Headway) | | CMU A | (45 min Headway) |
| 28X (30 min Peak Headway) | | CMU B | (1 hr Headway) |
| 58 (1 hr Peak Headway) | | CMU C | (45 min Headway) |
| 61A, B, C, D (15 min Pk Hdwy) | | PTC/MILL 19 | (1 hr Headway) |
| 71B, D (15 min Peak Headway) | | Shuttle Stop | |
| 71A,C/93 (15 min Peak Headway) | | | |
| 75 (25 min Peak Headway) | | | |
| B Bus Stop | | | |

| | |
|---|---|
| PROJECT NO/CLIENT | R200398.00 / Carnegie Mellon University |
| PROJECT | 2032 Carnegie Mellon Institutional Master Plan<br>City of Pittsburgh, Allegheny County |
| TITLE | Transit and Shuttle Network |
| DWN. | TMW |
| CHKD. | RAK |
| FIGURE | 3.3 |
| SCALE: N.T.S. | |

gai consultants

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn

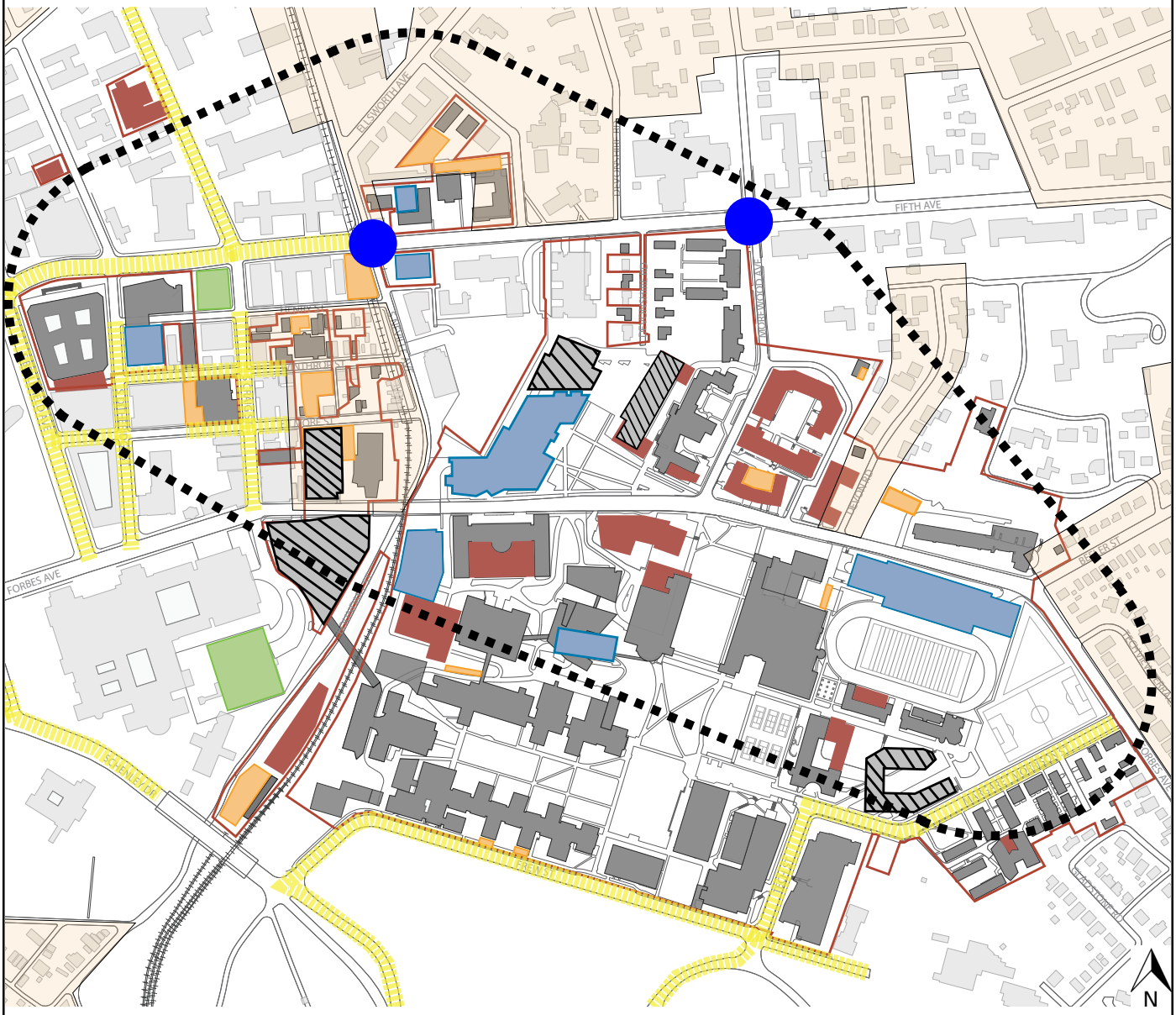
PLOTTED: 2/2/2022

# Campus Commute Patterns

*Each icon represents a total of 100 individuals or parking spaces*
*Demographic Data sourced from www.cmu.edu/ira | Survey Data collected Spring 2018 by Fehr & Peers*

| | | | |
|---|---|---|---|
| gai consultants | PROJECT NO/CLIENT R200398.00 / Carnegie Mellon University | | DWN. TMW |
| | PROJECT 2032 Carnegie Mellon Institutional Master Plan City of Pittsburgh, Allegheny County | | CHKD. RAK |
| | TITLE 2018 Parking Survey Mode Shares | SCALE: N.T.S. | FIGURE 4.0 |

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn
PLOTTED: 2/2/2022




- Area of Influence for Data Collection

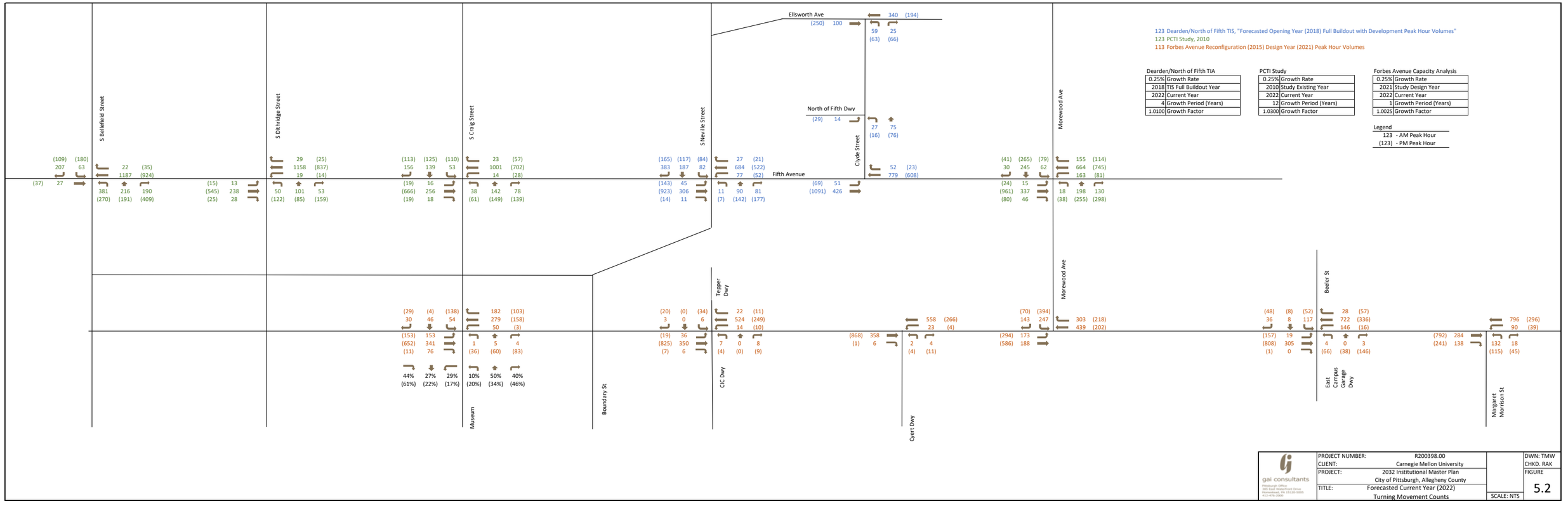
- Intersection Selected for Capacity Analysis

| | | | |
|---|---|---|---|
| gai consultants | PROJECT NO/CLIENT R200398.00 / Carnegie Mellon University | | DWN. TMW |
| | PROJECT 2032 Carnegie Mellon Institutional Master Plan City of Pittsburgh, Allegheny County | | CHKD. RAK |
| | TITLE Traffic Study Area of Impact | SCALE: N.T.S. | FIGURE 5.0 |

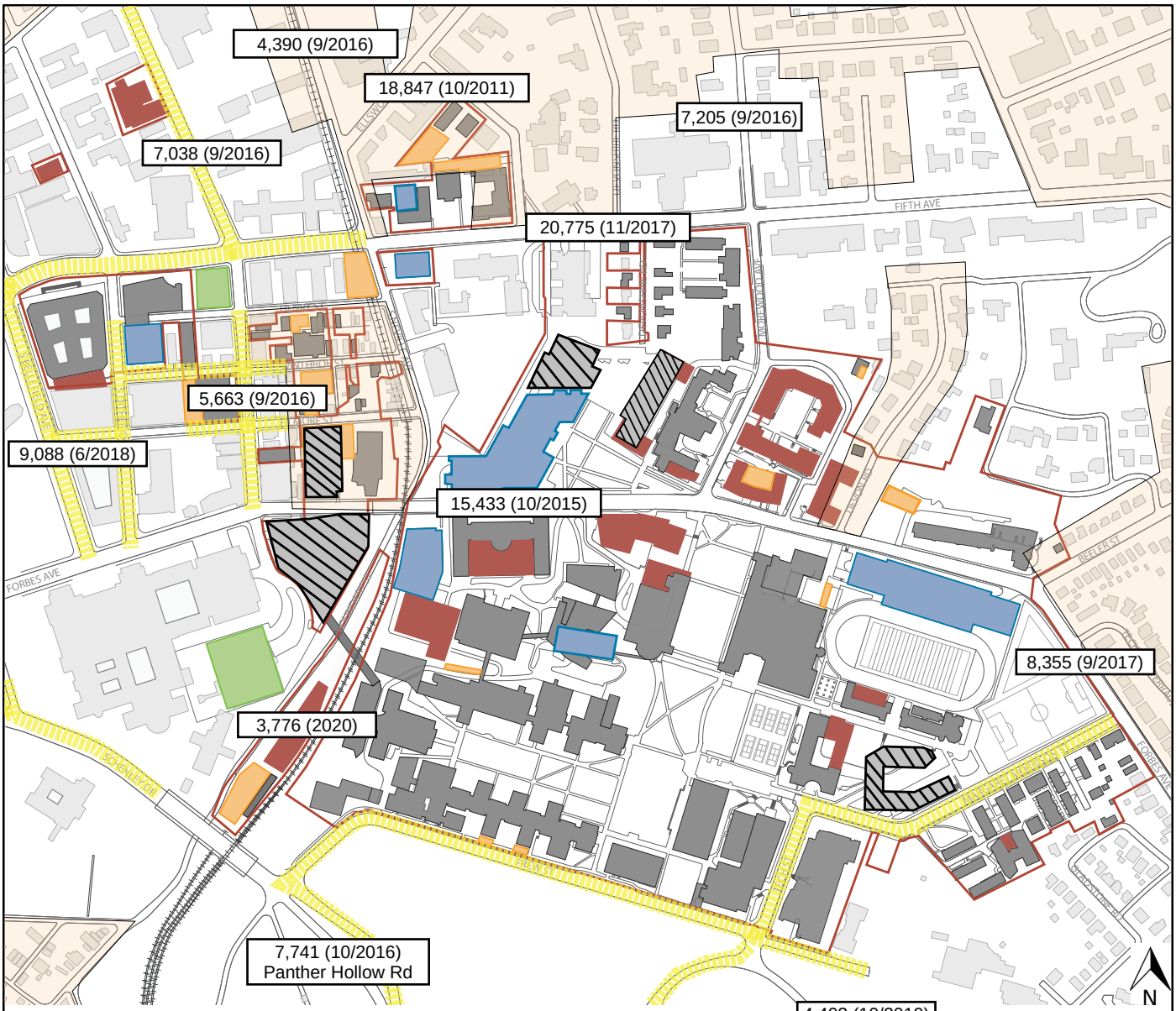
FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn

PLOTTED: 2/2/2022

| | | | |
|---|---|---|---|
| gai consultants<br>Pittsburgh Office<br>385 East Waterfront Drive<br>Homestead, PA 15120-5005<br>412-476-2000 | PROJECT NUMBER: R200398.00<br>CLIENT: Carnegie Mellon University<br>PROJECT: 2032 Institutional Master Plan<br>City of Pittsburgh, Allegheny County<br>TITLE: Turning Movement Counts from Previous Studies | SCALE: NTS | DWN: TMW<br>CHKD. RAK<br>FIGURE<br>5.1 |




| | | | |
|---|---|---|---|
| gai consultants | PROJECT NUMBER: R200398.00 | | DWN: TMW |
| Pittsburgh Office 385 East Waterfront Drive Homestead, PA 15120-5005 412-476-2000 | CLIENT: Carnegie Mellon University | | CHKD. RAK |
| | PROJECT: 2032 Institutional Master Plan<br>City of Pittsburgh, Allegheny County | | FIGURE 5.2 |
| | TITLE: Forecasted Current Year (2022)<br>Turning Movement Counts | SCALE: NTS | |




Source: PennDOT Traffic Information Respository (TIRe)

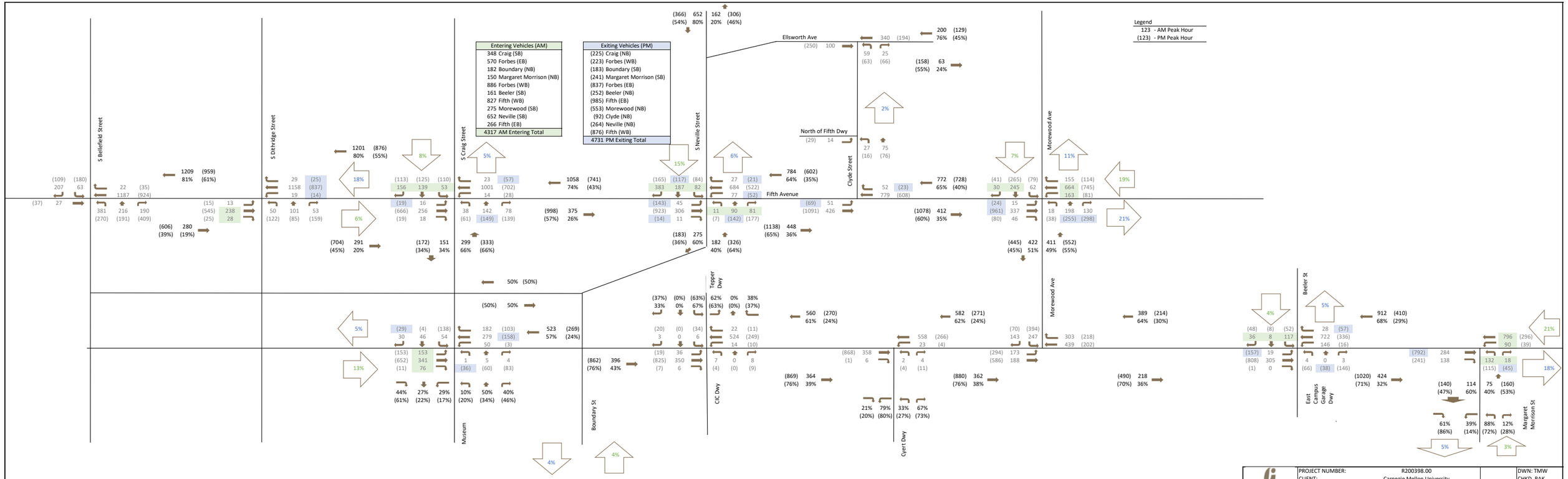
- Carnegie Mellon University Property in 2022 IMP
- Carnegie Mellon University Existing Buildings
- Development Sites
- CMU Structured Parking
- CMU Surface Lot
- New CMU Parking
- CMU Leased Parking
- Metered Street Parking
- Residential Permit Parking
- ADT (Date) — ADT from TIRe (Date Collected)

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn

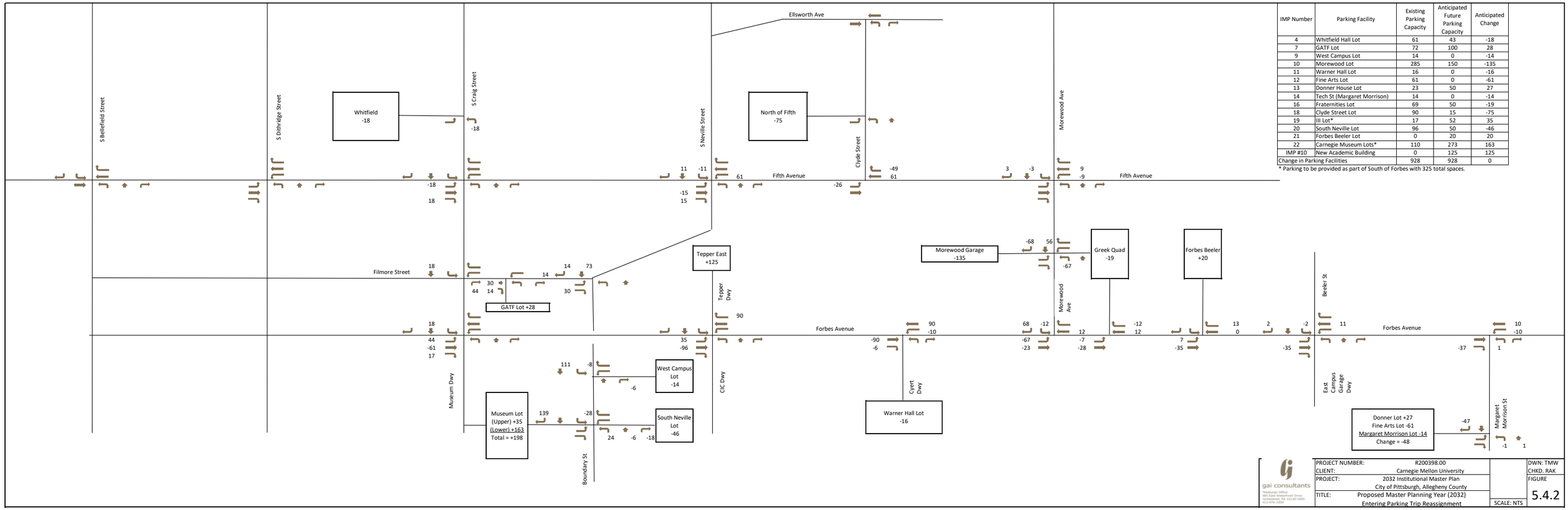
PLOTTED: 2/2/2022

gai consultants

| | |
|---|---|
| PROJECT NO/CLIENT | R200398.00 / Carnegie Mellon University |
| PROJECT | 2032 Carnegie Mellon Institutional Master Plan<br>City of Pittsburgh, Allegheny County |
| TITLE | Existing ADT Volume |
| SCALE: N.T.S. | |
| DWN. | TMW |
| CHKD. | RAK |
| FIGURE | 5.3 |




| | | | |
|---|---|---|---|
| gai consultants | PROJECT NUMBER: | R200398.00 | DWN: TMW |
| | CLIENT: | Carnegie Mellon University | CHKD. RAK |
| | PROJECT: | 2032 Institutional Master Plan<br>City of Pittsburgh, Allegheny County | FIGURE |
| | TITLE: | Existing Traffic Distribution | 5.4.1 |
| | | | SCALE: NTS |

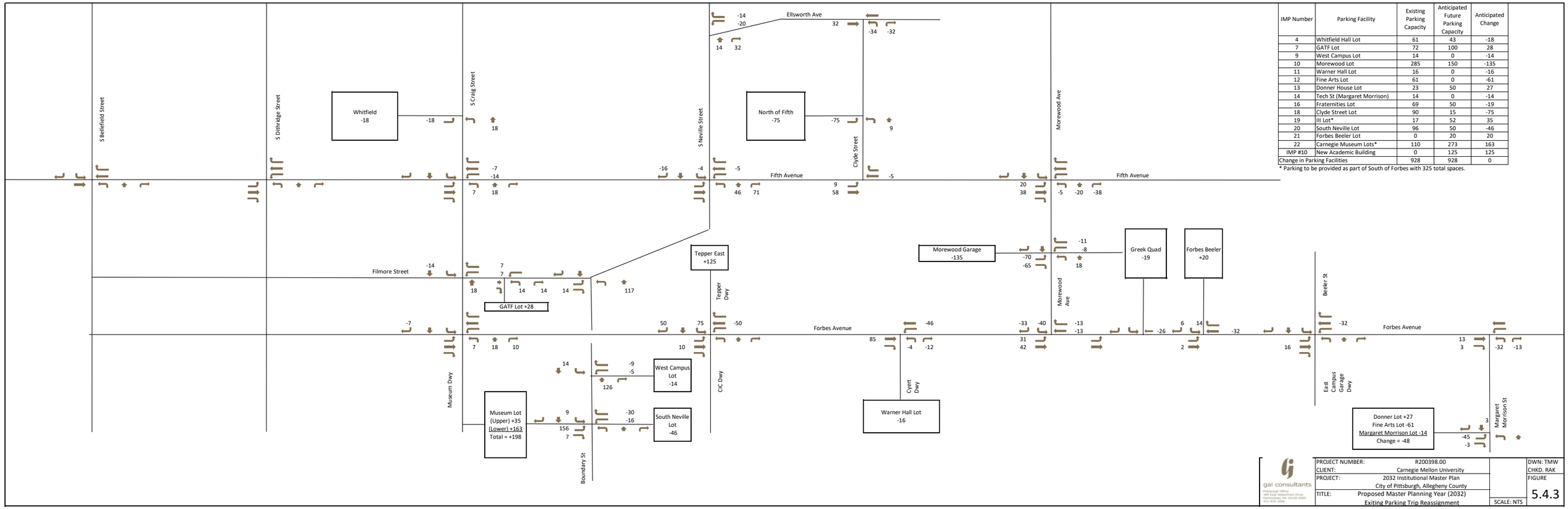



| IMP Number | Parking Facility | Existing Parking Capacity | Anticipated Future Parking Capacity | Anticipated Change |
|---|---|---|---|---|
| 4 | Whitfield Hall Lot | 61 | 43 | -18 |
| 7 | GATF Lot | 72 | 100 | 28 |
| 9 | West Campus Lot | 14 | 0 | -14 |
| 10 | Morewood Lot | 285 | 150 | -135 |
| 11 | Warner Hall Lot | 16 | 0 | -16 |
| 12 | Fine Arts Lot | 61 | 0 | -61 |
| 13 | Donner House Lot | 23 | 50 | 27 |
| 14 | Tech St (Margaret Morrison) | 14 | 0 | -14 |
| 16 | Fraternities Lot | 69 | 50 | -19 |
| 18 | Clyde Street Lot | 90 | 15 | -75 |
| 19 | III Lot* | 17 | 52 | 35 |
| 20 | South Neville Lot | 96 | 50 | -46 |
| 21 | Forbes Beeler Lot | 0 | 20 | 20 |
| 22 | Carnegie Museum Lots* | 110 | 273 | 163 |
| IMP #10 | New Academic Building | 0 | 125 | 125 |
| Change in Parking Facilities | | 928 | 928 | 0 |

* Parking to be provided as part of South of Forbes with 325 total spaces.

gai consultants
Pittsburgh Office
985 East Waterfront Drive
Homestead, PA 15120-5005
412-476-2000

| | | | |
|---|---|---|---|
| PROJECT NUMBER: | R200398.00 | | DWN: TMW |
| CLIENT: | Carnegie Mellon University | | CHKD. RAK |
| PROJECT: | 2032 Institutional Master Plan<br>City of Pittsburgh, Allegheny County | | FIGURE |
| TITLE: | Proposed Master Planning Year (2032)<br>Entering Parking Trip Reassignment | SCALE: NTS | 5.4.2 |




| IMP Number | Parking Facility | Existing Parking Capacity | Anticipated Future Parking Capacity | Anticipated Change |
|---|---|---|---|---|
| 4 | Whitfield Hall Lot | 61 | 43 | -18 |
| 7 | GATF Lot | 72 | 100 | 28 |
| 9 | West Campus Lot | 14 | 0 | -14 |
| 10 | Morewood Lot | 285 | 150 | -135 |
| 11 | Warner Hall Lot | 16 | 0 | -16 |
| 12 | Fine Arts Lot | 61 | 0 | -61 |
| 13 | Donner House Lot | 23 | 50 | 27 |
| 14 | Tech St (Margaret Morrison) | 14 | 0 | -14 |
| 16 | Fraternities Lot | 69 | 50 | -19 |
| 18 | Clyde Street Lot | 90 | 15 | -75 |
| 19 | III Lot* | 17 | 52 | 35 |
| 20 | South Neville Lot | 96 | 50 | -46 |
| 21 | Forbes Beeler Lot | 0 | 20 | 20 |
| 22 | Carnegie Museum Lots* | 110 | 273 | 163 |
| IMP #10 | New Academic Building | 0 | 125 | 125 |
| Change in Parking Facilities | | 928 | 928 | 0 |

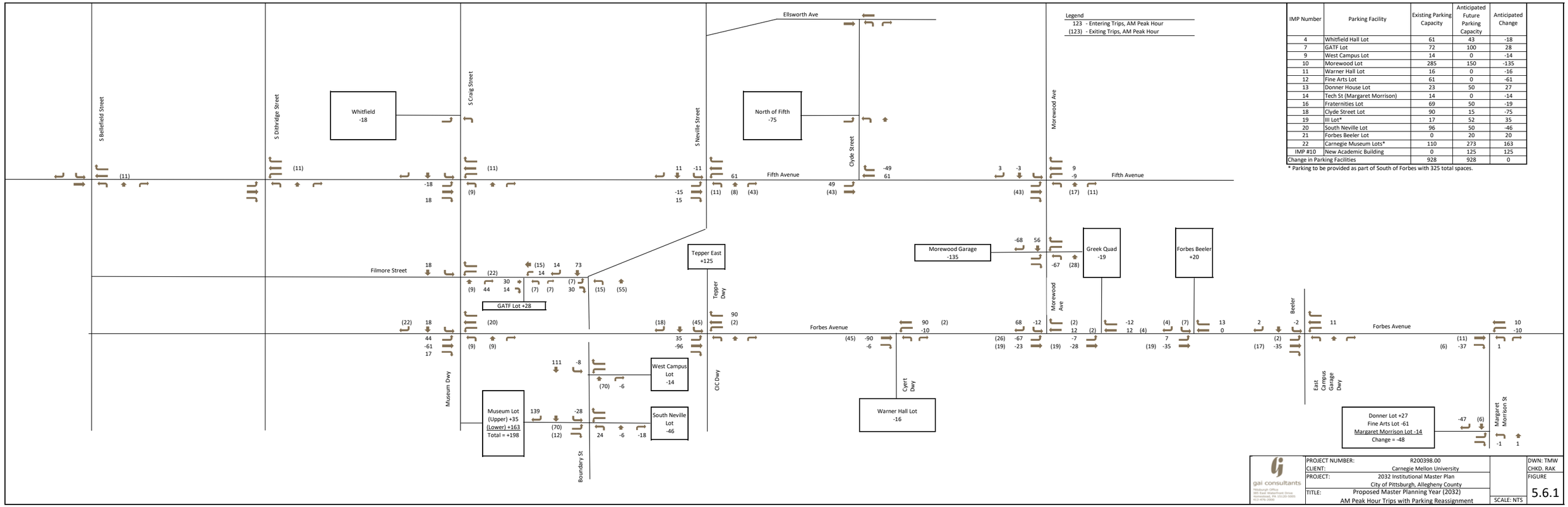
* Parking to be provided as part of South of Forbes with 325 total spaces.

gai consultants
Pittsburgh Office
385 East Waterfront Drive
Homestead, PA 15120-5005
412.476.2000

| | | | |
|---|---|---|---|
| PROJECT NUMBER: | R200398.00 | | DWN: TMW |
| CLIENT: | Carnegie Mellon University | | CHKD. RAK |
| PROJECT: | 2032 Institutional Master Plan<br>City of Pittsburgh, Allegheny County | | FIGURE |
| TITLE: | Proposed Master Planning Year (2032)<br>Exiting Parking Trip Reassignment | SCALE: NTS | 5.4.3 |

gai consultants
Pittsburgh Office
385 East Waterfront Drive
Homestead, PA 15120-5005
412-476-2000

| | | |
|---|---|---|
| PROJECT NUMBER: | R200398.00 | DWN: TMW |
| CLIENT: | Carnegie Mellon University | CHKD. RAK |
| PROJECT: | 2032 Institutional Master Plan<br>City of Pittsburgh, Allegheny County | FIGURE |
| TITLE: | Forecasted Master Planning Year (2032)<br>Turning Movement Counts without Development | 5.5 |
| | | SCALE: NTS |



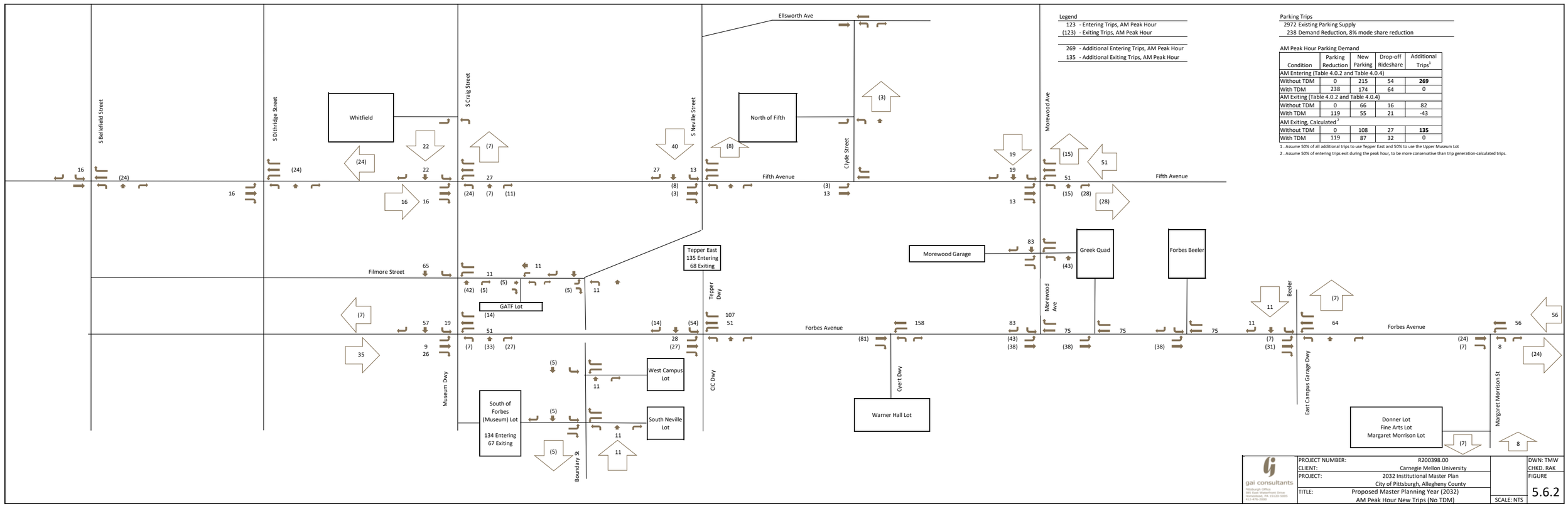

| IMP Number | Parking Facility | Existing Parking Capacity | Anticipated Future Parking Capacity | Anticipated Change |
|---|---|---|---|---|
| 4 | Whitfield Hall Lot | 61 | 43 | -18 |
| 7 | GATF Lot | 72 | 100 | 28 |
| 9 | West Campus Lot | 14 | 0 | -14 |
| 10 | Morewood Lot | 285 | 150 | -135 |
| 11 | Warner Hall Lot | 16 | 0 | -16 |
| 12 | Fine Arts Lot | 61 | 0 | -61 |
| 13 | Donner House Lot | 23 | 50 | 27 |
| 14 | Tech St (Margaret Morrison) | 14 | 0 | -14 |
| 16 | Fraternities Lot | 69 | 50 | -19 |
| 18 | Clyde Street Lot | 90 | 15 | -75 |
| 19 | III Lot* | 17 | 52 | 35 |
| 20 | South Neville Lot | 96 | 50 | -46 |
| 21 | Forbes Beeler Lot | 0 | 20 | 20 |
| 22 | Carnegie Museum Lots* | 110 | 273 | 163 |
| IMP #10 | New Academic Building | 0 | 125 | 125 |
| Change in Parking Facilities | | 928 | 928 | 0 |

* Parking to be provided as part of South of Forbes with 325 total spaces.

gai consultants
Pittsburgh Office
385 East Waterfront Drive
Homestead, PA 15120-5005
412-476-2000

| | |
|---|---|
| PROJECT NUMBER: | R200398.00 |
| CLIENT: | Carnegie Mellon University |
| PROJECT: | 2032 Institutional Master Plan<br>City of Pittsburgh, Allegheny County |
| TITLE: | Proposed Master Planning Year (2032)<br>AM Peak Hour Trips with Parking Reassignment |

DWN: TMW
CHKD. RAK
FIGURE
5.6.1
SCALE: NTS




Legend

| | |
|---|---|
| 123 | - Entering Trips, AM Peak Hour |
| (123) | - Exiting Trips, AM Peak Hour |
| 269 | - Additional Entering Trips, AM Peak Hour |
| 135 | - Additional Exiting Trips, AM Peak Hour |

Parking Trips

2972 Existing Parking Supply
238 Demand Reduction, 8% mode share reduction

AM Peak Hour Parking Demand

| Condition | Parking Reduction | New Parking | Drop-off Rideshare | Additional Trips[1] |
|---|---|---|---|---|
| AM Entering (Table 4.0.2 and Table 4.0.4) | | | | |
| Without TDM | 0 | 215 | 54 | **269** |
| With TDM | 238 | 174 | 64 | 0 |
| AM Exiting (Table 4.0.2 and Table 4.0.4) | | | | |
| Without TDM | 0 | 66 | 16 | 82 |
| With TDM | 119 | 55 | 21 | -43 |
| AM Exiting, Calculated[2] | | | | |
| Without TDM | 0 | 108 | 27 | **135** |
| With TDM | 119 | 87 | 32 | 0 |

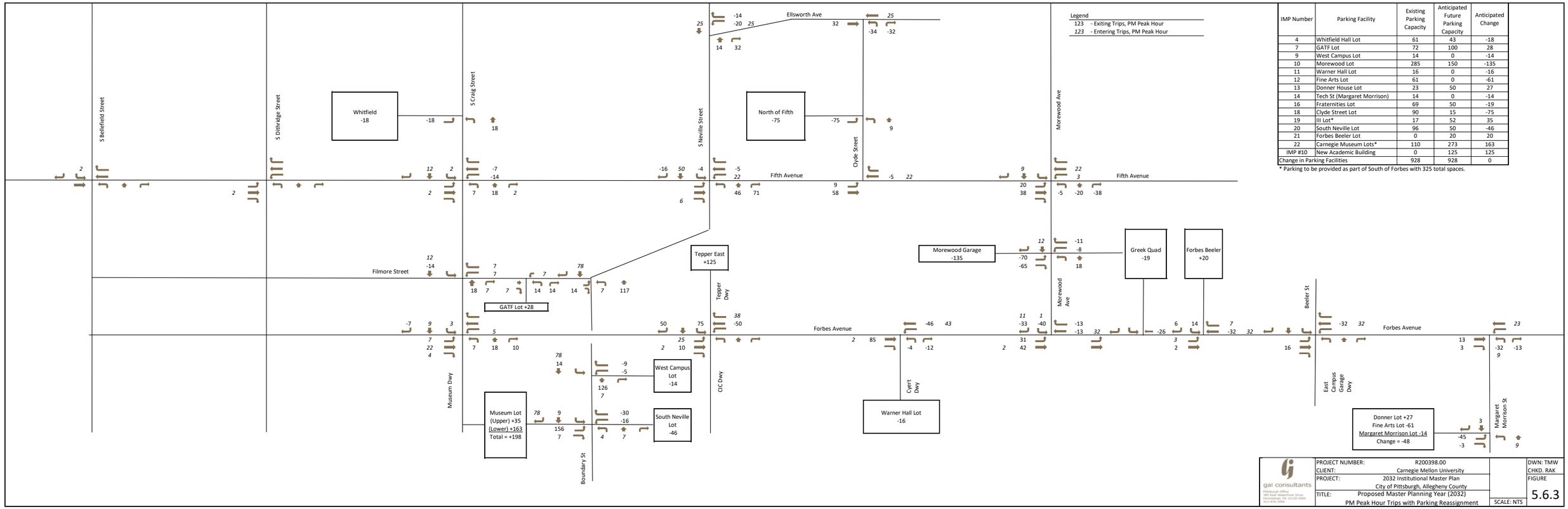
1 . Assume 50% of all additional trips to use Tepper East and 50% to use the Upper Museum Lot

2 . Assume 50% of entering trips exit during the peak hour, to be more conservative than trip generation-calculated trips.

gai consultants
Pittsburgh Office
385 East Waterfront Drive
Homestead, PA 15120-5005
412-476-2000

| | |
|---|---|
| PROJECT NUMBER: | R200398.00 |
| CLIENT: | Carnegie Mellon University |
| PROJECT: | 2032 Institutional Master Plan<br>City of Pittsburgh, Allegheny County |
| TITLE: | Proposed Master Planning Year (2032)<br>AM Peak Hour New Trips (No TDM) |
| SCALE: NTS | |

DWN: TMW
CHKD. RAK
FIGURE
5.6.2

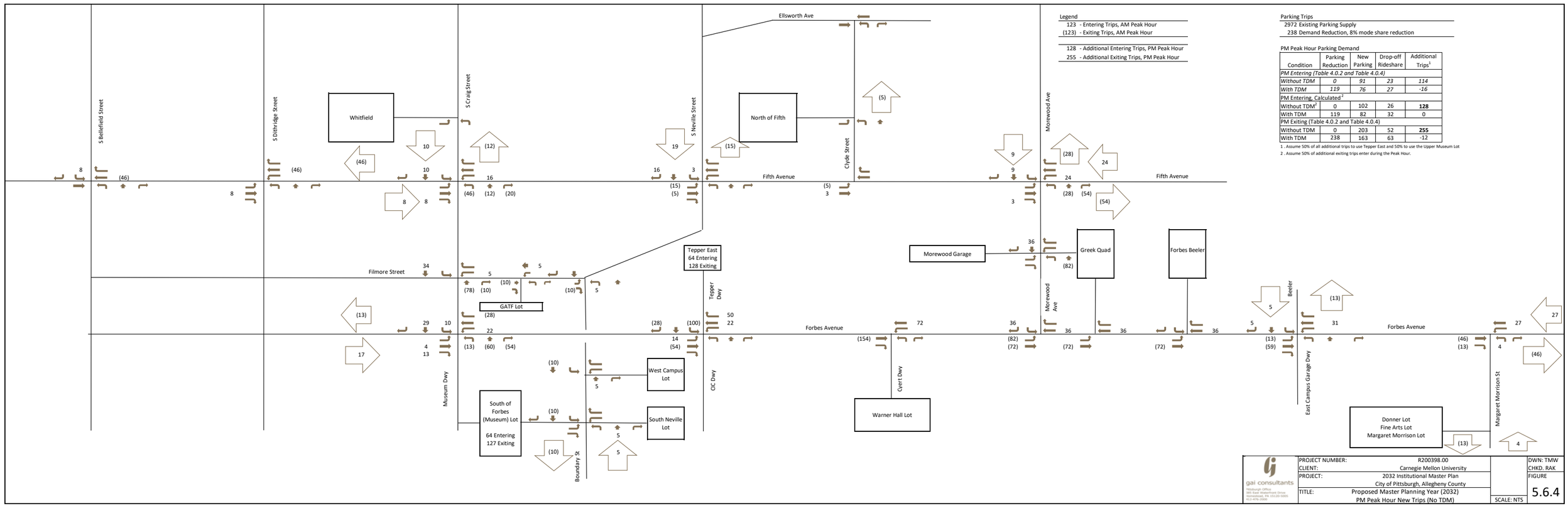



| IMP Number | Parking Facility | Existing Parking Capacity | Anticipated Future Parking Capacity | Anticipated Change |
|---|---|---|---|---|
| 4 | Whitfield Hall Lot | 61 | 43 | -18 |
| 7 | GATF Lot | 72 | 100 | 28 |
| 9 | West Campus Lot | 14 | 0 | -14 |
| 10 | Morewood Lot | 285 | 150 | -135 |
| 11 | Warner Hall Lot | 16 | 0 | -16 |
| 12 | Fine Arts Lot | 61 | 0 | -61 |
| 13 | Donner House Lot | 23 | 50 | 27 |
| 14 | Tech St (Margaret Morrison) | 14 | 0 | -14 |
| 16 | Fraternities Lot | 69 | 50 | -19 |
| 18 | Clyde Street Lot | 90 | 15 | -75 |
| 19 | III Lot* | 17 | 52 | 35 |
| 20 | South Neville Lot | 96 | 50 | -46 |
| 21 | Forbes Beeler Lot | 0 | 20 | 20 |
| 22 | Carnegie Museum Lots* | 110 | 273 | 163 |
| IMP #10 | New Academic Building | 0 | 125 | 125 |
| Change in Parking Facilities | | 928 | 928 | 0 |

* Parking to be provided as part of South of Forbes with 325 total spaces.

gai consultants
Pittsburgh Office
385 East Waterfront Drive
Homestead, PA 15120-5005
412-476-2000

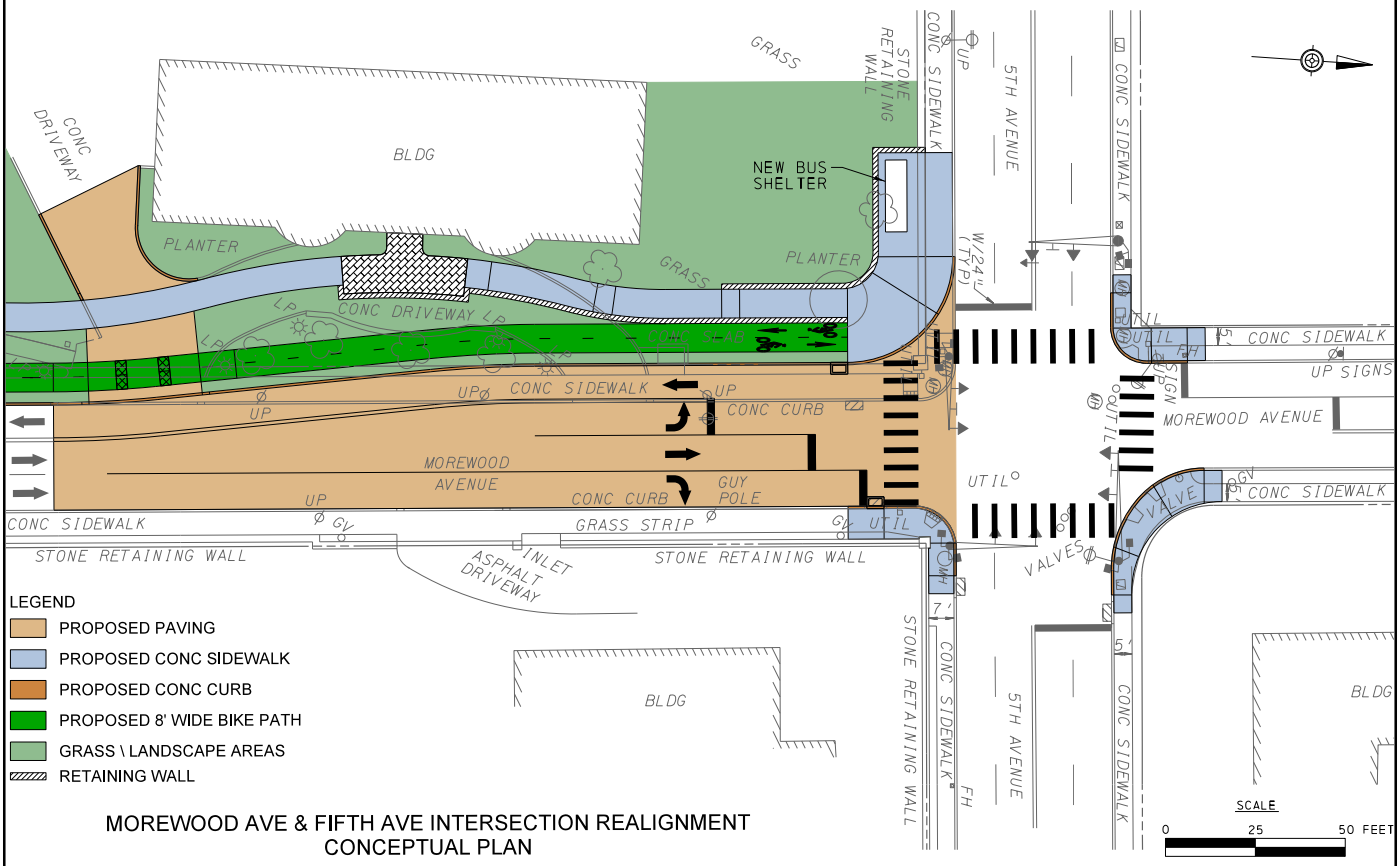
| | |
|---|---|
| PROJECT NUMBER: | R200398.00 |
| CLIENT: | Carnegie Mellon University |
| PROJECT: | 2032 Institutional Master Plan<br>City of Pittsburgh, Allegheny County |
| TITLE: | Proposed Master Planning Year (2032)<br>PM Peak Hour Trips with Parking Reassignment |
| SCALE: NTS | |
| DWN: TMW | |
| CHKD. RAK | |
| FIGURE | 5.6.3 |


Legend
123 - Entering Trips, AM Peak Hour
(123) - Exiting Trips, AM Peak Hour
128 - Additional Entering Trips, PM Peak Hour
255 - Additional Exiting Trips, PM Peak Hour
Parking Trips
2972 Existing Parking Supply
238 Demand Reduction, 8% mode share reduction
PM Peak Hour Parking Demand
Condition | Parking Reduction | New Parking | Drop-off Rideshare | Additional Trips[1]
PM Entering (Table 4.0.2 and Table 4.0.4)
Without TDM | 0 | 91 | 23 | 114
With TDM | 119 | 76 | 27 | -16
PM Entering, Calculated[2]
Without TDM[2] | 0 | 102 | 26 | 128
With TDM | 119 | 82 | 32 | 0
PM Exiting (Table 4.0.2 and Table 4.0.4)
Without TDM | 0 | 203 | 52 | 255
With TDM | 238 | 163 | 63 | -12
1 . Assume 50% of all additional trips to use Tepper East and 50% to use the Upper Museum Lot
2 . Assume 50% of additional exiting trips enter during the Peak Hour.
S Bellefield Street
S Dithridge Street
S Craig Street
S Neville Street
Morewood Ave
Ellsworth Ave
Fifth Avenue
Forbes Avenue
Filmore Street
Clyde Street
Whitfield
North of Fifth
Tepper East
64 Entering
128 Exiting
Tepper Dwy
GATF Lot
Morewood Garage
Greek Quad
Forbes Beeler
Beeler
Museum Dwy
West Campus Lot
South of Forbes (Museum) Lot
64 Entering
127 Exiting
South Neville Lot
Boundary St
CIC Dwy
Cvert Dwy
Warner Hall Lot
East Campus Garage Dwy
Donner Lot
Fine Arts Lot
Margaret Morrison Lot
Margaret Morrison St
PROJECT NUMBER: R200398.00
CLIENT: Carnegie Mellon University
PROJECT: 2032 Institutional Master Plan
City of Pittsburgh, Allegheny County
TITLE: Proposed Master Planning Year (2032)
PM Peak Hour New Trips (No TDM)
SCALE: NTS
DWN: TMW
CHKD. RAK
FIGURE
5.6.4

| | |
|---|---|
| PROJECT NUMBER: | R200398.00 |
| CLIENT: | Carnegie Mellon University |
| PROJECT: | 2032 Institutional Master Plan<br>City of Pittsburgh, Allegheny County |
| TITLE: | Forecasted Master Planning Year (2032)<br>Maximum Trip Conditions (50% Buildout, No TDM) |
| SCALE: NTS | |
| DWN: TMW | |
| CHKD. RAK | |
| FIGURE | 5.6.5 |

gai consultants
Pittsburgh Office
385 East Waterfront Drive
Homestead, PA 15120-5005
412-476-2000

| | | | |
|---|---|---|---|
| gai consultants | PROJECT NUMBER: R200398.00 | | DWN: TMW |
| Pittsburgh Office<br>300 East Waterfront Drive<br>Homestead, PA 15120-5005<br>412-476-2000 | CLIENT: Carnegie Mellon University | | CHKD. RAK |
| | PROJECT: 2032 Institutional Master Plan<br>City of Pittsburgh, Allegheny County | | FIGURE |
| | TITLE: Forecasted Master Planning Year (2032)<br>Anticipated Conditions (50% Buildout & TDM) | SCALE: NTS | 5.6.6 |



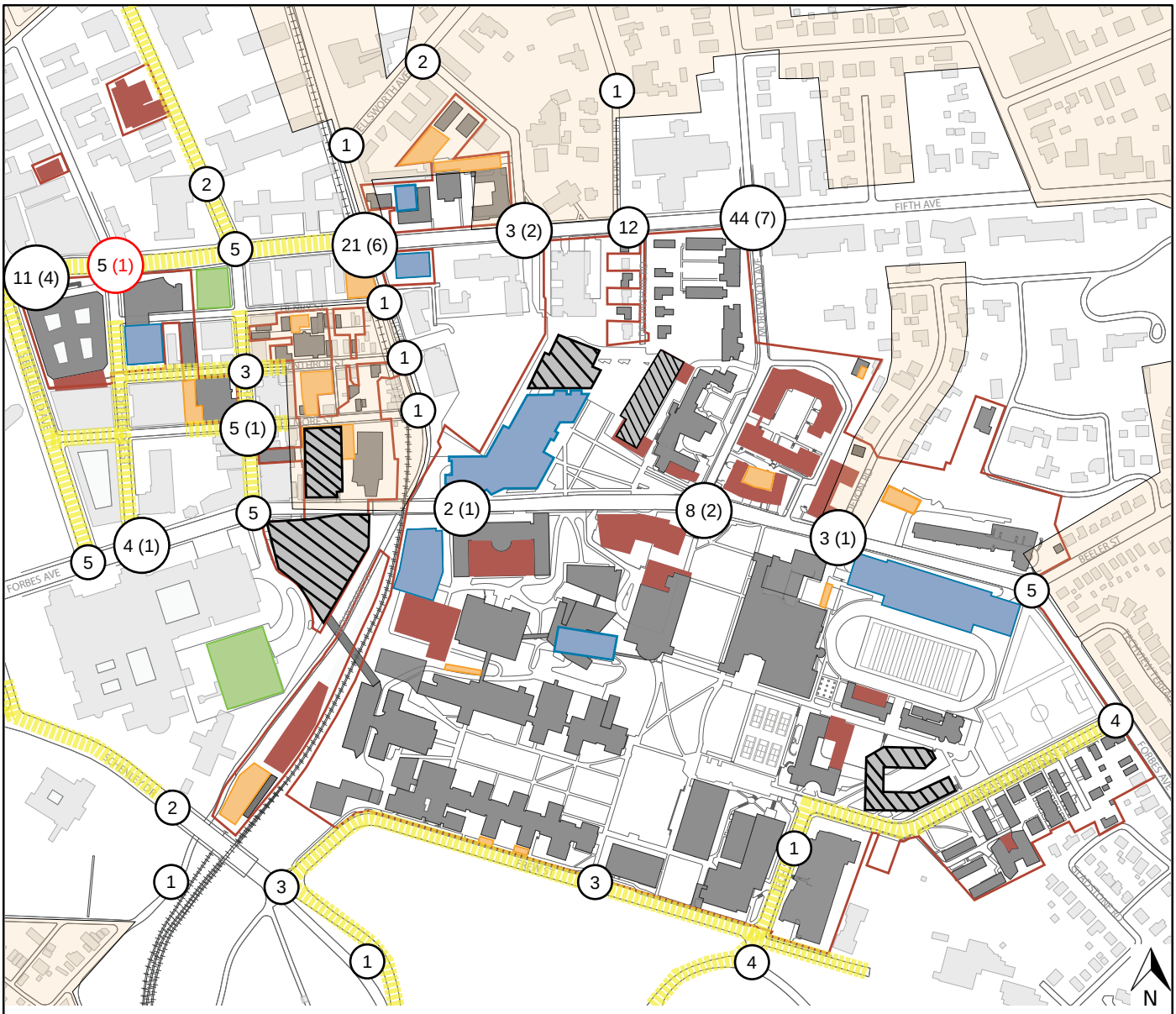

MOREWOOD AVE & FIFTH AVE INTERSECTION REALIGNMENT
CONCEPTUAL PLAN

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn

PLOTTED: 2/2/2022

gai consultants

| | |
|---|---|
| PROJECT NO/CLIENT | R200398.00 / Carnegie Mellon University |
| PROJECT | 2032 Carnegie Mellon Institutional Master Plan<br>City of Pittsburgh, Allegheny County |
| TITLE | Fifth Avenue and Morewood Avenue<br>Northbound Approach Realignment |
| DWN. | TMW |
| CHKD. | RAK |
| FIGURE | 5.7 |




Data represents reportable crashes from January 2016 through December 2020

Source: Pennsylvania Crash Information Tool

Legend

1 (1) - Number of Crashes (Pedestrian Crashes)

- Fatal Crash

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn

PLOTTED: 2/2/2022

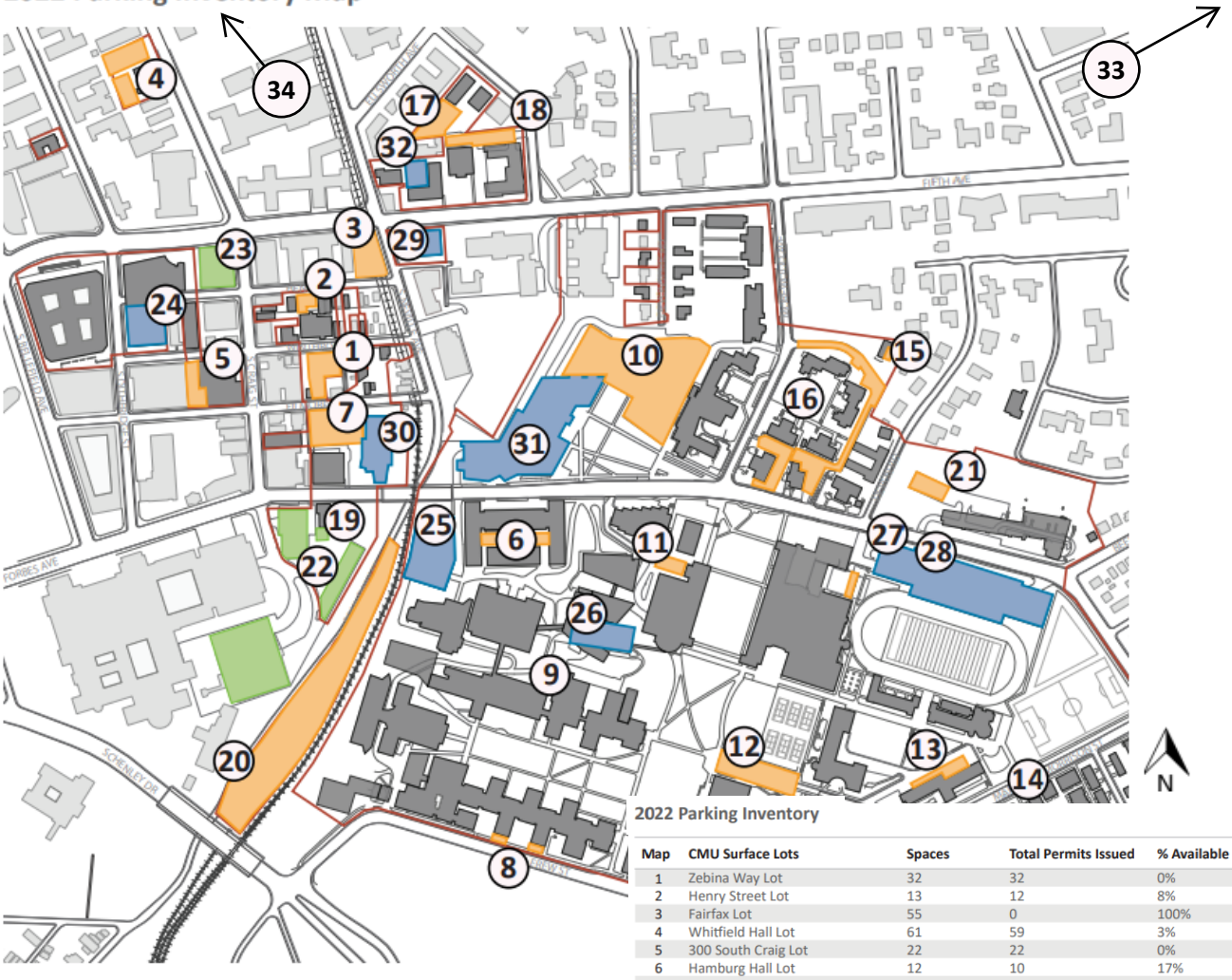
gai consultants

| | |
|---|---|
| PROJECT NO/CLIENT | R200398.00 / Carnegie Mellon University |
| PROJECT | 2032 Carnegie Mellon Institutional Master Plan<br>City of Pittsburgh, Allegheny County |
| TITLE | Summary Crash Locations (5 Years) |

SCALE: N.T.S.

| | |
|---|---|
| DWN. | TMW |
| CHKD. | RAK |
| FIGURE | 5.8 |

## 2022 Parking Inventory Map




## Parking Options around Carnegie Mellon University

- CMU Garage
- CMU Surface Lot
- CMU Leased Parking

**Total Existing Parking Inventory: 2,972**

### 2022 Parking Inventory

| Map | CMU Surface Lots | Spaces | Total Permits Issued | % Available |
|---|---|---|---|---|
| 1 | Zebina Way Lot | 32 | 32 | 0% |
| 2 | Henry Street Lot | 13 | 12 | 8% |
| 3 | Fairfax Lot | 55 | 0 | 100% |
| 4 | Whitfield Hall Lot | 61 | 59 | 3% |
| 5 | 300 South Craig Lot | 22 | 22 | 0% |
| 6 | Hamburg Hall Lot | 12 | 10 | 17% |
| 7 | GATF Lot | 72 | 72 | 0% |
| 8 | Frew Street Meters | 10 | 10 | 0% |
| 9 | West Campus Lot | 14 | 9 | 36% |
| 10 | Morewood Lot | 285 | 288 | -1% |
| 11 | Warner Hall Lot | 16 | 16 | 0% |
| 12 | Fine Arts Lot | 61 | 54 | 12% |
| 13 | Donner House Lot | 23 | 23 | 0% |
| 14 | Margaret Morrison St | 14 | 7 | 50% |
| 15 | Bramer House Lot | 5 | 5 | 0% |
| 16 | Fraternities Lot | 69 | 71 | -3% |
| 17 | Fifth and Neville Lot | 16 | 15 | 6% |
| 18 | Clyde Street Lot | 90 | 81 | 10% |
| 19 | III Lot | 17 | 16 | 6% |
| 20 | South Neville | 96 | 95 | 1% |
| 21 | Forbes Beeler Lot | | n/a | 20 available in 2023 |
| 22 | Carnegie Museum Lots | 110 | 110 | 0% |

| Map | CMU Garages | Spaces | Total Permits Issued | % Available |
|---|---|---|---|---|
| 23 | 5th and Craig Street Garage | 40 | 5 | 13% |
| 24 | Dithridge Garage | 370 | 388 | -5% |
| 25 | CIC Garage | 226 | 196 | 13% |
| 26 | Gates Garage | 138 | 142 | -3% |
| 27 | East Campus Garage | 780 | 633 | 19% |
| 28 | East Campus Garage Motorcycle | 14 | 14 | 0% |
| 29 | Residence at Fifth Garage | 37 | 36 | 3% |
| 30 | TCS Garage | 35 | 0 | 100% |
| 31 | Tepper Quad | 126 | 95 | 25% |
| 32 | Fifth Neville Garage | 29 | 0 | 100% |

| Map | CMU Shuttle Lots | Spaces | Total Permits Issued | % Available |
|---|---|---|---|---|
| 33 | 6555 Penn Ave | 54 | 32 | 59% |
| 34 | Melwood | 30 | TBD | TBD |

gai consultants

PROJECT NO/CLIENT R200398.00 / Carnegie Mellon University

PROJECT
2032 Carnegie Mellon Institutional Master Plan
City of Pittsburgh, Allegheny County

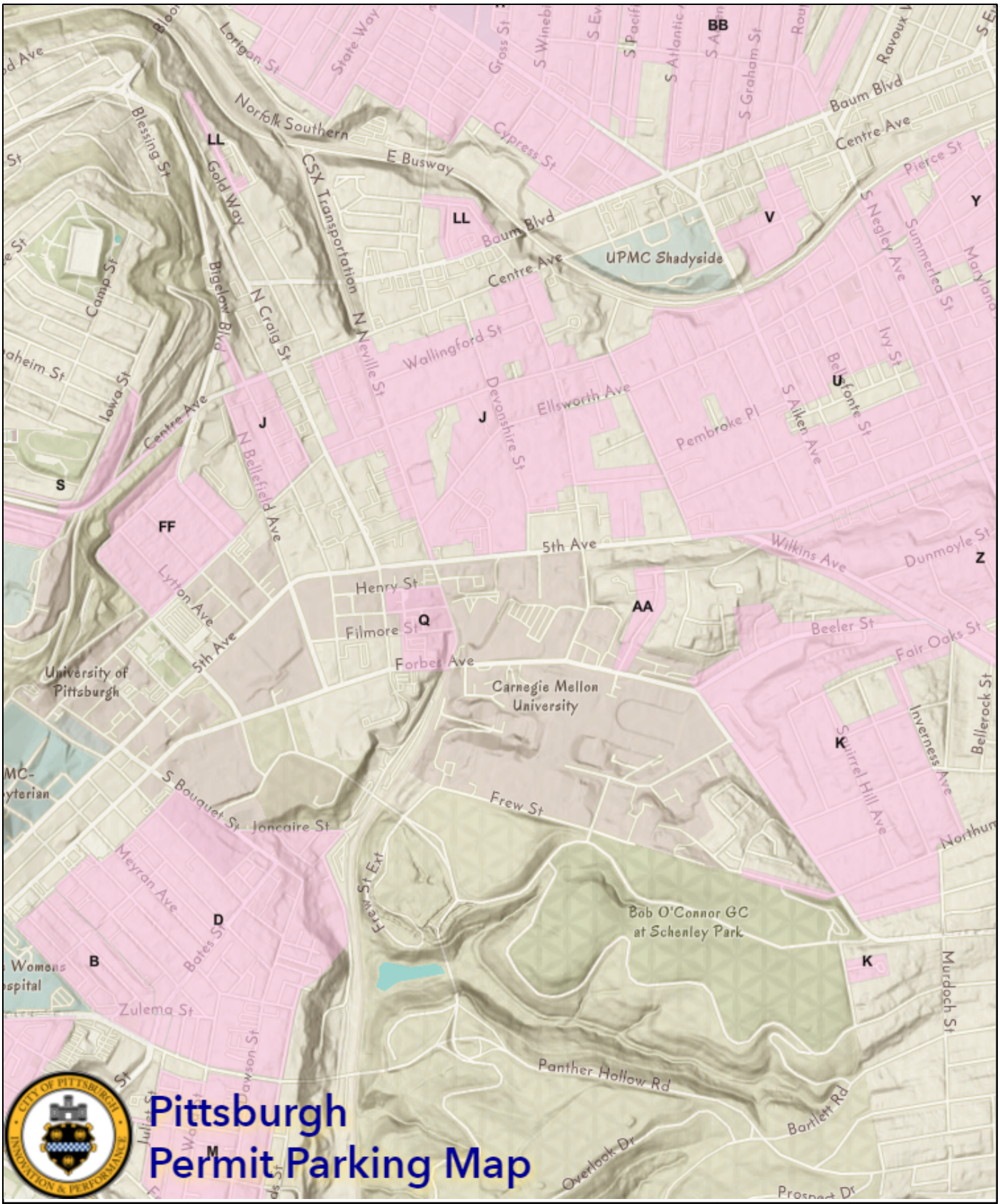
TITLE
Existing Parking Inventory

SCALE: N.T.S.

DWN. TMW
CHKD. RAK

FIGURE
6.0

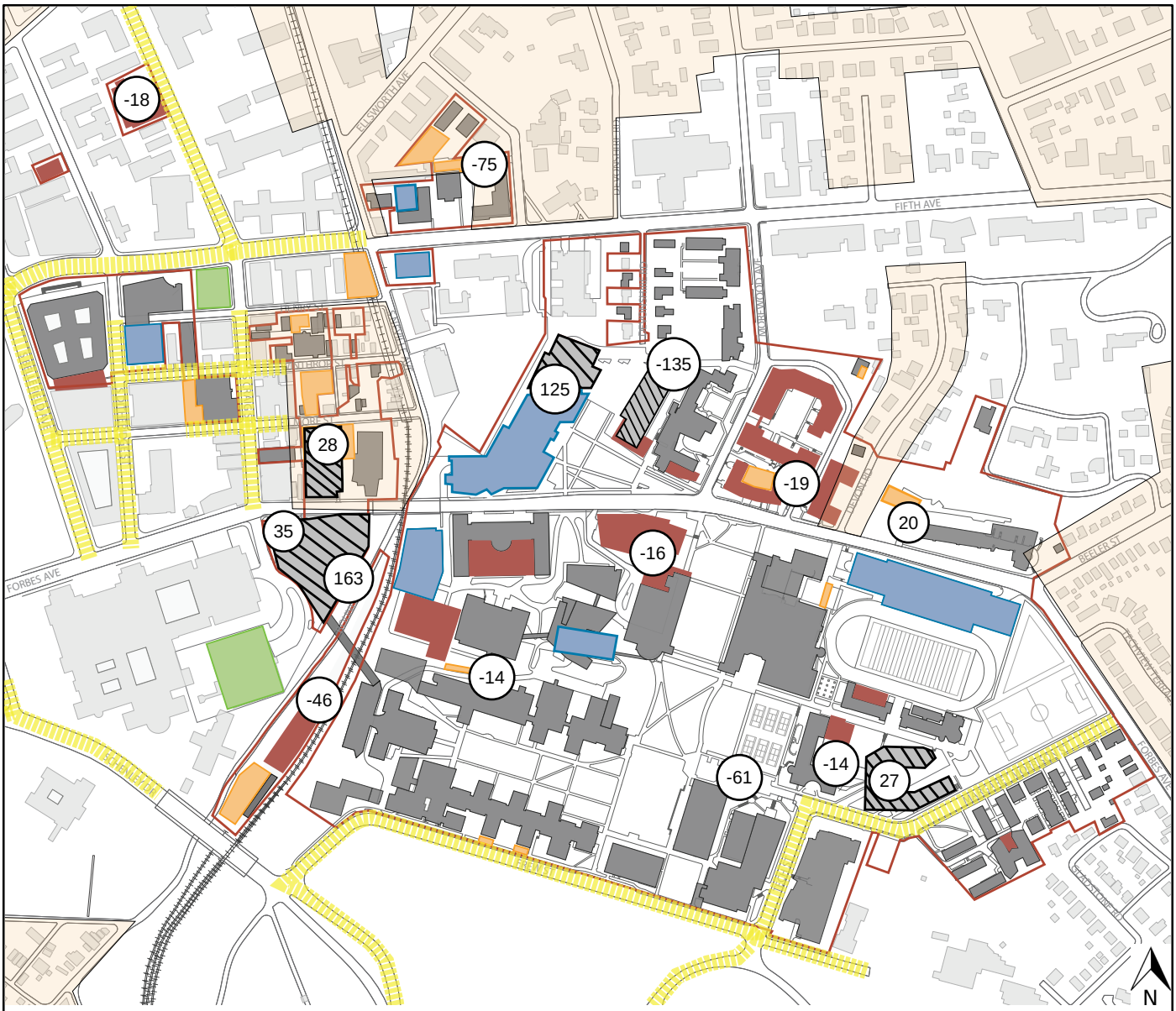
FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn
PLOTTED: 2/21/2022




| | | | |
|---|---|---|---|
| gai consultants | PROJECT NO/CLIENT R200398.00 / Carnegie Mellon University | | DWN. TMW |
| | PROJECT 2032 Carnegie Mellon Institutional Master Plan City of Pittsburgh, Allegheny County | | CHKD. RAK |
| | TITLE Existing Residential Permit Parking | SCALE: N.T.S. | FIGURE 6.1 |

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn

PLOTTED: 2/21/2022




- Carnegie Mellon University Property in 2022 IMP
- Carnegie Mellon University Existing Buildings
- Development Sites
- CMU Structured Parking
- CMU Surface Lot
- New CMU Parking
- CMU Leased Parking
- Metered Street Parking
- Residential Permit Parking

gai consultants

PROJECT NO/CLIENT R200398.00 / Carnegie Mellon University

PROJECT
2032 Carnegie Mellon Institutional Master Plan
City of Pittsburgh, Allegheny County

TITLE
# Parking Capacity Changes 2022-2032

SCALE: N.T.S.

DWN. TMW
CHKD. RAK
FIGURE
6.2

FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn

PLOTTED: 2/2/2022

# APPENDIX

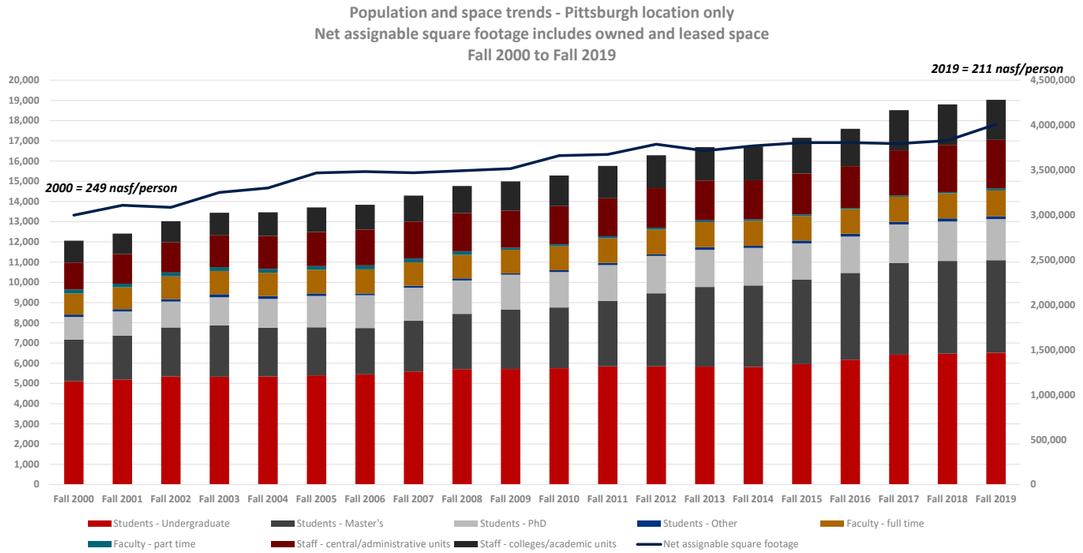
# APPENDIX A
## Carnegie Mellon University Demographics

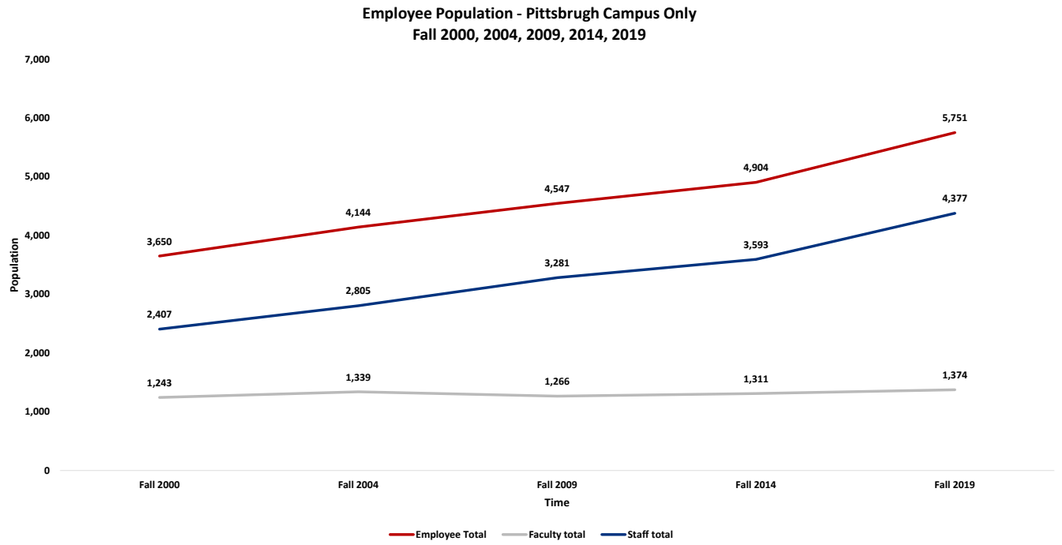


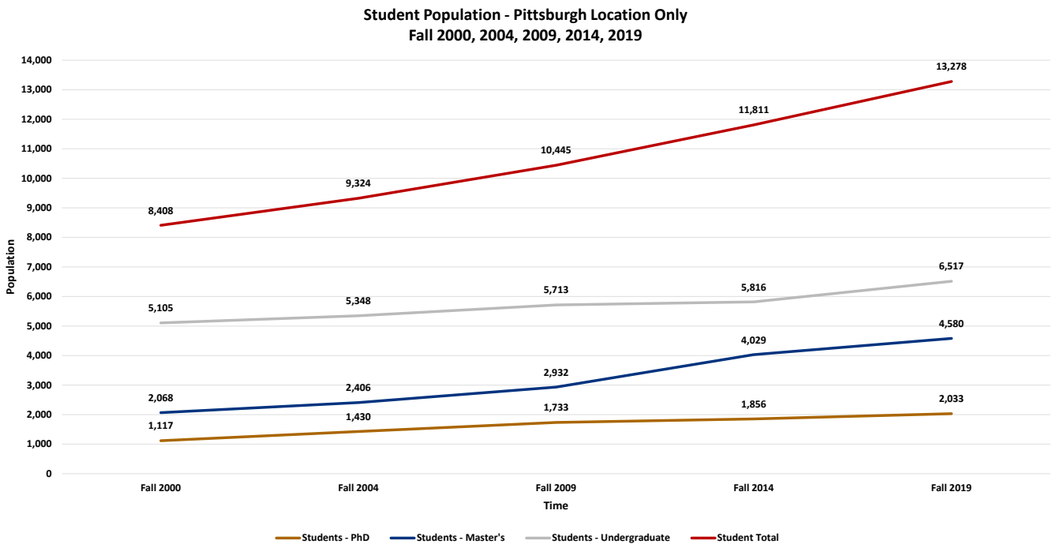
gai consultants
transforming ideas into reality®

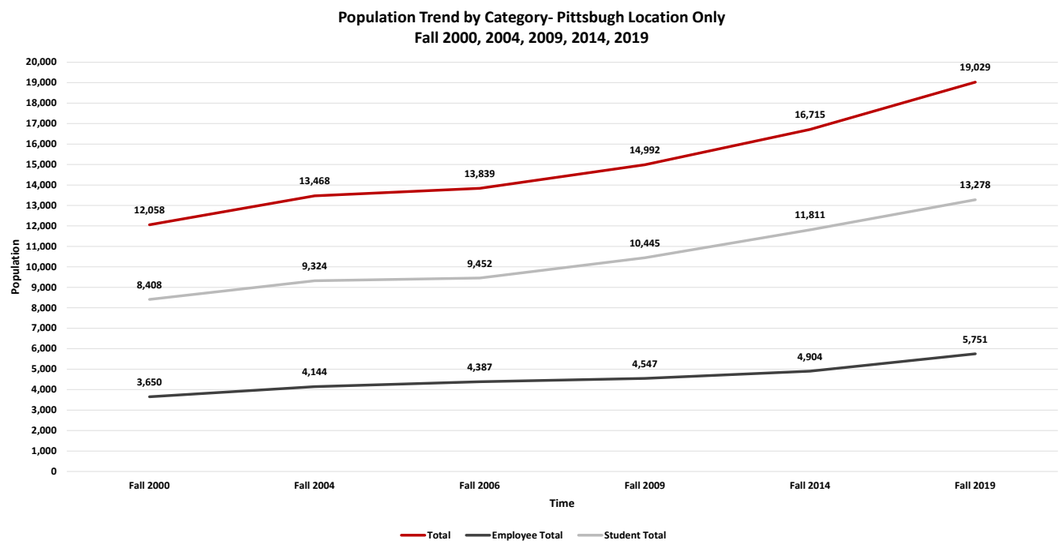
# APPENDIX A

## Population Trends



# Carnegie Mellon University

cmu.edu/visit #mytartanvisit

One square = approx 425' or 130 m. (Updated 02-03-2020)

# Carnegie Mellon University

cmu.edu/visit #mytartanvisit

## ACADEMIC/ADMINISTRATIVE

| | | |
|---|---|---|
| Alumni House | AH | G4 |
| ANSYS Hall | AN | D6 |
| Baker Hall (DC) | BH | E6 |
| Bakery Square | BK | ◆ |
| Bramer House | BR | G3 |
| Cohon University Center | CUC | G5 |
| College of Fine Arts (CFA) | CFA | F6 |
| Cyert Hall | CYH | E4 |
| Doherty Hall | DH | E6 |
| Facilities Management Services Building | FM | D5 |
| FMS Roads & Grounds | FR | C6 |
| Gates Center for Computer Science (SCS) | GHC | E5 |
| Hall of the Arts | HOA | F7 |
| Hamburg Hall (HC) | HBH | D4 |
| Hamerschlag Hall | HH | D6 |
| Hillman Center for Future Generation Technologies | GHC | E5 |
| Hunt Library | HL | F7 |
| Integrated Innovation Institute | III | C4 |
| Margaret Morrison Carnegie Hall | MM | G6 |
| Mehrabian Collaborative Innovation Center | CIC | D4 |
| Mellon Institute (MCS) | MI | A3 |
| Mill 19 | M19 | ◆ |
| National Robotics Engineering Center | NR | ◆ |
| Newell-Simon Hall | NSH | D5 |
| Pittsburgh Technology Center | PTC | ◆ |
| Porter Hall | PH | D6 |
| Posner Center | PC | F6 |
| Posner Hall | POS | G6 |
| PPG 6 | PP | ◆ |
| Purnell Center for the Arts | PCA | F5 |
| Rand Building | RA | B2 |
| Roberts Engineering Hall | REH | C6 |
| Scaife Hall (E) | SH | C6 |
| Scott Hall | SC | D5 |
| Skibo Gymnasium | GYM | G7 |
| Smith Hall | EDS | D4 |
| Software Engineering Institute | SEI | B2 |
| TCS Hall (2020) | TCS | C4 |
| Tepper Building (TSB) | TEP | E3 |
| Warner Hall | WH | F4 |
| Wean Hall | WEH | D5 |
| West Wing | WWG | G5 |
| Whitfield Hall | WF | B1 |
| WQED Building | WQ | E2 |
| 205 S. Craig | 2SC | C3 |
| 300 S. Craig (Police) | 3SC | B3 |
| 311 S. Craig | CA | C3 |
| 407 S. Craig | 4SC | C3 |
| 417 S. Craig | CC | C4 |
| 4516 Henry | UT | B3 |
| 4609 Winthrop | GL | C3 |
| 4615 Forbes | FRB | C4 |
| 4616 Henry | INI | C3 |
| 4620 Henry | PO | C2 |
| 4721 Fifth Ave. | MC | D1 |
| 477 Melwood Ave. | MEL | ◆ |
| 6555 Penn | PE | ◆ |

## POINTS OF INTEREST

| | | |
|---|---|---|
| Coulter Welcome Center | WC | D4 |
| Office of Undergraduate Admission | AD | F4 |
| Art Park | AP | C4 |
| Center for Student Diversity & Inclusion | DI | G5 |
| Dining Services | DN | D2 |
| Disability Resources | DR | I6 |
| Entropy+ Convenience Store | EN | G5 |
| The Fence | FE | F6 |
| Housing Services | HO | D2 |
| The Hub | HU | F4 |
| Human Resources | HR | B1 |
| Kraus Campo | KC | F7 |
| Legacy Plaza | LP | G5 |
| Miller ICA | ML | F5 |
| Office of International Education | OIE | E4 |
| Pausch Bridge | PB | E5 |
| Peace Garden | PG | F7 |
| Student Health Services | HS | F3 |
| University Store | US | F5 |
| Walking to the Sky | WS | F4 |

## RESIDENTIAL

| | | |
|---|---|---|
| Boss House | BOS | H6 |
| Clyde House | CLY | D1 |
| Doherty Apartments | DOH | H4 |
| Donner House | DON | H6 |
| Fairfax Apartments | FAF | C2 |
| Fifth Neville Apartments | FIF | D2 |
| Greek Quad | GQ | G3 |
| Hamerschlag House | HAM | H7 |
| Henderson House | HEN | H7 |
| Highlands Apartments | HIL | D1 |
| Margaret Morrison Apartments Greek Housing | MMA | I6 |
| McGill House | MCG | H6 |
| Morewood E-Tower | MOE | F3 |
| Morewood Gardens | MOR | F3 |
| Mudge House | MUD | F2 |
| Neville Apartments | NVL | D1 |
| Residence on Fifth | ROF | D2 |
| Resnik House | RES | H6 |
| Roselawn Terrace | ROS | I6 |
| Scobell House | SCO | H7 |
| Shady Oak Apartments | SHA | D1 |
| Shirley Apartments | SHI | A1 |
| Spirit House | SPT | I6 |
| Stever House | STE | F2 |
| Webster Hall Apartments | WEB | A2 |
| Welch House | WEL | H7 |
| West Wing | WWG | G5 |
| Woodlawn Apartments | WOO | I6 |

## PARKING

| | | |
|---|---|---|
| East Campus Garage | ECG | H4 |
| Dithridge St. Garage | DS | B3 |
| Gates Garage | GHC | E5 |
| Mehrabian Collaborative Innovation Center Garage (CIC Garage) | CIC | D4 |

| | | |
|---|---|---|
| Alumni House | AH | G4 |
| Bramer House | BR | G3 |
| Carnegie Museum Lot | CM | C5 |
| Children's School | CS | G6 |
| Clyde St. Lot | CLY | D1 |
| Doherty Apartments | DOH | H4 |
| Donner House | DON | H6 |
| Fifth Neville | FIF | D1 |
| Fine Arts Lot | CFA | F6 |
| Frew St. | FS | E7 |
| GATF | FRB | C3 |
| Greek Quad | GQ | G3 |
| Hamburg Hall Lot | HP | D4 |
| Henry St. | HY | C2 |
| Integrated Innovation Institute | III | C4 |
| Melwood Ave. | MEL | ◆ |
| Morewood Lot | MOR | E3 |
| Pittsburgh Technology Center | PTC | ◆ |
| South Neville Lot | SN | C6 |
| Tepper Quad | TEP | D4 |
| Warner Hall | WH | F4 |
| West Campus | WE | E5 |
| Whitfield Hall | WF | B1 |
| Zebina Way | ZW | C3 |
| 300 S. Craig (Police) | 3SC | B3 |
| 4700 Fifth Ave. | ROF | D2 |
| 6555 Penn | PE | ◆ |

**KEY**

- ◆ Off campus
- University Police
- Student Health Services

**COLLEGES AND SCHOOLS (Dean's office locations)**

| | |
|---|---|
| E | College of Engineering |
| CFA | College of Fine Arts |
| DC | Dietrich College of Humanities & Social Sciences |
| HC | Heinz College of Information Systems and Public Policy |
| MCS | Mellon College of Science |
| SCS | School of Computer Science |
| TSB | Tepper School of Business |

Visit our on-campus dining locations at cmu.edu/dining-locations

## TRANSPORTATION TO CAMPUS

The Pittsburgh International Airport (PIT) is 22 miles from the Carnegie Mellon University campus. Travel time to campus is 45 minutes. Car rentals are available at the airport.

**UBER, LYFT OR TAXI:** Average taxi fare: $45.00.

**HOTEL SHUTTLES:** (*Highly encouraged*): Often offered by hotels within a few miles of campus.

**BUS:** 28X Airport Flyer Bus (Port Authority Transit), stops at the Carnegie Mellon campus. Cost is $2.75 each way (exact change required) but free to students.

## PARKING ON CAMPUS

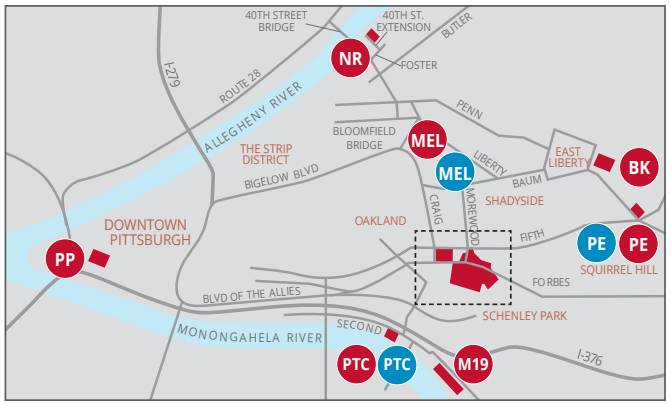
**East Campus Garage**

GPS address: 5040 Forbes Ave., Pittsburgh, PA 15213

At times the East Campus Garage does fill. Additional metered parking is available along Frew St., Tech St., S. Craig St., Margaret Morrison St. and near the Schenley Park Visitor Center.

View bicycle parking locations at cmu.edu/bicycle-parking

## ◆ OFF CAMPUS



# APPENDIX B
## Approved TIS Scoping Form



gai consultants
transforming ideas into reality®

**DEPARTMENT OF MOBILITY AND INFRASTRUCTURE**
**TRANSPORTATION STUDY SCOPING FORM Revised**
**August 2021**

***Submit scoping form and trip generation one week prior to scoping meeting or the meeting may need to be rescheduled.***

***Final scoping form, sign-in sheet and meeting minutes subject to DOMI approval.***

***For more information, please see DOMI Transportation Review Impact Guidelines.***

**NAME OF PROJECT** Carnegie Mellon University Institutional Master Plan (CMU IMP)

Developer/Applicant: Carnegie Mellon University

Anticipated Development Date: 2022 - 2032 Anticipated Completion Date: 2032

Date Filed:

Prepared by: GAI Consultants

**1.0. Project Overview** University 10-year Master Plan projects

**1.1 Physical Address or Cross Street:** 5000 Forbes Ave, Pittsburgh, PA 15213

**1.2 ZBA Hearing Required** ☐ **YES** ☐ **NO** **Notes:**

**1.3 Planning Commission Required** ☑ **YES** ☐ **NO** **Notes:**

**1.4 Adopted/Approved Plans** ☐ **YES** ☐ **NO** **Notes:**

**1.5 Impact or access to PennDOT Road** ☑ **YES** ☐ **NO** **Notes:**

**1.6 TDM Plan Required**
Complete Checklist for TDM at end of form ☑ **YES** ☐ **NO** **Notes:**

**1.7 Development Description: For phased developments, description should be provided by phase**

| | EXISTING ON-SITE CONDITIONS | | | FUTURE ON-SITE CONDITIONS | | | NET DIFFERENCE |
|---|---|---|---|---|---|---|---|
| **Project Component** | **Size (Sq. Ft.)** | **# of Units** | **# Parking** | **Size (Sq. Ft.)** | **# of Units** | **# Parking** | |
| **List by Type Ex: Office, Residential, Retail, etc.** | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **TOTAL** | | | | | | | |

***Comments:***

Refer to Table 1.7 (attached) for maximum massing for 10-year development components, including maximum parking capacities that could fit on each site. In the 2012-2022 master plan, approximately 1/3 (1,166,000 SF of the proposed 3,707,500 SF) was built and parking supply remained relatively constant. To provide a realistic yet conservative estimate for this TIS, up to 50% of master plan maximum square footage is anticipated to be realized. Should more development be built by 2032, an amended TIS would be required. CMU anticipates no net long-term change in parking supply, with new parking facilities built to replace existing surface lots. Refer to Table 6.2 for anticipated parking facility sizes.

**2.0 Site Plan: Attach latest site plan** See attached

**2.1 Vehicular Site Access** See attached

**Vehicular Site Access**

| Proposed Conditions | Signalized | Unsignalized | Proposed Access (Full or Restricted) |
|---|---|---|---|
| **Project Entry/Exit Points** | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**The distance calculation to be provided for all access points**

**2.2 Loading**

| | | Check |
|---|---|---|
| **2.2.1** | **On-Site**<br>Note: Include Vehicle Class: _____ | |
| **2.2.2** | **On Street Requested** | |
| **2.2.3** | **Loading Demand Analysis**<br>Note: Include timing, type, frequency, and vehicle class: _____ | |
| **2.2.4** | **Refuse Storage/Pickup** | |

**3.0 Multi Modal Analysis: Attach map for existing bike, transit or pedestrian facilities**

**3.1 Bicycle Routes to or Near Site**

| **Bicycle Routes to or Near Site** | | Check |
|---|---|---|
| 3.1.1 | Bicycle Parking Required | X |
| 3.1.2 | Bicycle Parking for vehicular parking reduction | X |
| 3.1.3 | Additional Bicyclist End-of trip Facilities Provided (Showers, Changing Rooms, etc.) for TDM | X |

***Comment:*** CMU will continue meeting criteria from the League of American Bicyclists Silver Level Award as part of their Bicycle Friendly University program and will perform additional improvements and provide additional amenities towards the Gold Level Award. TDM IMP mitigation projects focus on integrating the campus area into the surrounding bicycle network.

**3.2 Bicycle Routes to or Near Site (Attach Map)**

| | | Check |
|---|---|---|
| 3.2.1 | Identify existing on-street bike routes or trail connections to the site | X |
| 3.2.2 | Identify proposed developer created amenities to attract greater bicyclist use | X |
| 3.2.3 | Identify planned new or extended bicycle routes near the site | X |
| 3.2.4 | Site is located within .25 miles of a Healthy Ride Station | X |
| 3.2.5 | Site is located within .25 miles of trail access | X |

***Comment:*** Through IMP process, additional joint bicycle infrastructure projects will be recommended, including a Frew/Tech/Margaret Morrison Street neighborway and a cycle track between Schenley Park at Frew Street and Fifth Avenue along Morewood Avenue and through campus. An additional University-sponsored bike route is planned to connect Frew Street with Boundary/Neville Street along Hamerschlag Drive. Bike trails are existing in Schenley Park and the University has reserved space in their Neville Parking Lot for a bike trail connection through City-owned property in Junction Hollow.

**3.3 Pedestrian Access, Circulation and Safety**

| | | Check |
|---|---|---|
| 3.3.1 | On-site Points of Entry and Egress | X |
| 3.3.2 | New or Replace sidewalk | X |
| 3.3.3 | Crosswalk need and warrants Note pedestrian desire lines | |

***Comment:***

**3.4 Transit Routes to or Near the Site (Attach Map)**

| Transit Routes to or Near the Site (Attach Map) | | Check |
|---|---|---|
| 3.4.1 | Identify Peak and Non-Peak Bus Routes At or Near the Site and Frequency | X |
| 3.4.2 | Identify Bus Stop and Shelter Locations At or Near the Site | X |
| 3.4.3 | Identify developer created amenities to attract greater transit use | X |
| 3.4.4 | Site is Located within .25 miles of busway or T station | |
| 3.4.5 | Existing stop adjacent to site | X |

***Comment:*** BRT stops are planned along Forbes and Fifth avenues.

**4.0 Trip Generation: Submit prior to scoping meeting to ensure thorough review, attach to scoping form**

| Trip Generation Rate | Project Component | Note |
|---|---|---|
| **ITE General Urban/Suburban** | Master Plan | ITE Methodology (LU 550, LU 225, LU 170) with employee and student mode share factors. |
| **ITE Dense Multi-Use Urban** | | |
| **ITE Rural** | | |
| **ITE Center City Core** | | |
| **Independent Survey** | Master Plan | CMU data may be used to supplement/replace data as applicable based on employee/student projections. |
| **Other (specify)** | | |

**4.1 Trip Removals**

| Trip Reduction Based on Transportation Demand Analysis | | | | Check |
|---|---|---|---|---|
| Mode Share traffic Adjustment Factors | | Percent | *Data Source (Specify)* | X |
| | Auto | 30 % | Target mode shares (left) are CMU's IMP/TDM mobility goals based on faculty and staff CMU Campus Commute Patterns, 2018 (Carnegie Mellon University Parking Study \| 2018, Ayers Saint Gross, Brailsford & Dunlavey, Fehr & Peers, November 2018), where 38% parked, 29% took transit (22% bus, 7% shuttle), 19% walked, 7% biked, 5% drop-off or rideshare, and 2% other. Existing student mode share to be used for student housing only (Parking Study mode share: 2% drove, 45% took transit (35% bus, 10% shuttle), 29% walked, 12% biked, 6% drop-off/rideshare, and 5% other). | |
| | Total non-Auto | 63 % | | |
| | Transit | 30 % | | |
| | Bicycle | 9 % | | |
| | Pedestrian | 19 % | | |
| | Other | 5 % | | |
| | | | | |

**4.2 Trip Adjustment Factors**

| Trip Generation Adjustment Factors (check as applicable and explain) | | | Check |
|---|---|---|---|
| Base Traffic Adjustment Factors | Percent | *Comment* | |
| Internal Trips | TBD % | | |
| Shared Trips | TBD % | | |
| Pass-by Trips | TBD % | | |

**5.0 Roadway Network and Operations Analysis: See section 4.5.0 of Transportation Impact Review Guidelines**

**5.1 Area of Impact- Required Data Collection**

| Study Intersections | Unsignalized | Signalized | Check |
|---|---|---|---|
| Fifth Avenue at Craig Street | | X | |
| Fifth Avenue at Neville Street | | X | |
| Fifth Avenue at Clyde Street | | X | |
| Fifth Avenue at Morewood Avenue | | X | |
| Forbes Avenue at Craig Street | | X | |
| Forbes Avenue at CIC/Tepper Drive | | X | |
| Forbes Avenue at Morewood Avenue | | X | |
| Forbes Avenue at Beeler Street | | X | |
| Forbes Avenue at Margaret Morrison Street | | X | |

**Attach map showing project site, nearby critical intersections, study intersections, and proposed project entry/exit points.**
**Note: Data Collection Must Include: Turning Movement, Transit, Heavy Vehicles, Bicycle, and Pedestrian Counts.**

Data collection has been taken from previous studies and grown to 2022 (0.25% per year linear per the Forbes Avenue Capacity Analysis). Due to unknowns from pandemic traffic volumes and from proposed improvements along Fifth Avenue due to the upcoming BRT Project, new data collection cannot be reliably performed. Driveway turning movements and heavy vehicle, bicycle, and pedestrian counts may not be available at all locations. TDM is anticipated to mitigate parking trip increases through the mobility goal of providing no net new parking.

**5.2 ATR**

**5.2.1**

| Location (Street & Cross Streets) | 48-Hour | 7-Day | Other | Check |
|---|---|---|---|---|
| | | | | X |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Comment:** Due to ongoing pandemic impacts, ATR data not proposed. PennDOT Traffic Information Repository (TIRe) summary data is provided in Figure 5.2

**5.2.2 Type ATR Count(Please check)**

| | Check | Comment | Check |
|---|---|---|---|
| Volume Counts | | | |
| 15-Minute Increments | | | |
| 1-Hour Increments | | | |
| Speed Data | | | |
| Vehicle Classification Data | | | |

**Comment:**

### 5.3 Study Periods

**Study Periods (Please check)**

| | Check | *Comment-Note Hours* |
|---|---|---|
| AM Peak | ✔ | AM Peak Hour (7:00 AM to 9:00 AM) as required |
| PM Peak | ✔ | PM Peak Hour (4:00 PM to 6:00 PM) as required |
| Saturday Peak | | |
| Custom Design Peak (ex: School, Hospital, Event, Religious, etc.) | | |
| Other | | |

### 5.4 Trip Distribution and Assignment

| **Methodology for Trip Assignment (Please check)** | **Check** |
|---|---|
| Existing Traffic Data | X |
| Gravity Distribution Model-See TIS Guidelines | |
| SPC Model | |
| Market Study | |
| Other (Specify) Parking is a system on the CMU campus, so trips will be distributed based on changes in parking locations which will represent the main activity of changes in vehicular trips. | X |

**Comment:** TDM is anticipated to mitigate parking increases, resulting in no net new parking demand. Table 4.0.2 Trip Generation and Table 6.2 Parking Supply and Demand Analysis (both assuming 50% of master plan components will be built) show peak hour vehicular trip changes would be less than total parking space relocations. Therefore, trip distribution and assignment based on full capacity (100% occupancy) of AM entering and PM exiting parking space relocations, with AM exiting and PM entering peak hour trips conservatively assumed at 50% of entering and exiting trips.

### 5.5 Background Traffic/Future Conditions

**5.5.1 Future Year Conditions**

| | **Check** |
|---|---|
| Annual Base Traffic Growth per year (Please indicate date, source and provide comments | |

**Comment:** While historical traffic data has declined, the 0.25% per year linear growth rate that was approved for use in the Forbes Avenue Capacity Analysis will be conservative, but appropriate, for this study.

**5.5.2 Trip Removals (Please check and comment)**

| | **Check** |
|---|---|
| Onsite Removals | X |
| Other (Explain) | |

**Comment:** Removals based on parking lot changes.

**5.5.3 New Projects to be added to base traffic (As specified by DCP)**

| **Note these are developments which the city has approved but have not been built or occupied and would not otherwise be covered under background trips** | | | **Check** |
|---|---|---|---|
| **Project** | **Year** | **Data Source** | |
| | | | |
| | | | |
| | | | |
| | | | |

### 5.6 Capacity Analysis

| **Capacity Analysis** | | **Check** |
|---|---|---|
| 5.6.1 | Existing Conditions | X |
| 5.6.2 | Analysis Year Without New Project | |
| 5.6.3 | Analysis Year With New Project | |
| 5.6.4 | Analysis Year With New Project and Mitigation | |

| | Check |
|---|---|
| 5 year Horizon | |
| 10 year Master Plan | X |
| 20 Year (federally funded) | |
| Other Time Frame | |

***Comment:*** 10 year Master Plan capacity analysis (50% full buildout) to be performed at two most impacted locations (assumed Fifth at Morewood & Neville as they have the greatest capacity and trip change impacts). Fifth Avenue BRT upgrades and uncertain post-pandemic traffic volumes may impact results. 50% full buildout is greater than the 33% of 2012-22 IMP realized full buildout. Development beyond 50% will require an amended TIS. TDM is anticipated to mitigate new parking demand, so CMU is proposing a number of pedestrian and bicycle alternative improvements for TDM.

## 5.7 Queuing Analysis

| **Queuing Analysis** | Check |
|---|---|
| | X |

| **Locations** | Check |
|---|---|
| Each Movement of all Study Interactions | X |

| **Queuing Method** | Check |
|---|---|
| Synchro | X |
| HCS | |
| Other | |

**Comment:** Queuing analysis will be performed for the two analyzed intersections. Tables summarizing 95th percentile Synchro and SimTraffic-calculated queues (5 runs, 10 minutes seeding) will be provided.

## 5.8 Traffic Signal Warrant Analysis

### 5.8.1 Signal Warrant Analysis

| | | Check |
|---|---|---|
| 5.8.1.a | All unsignalized study intersections | |
| 5.8.1.b | All signalized study intersections | |
| 5.8.1.c | All Site Driveways | |
| 5.8.1.d | Signal Deficiency Review (Removal, Phasing or Pedestrian or other Upgrades) | |
| 5.8.1.e | Custom (Specify Locations below) | |

### 5.8.2 Signal Warrant Analysis

| | | Check |
|---|---|---|
| 5.8.2.a | 8-Hour | |
| 5.8.2.b | 4-Hour | |
| 5.8.2.c | Peak Hour | |
| 5.8.2.d | Pedestrian Volume | |
| 5.8.2.e | School Crossing | |
| 5.8.2.f | Coordinated Signal System | |
| 5.8.2.g | Crash Experience | |
| 5.8.2.h | Roadway Network | |

### 5.8.3 Auxiliary Turn Lane Warrant

| | | Check |
|---|---|---|
| 5.8.3.a | Left Turn Lane Warrant | |
| 5.8.3.b | Right Turn Lane Warrant | |
| 5.8.3.c | Recommended Length | |

**Comment:** No new signals are proposed in the IMP. Traffic volumes not anticipated to warrant any new signalization.

## 5.8 Crash History/ Analysis

**5.9.1** | **Check**

**Locations** Locations around the campus will be reviewed. Both reportable crashes and non-reportable crashes recorded by CMU Police will be reviewed. | ☒

**Contact:** penndotcrashhelp@pa.gov

**5.9.2** | **Check**

**Collision Diagram** | ☐

3-Year Data | ☒

5-Year Data | ☐

**Comment:**` CMU non-reportable police data to be included, which is available for 2018-2020. Data to be summarized in tabular form only.

## 6.0 Parking

**Check**

**6.1 Existing Conditions**

Existing Parking Management Plan (for Institutional Master Plans) | ☐

Existing Residential Permit Parking Program (RPPP) Areas (attach map) | ☒

Please refer to: http://www.pittsburghparking.com/rppp | ☐

## 6.2 Proposed Parking

**Proposed Parking (Check Source used)**

| Methodology | Check |
|---|---|
| ITE Parking Generation Manual | ☐ |
| City of Pittsburgh Zoning Code | ☐ |
| Site specific Parking Study or Market Demand CMU's 2018 Parking Master Plan and supporting data | ☒ |
| Other Methodology (ex: Urban Land Institute or other, please specify) | ☐ |

***Comment:*** Proposed parking to be based on IMP Mobility Goals and TDM

| **Parking Conditions Supply and Demand Analysis** | **Check** |
|---|---|
| Existing Conditions | ☒ |
| Phase 1 Year | ☐ |
| Phase 2 Year | ☐ |
| Phase 3 Year | ☐ |
| 10-Year Master Plan Year Based on CMU's February 2020 parking data and CMU's 2018 Parking Master Plan with its supporting data. Refer to Table 6.2 attached. | ☒ |

***Comment:***

## 6.3 Parking Reduction

| **Parking Reduction: Check all that apply** | | **Check** |
|---|---|---|
| 6.3.1 | Parking Reduction Area | ☒ |
| 6.3.2 | Bicycle parking reduction | ☒ |
| 6.3.3 | Shared Parking | ☒ |
| 6.3.4 | Fee in lieu | ☐ |

## 6.4 Parking Demand Analysis

**Check**

**Parking Demand Analysis** | ☒

**On and off street inventory(map)** | ☒

**Data Collection(Describe):** Due to ongoing Covid-19 impacts, accurate data cannot be collected during the master planning process. Parking will be based on CMU's 2018 Parking Master Plan data and pre-pandemic parking data, as parking demand is not anticipated to recover to normal patterns until fall 2022 or beyond.

**6.5 Other Transportation**

| **Other Transportation** | **Check** |
|---|---|
| **Shuttle Bus /Other Private Carrier Service Analysis** | |
| Identify Peak and Non Peak Routes | X |
| Identify Shuttle Stop Locations At or Near the Site | X |
| Estimate number of passengers served | X |
| Time of Day/Frequency of Operations | X |
| **School Buses** | |
| Identify Peak and Non Peak Routes | |
| Identify School Bus Stop Locations At or Near the Site | |
| Estimate number of students served | |
| Time of Day/Frequency of operations | |

**Comment:**

| **Submission Requirements** | | **Check** |
|---|---|---|
| Emailed to DOMI | **Digital copy of Final Traffic Impact Study Report** | |
| Emailed to DOMI | **Executive Summary (include in the beginning of report)** | |
| Emailed to DOMI | **City Correspondence/Comment Response Letters (Include in beginning of Final Report)** | |
| Emailed to DOMI | **Approved Scoping Form (Include copy in back of Final Report)** | |
| Emailed to DOMI | **Raw Data Files** | |
| Emailed to DOMI | **Digital copy of report, appendices, analysis and data in PDF format (no CD's)** | |

**Send To:**

| **Name** | **Department** | **Mailing Address** | |
|---|---|---|---|
| Katie K. Reed, Senior Planner<br>Zoning Case Manager | City of Pittsburgh Dept. of Mobility and Infrastructure | 414 Grant St., 2nd Fl, Pittsburgh, PA 15219 | katherine.reed@pittsburghpa.gov |

DOMI

Department of Mobility and Infrastructure

# TDM Checklist

August 2021

There is not a one size fits all strategy for TDM. To assist in the development of a TDM plan, DOMI has prepared a checklist intended to identify expected (pre-checked) and optional aspects of a TDM plan submitted to the City. Applicants should work with a qualified transportation professional and DOMI to identify a mix of strategies which address transportation impacts, provide adequate multimodal transportation facilities and incentives for non-SOV trips appropriate to the context, scale and use of the proposed development.

No TDM Program is expected to incorporate all of the strategies outlined in the checklist. Rather, the checklist provides a framework of options from which developers can identify appropriate actions for their project. The checklist is not exhaustive and does not constitute a full TDM scope.

| | |
|---|---|
| Meet with the Transportation Management Association (TMA): Downtown and Oakland only | ✔ |
| Set mode split goals and commitment to survey. Goals should be consistent with relevant adopted neighborhood or master plans. | ✔ |
| Identify responsible party or dedicated staff assigned to administer TDM program and report on progress (this can be specific to the tenant or property manager); for speculative developments, this can be a description of how potential tenant will be made aware of TDM requirements and the property owner or tenant requirement to maintain multi-modal facilities. | ✔ |
| Hire TDM Coordination opt assign staff responsibility to administer a TDM program | ✔ |
| Payback incentives for using non-motorized and carpool commuters | ✔ |
| Provide transit passes or subsides to employees or residents | ✔ |
| Offer employees or residents free or discount bikeshare membership through the Healthy Ride Corporate Membership Program | ✔ |
| Membership in the 2030 District | ✔ |
| Parking policies that unbundle the cost of parking lease from rent | ✔ |
| Promotion of SPC Commuter Connects programs | ✔ |
| Flexible work hours and/or telecommute program | ✔ |
| Real time transportation displays internal to the development. | ✔ |
| Corporate carpool and/or ride partner programs | ✔ |
| Other: | |
| Other: | |
| Other: | |
| Other: | |

| Site Plan Strategies | |
|---|---|
| Adequate sidewalk widths and ADA ramps along all building frontages | ✔ |
| Bicycle parking required by code. A mix of bicycle parking should include convenient short-term parking and secure, covered parking accessible from the ground floor (not through the driveway of a garage) for long-term bicycle parking or storage. | ✔ |
| When impacting a bus stop: work with the City and Port Authority to relocate during construction and restore with amenities | ✔ |
| When providing public easement or public access to privately owned open space: wayfinding | ✔ |
| Upgrades and enhancements for pedestrian safety at site access and intersections | ✔ |
| Consistency with improvements identified in City plans or policy | ✔ |
| For master plan areas with very large existing parking structures (i.e., 500 or more parking spaces), identify how existing parking space can be repurposed as part of reducing SOV trips | ✔ |
| Enhancements to pedestrian facilities that address the last mile problem from transit stops and desired pedestrian paths | ✔ |
| Bicycle storage facilities that exceed Zoning code requirements. | ✔ |
| Bikeshare station on site | ✔ |
| Shower rooms or shower passes for employees who bike to work (office only) | ✔ |
| Unbundled parking | ✔ |
| Shared parking | ✔ |
| Priority carpool parking | ✔ |
| Dedicated car share parking | ✔ |
| Sponsored car share or bikeshare memberships for employees or residents (annual or intro membership) | ✔ |
| Real time arrival transit screens in publicly accessible space | ✔ |
| Transit station enhancements or improvements | ✔ |
| Pedestrian enhancements between proposed buildings and nearby transit stations, such as adding pedestrian scale lighting, emergency call boxes, street trees, and seating | ✔ |
| Sponsored car share or bikeshare memberships for employees or residents (annual or intro membership) | ✔ |
| Real time arrival transit screens in publicly accessible space | ✔ |
| Transit station enhancements or improvements | ✔ |
| Other: Electric vehicle charging | ✔ |
| Other: Tandem parking | ✔ |
| Other Personal mobility (scooter) parking on-campus | ✔ |
| Other: | |

For more information, please see our DOMI TDM Guidelines
For questions, please email katherine.reed@pittsburghpa.gov

# APPENDIX C
## Trip Generation Calculation Sheets



gai consultants
transforming ideas into reality®

# Utility
(170)

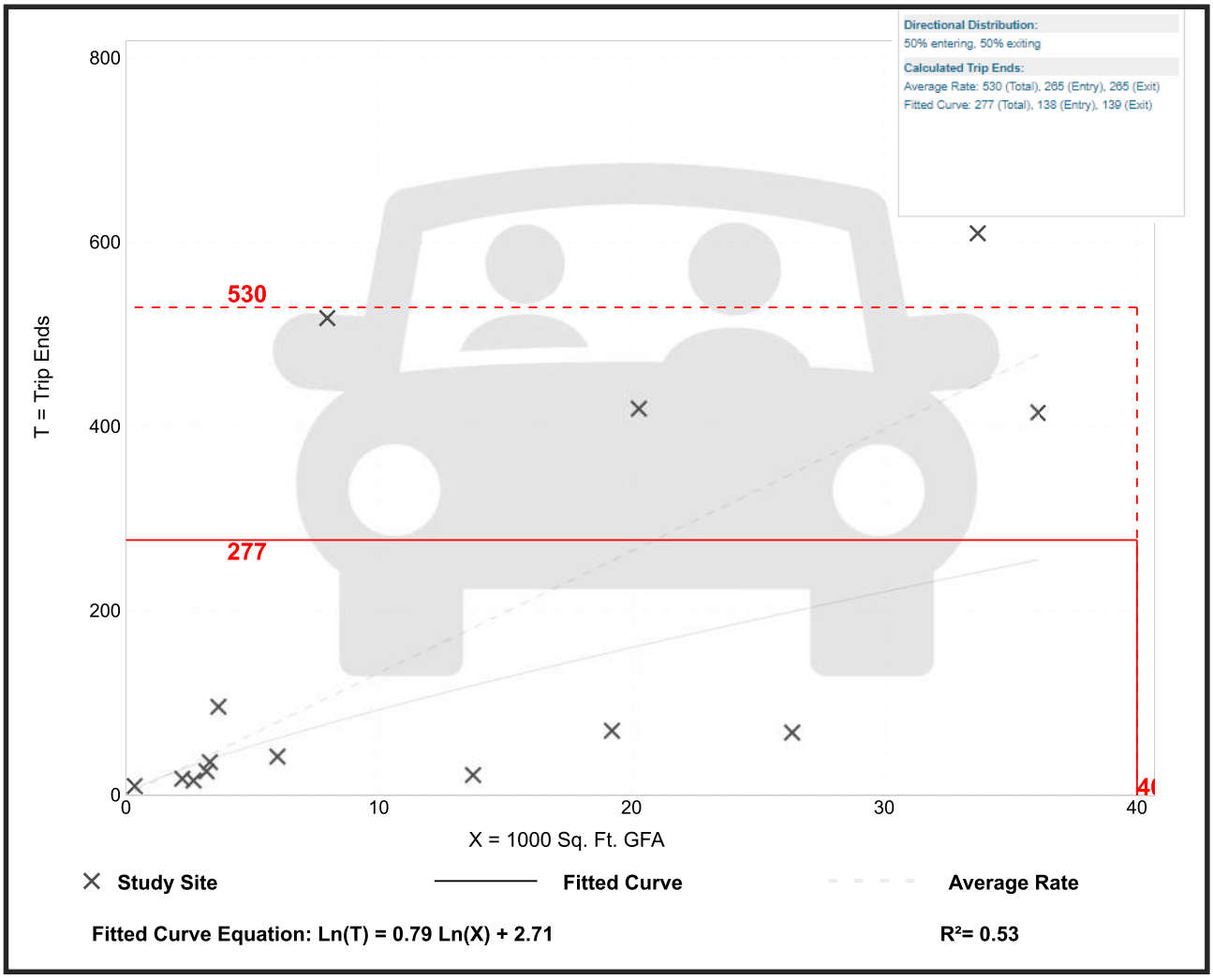
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

**Setting/Location:** **General Urban/Suburban**
Number of Studies: 14
Avg. 1000 Sq. Ft. GFA: 13
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 13.24 | 1.60 - 65.03 | 13.72 |

## Data Plot and Equation



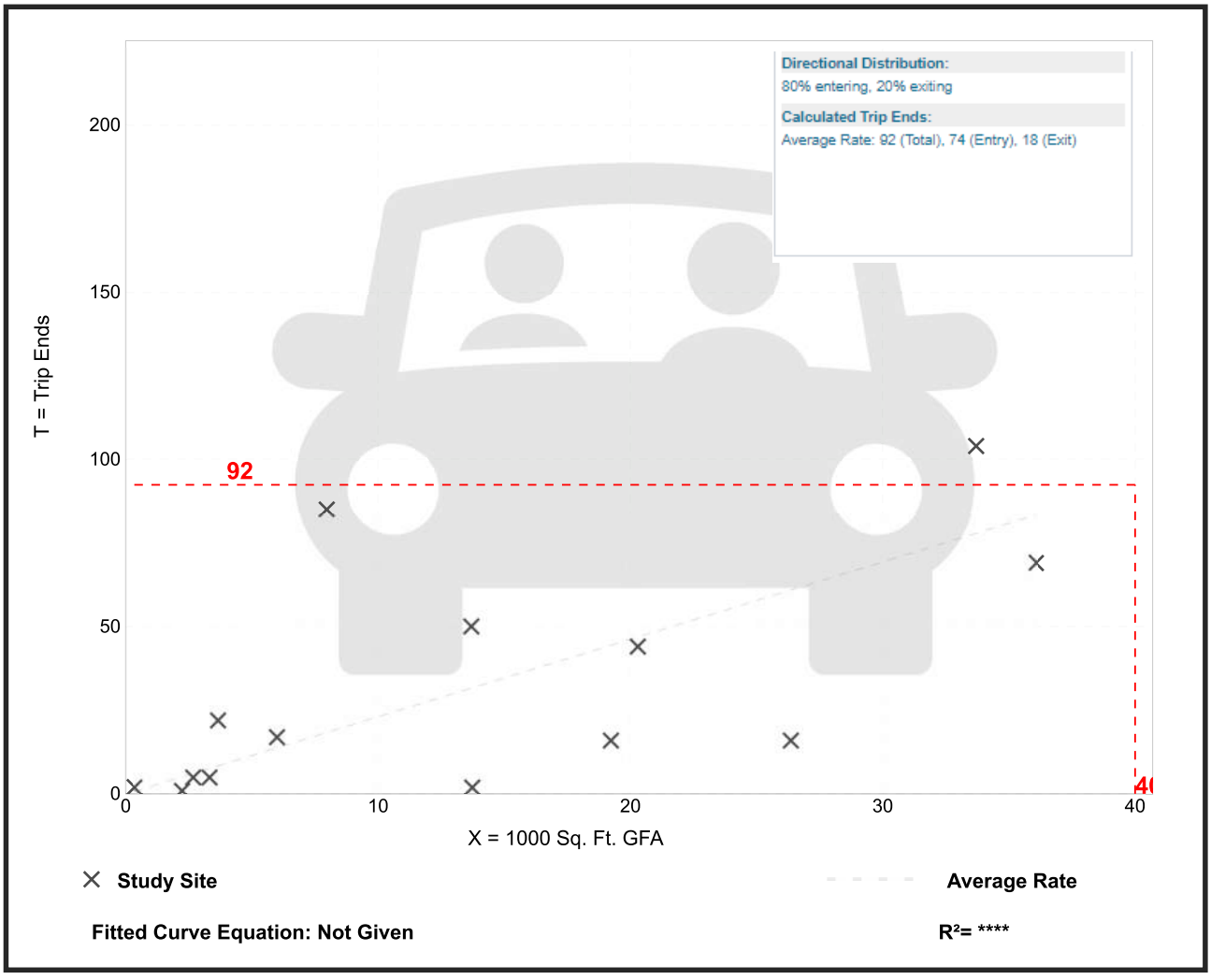
# Utility
(170)

| | |
|---|---|
| **Vehicle Trip Ends vs:** | **1000 Sq. Ft. GFA** |
| **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: | 14 |
| Avg. 1000 Sq. Ft. GFA: | 14 |
| Directional Distribution: | 80% entering, 20% exiting |

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 2.31 | 0.15 - 10.67 | 2.21 |

## Data Plot and Equation




*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

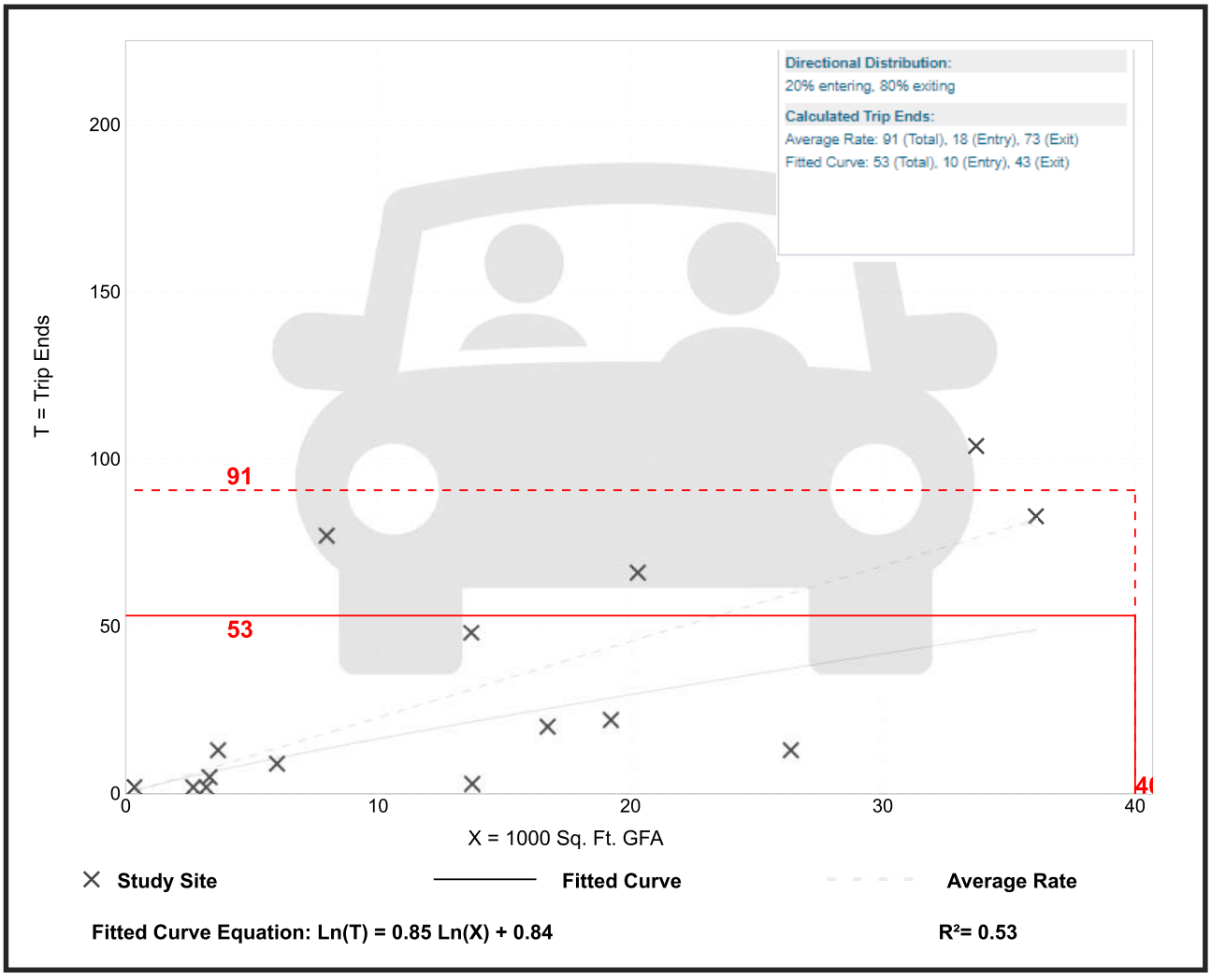
# Utility
(170)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**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: 15
Avg. 1000 Sq. Ft. GFA: 14
Directional Distribution: 20% entering, 80% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 2.27 | 0.22 - 9.67 | 1.92 |

## Data Plot and Equation



# Utility
(170)

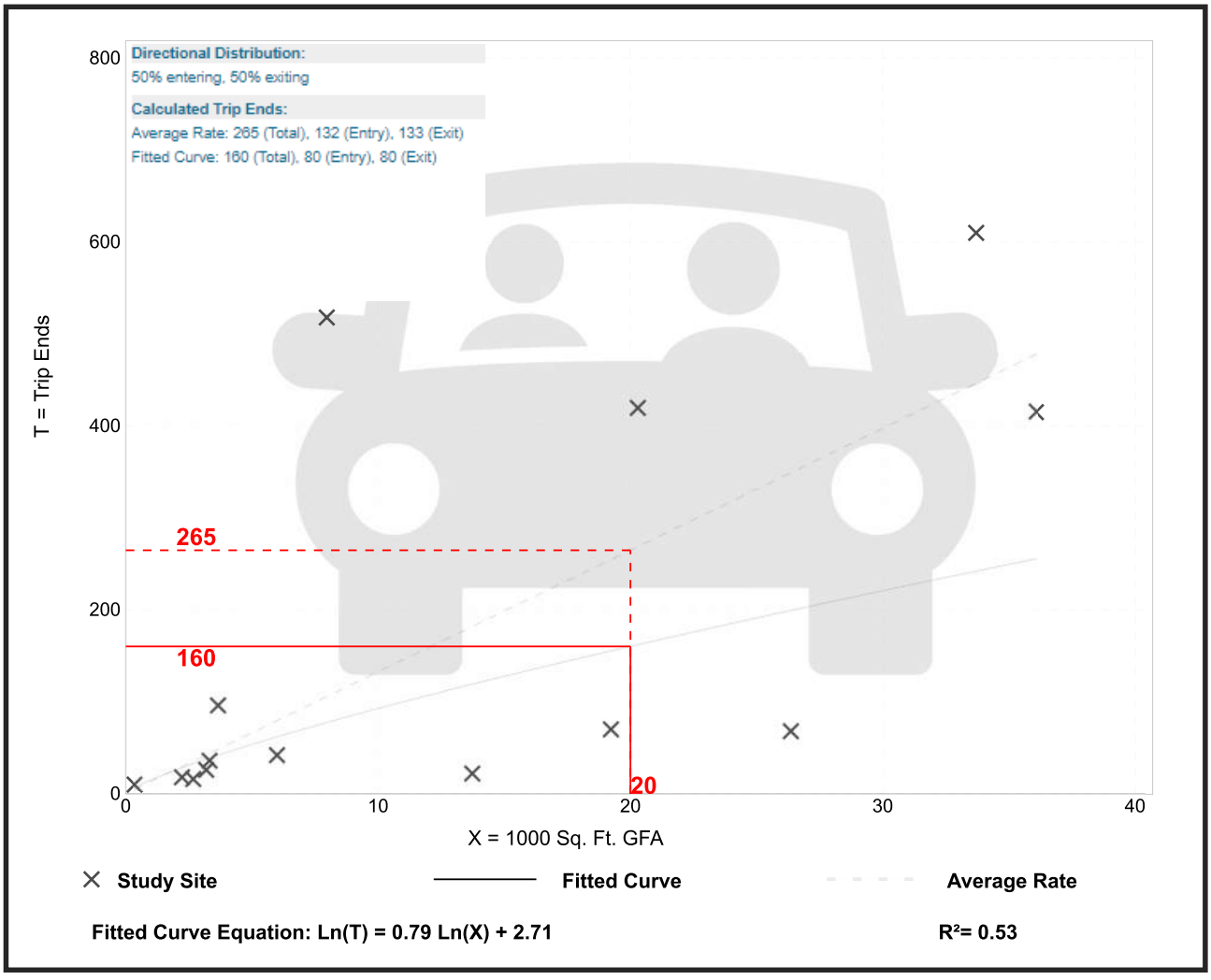
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

**Setting/Location:** **General Urban/Suburban**
Number of Studies: 14
Avg. 1000 Sq. Ft. GFA: 13
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 13.24 | 1.60 - 65.03 | 13.72 |

## Data Plot and Equation



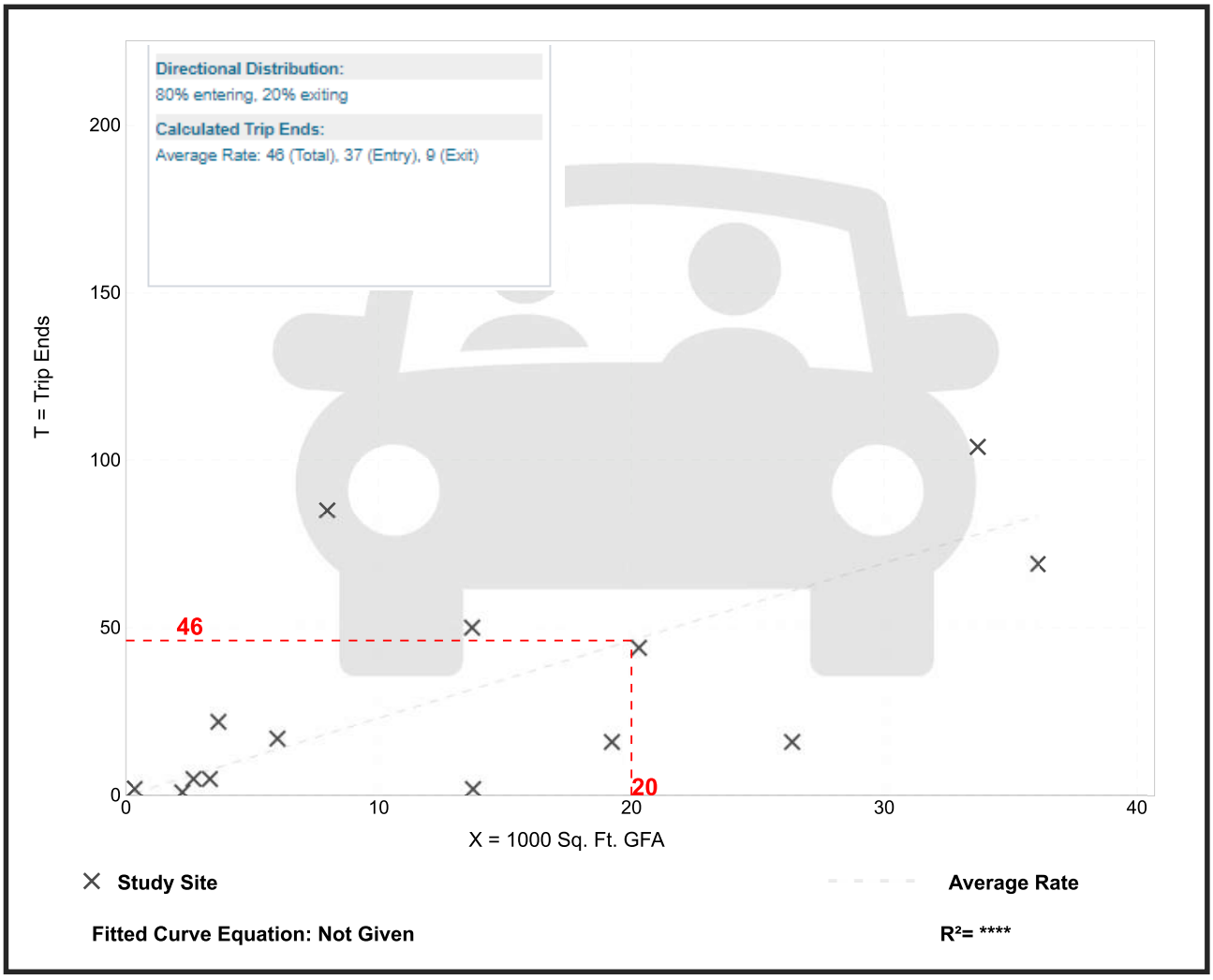
# Utility
(170)

| | |
|---|---|
| **Vehicle Trip Ends vs:** | **1000 Sq. Ft. GFA** |
| **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: | 14 |
| Avg. 1000 Sq. Ft. GFA: | 14 |
| Directional Distribution: | 80% entering, 20% exiting |

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 2.31 | 0.15 - 10.67 | 2.21 |

## Data Plot and Equation



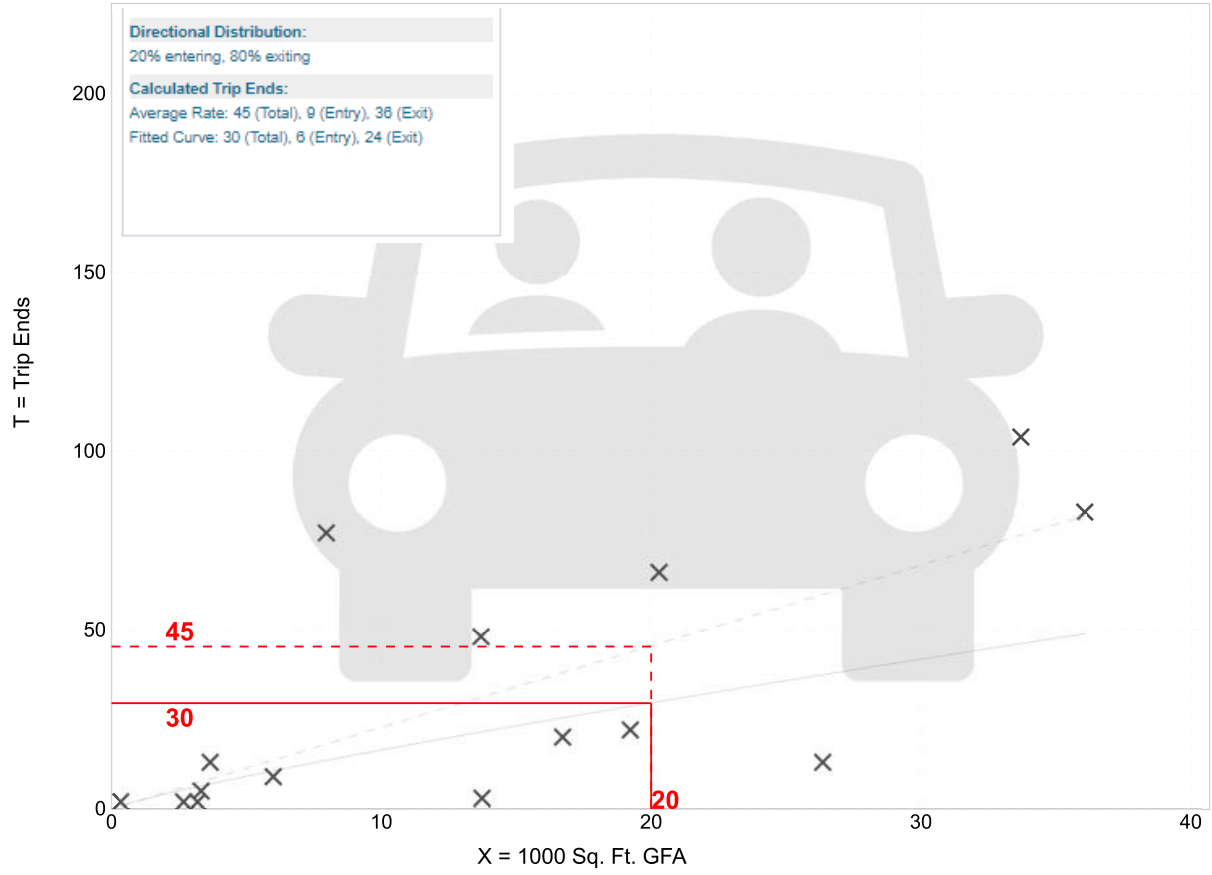
# Utility
(170)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**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: 15
Avg. 1000 Sq. Ft. GFA: 14
Directional Distribution: 20% entering, 80% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 2.27 | 0.22 - 9.67 | 1.92 |

## Data Plot and Equation




**Fitted Curve Equation: Ln(T) = 0.85 Ln(X) + 0.84** **$R^2$= 0.53**

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

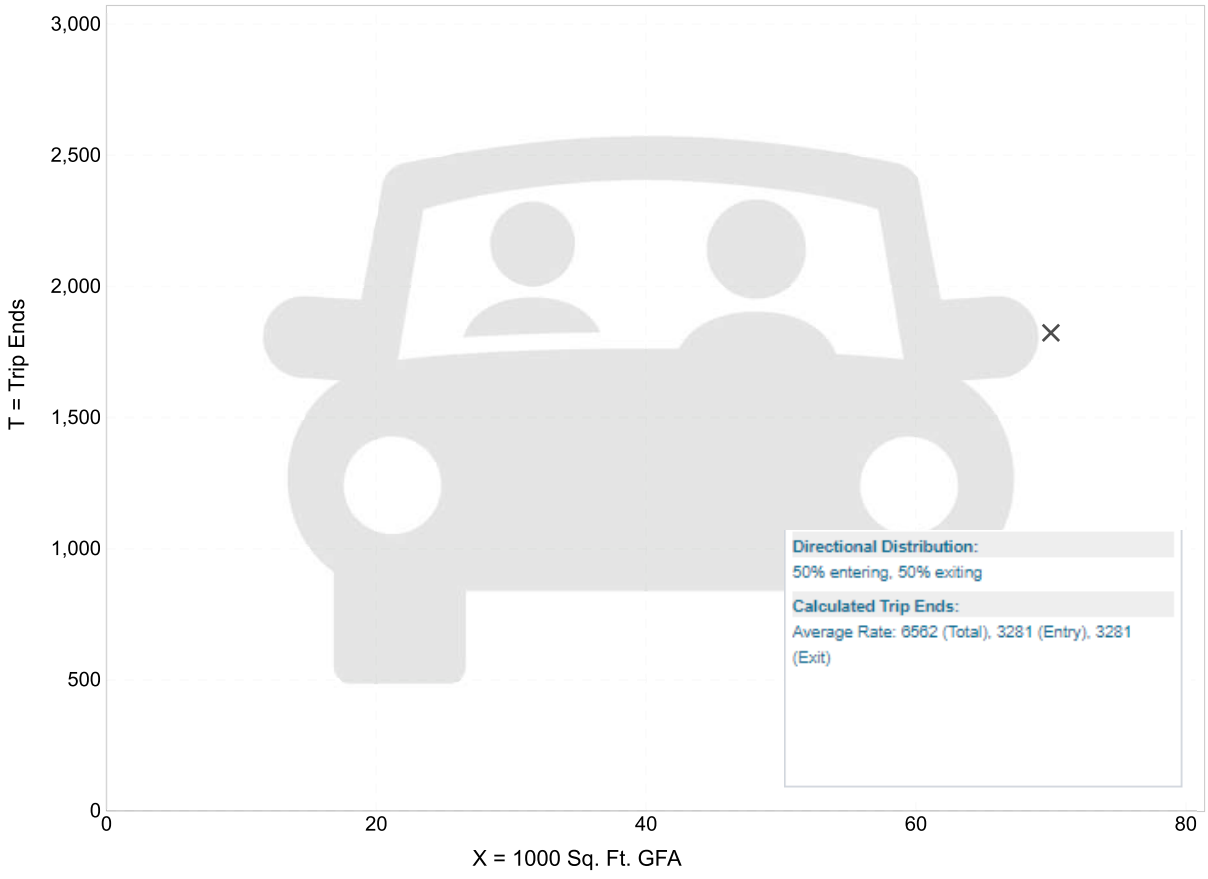
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

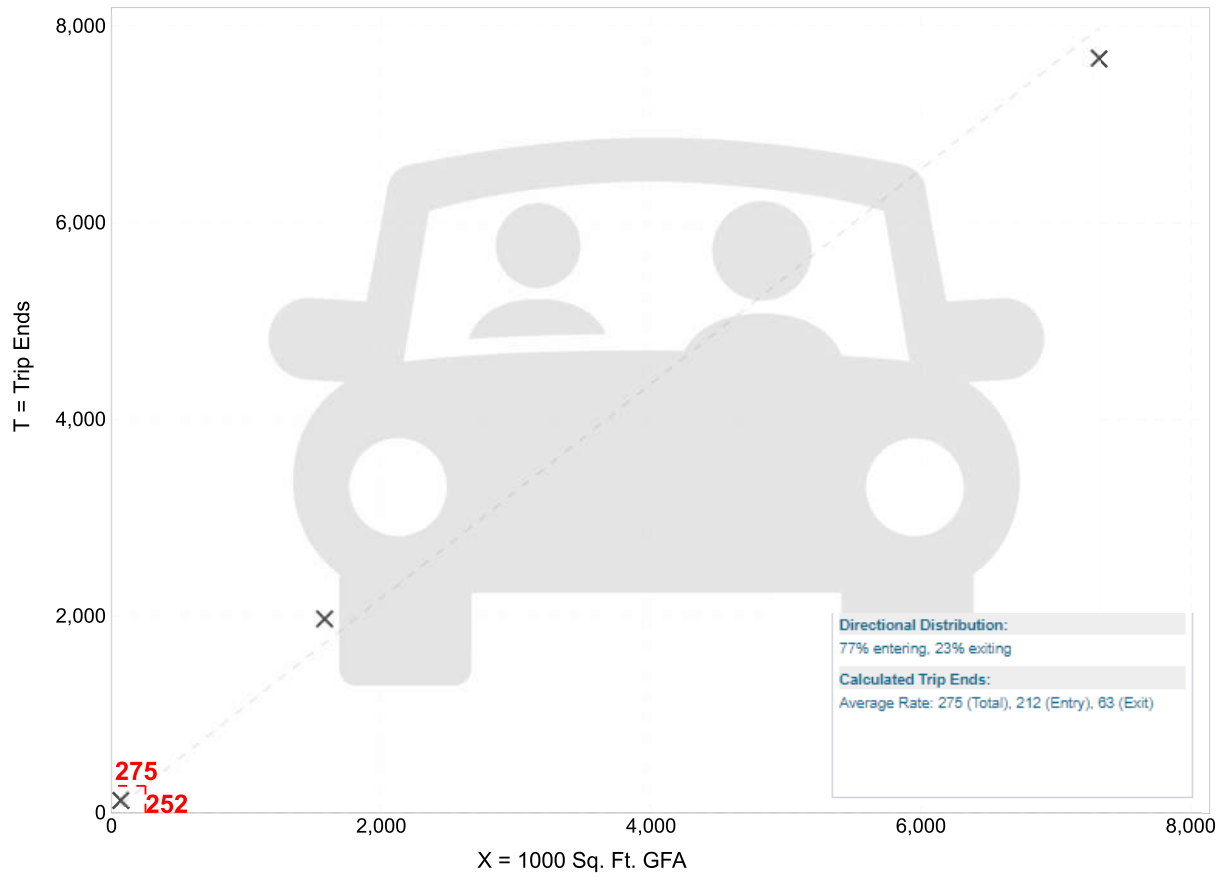
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

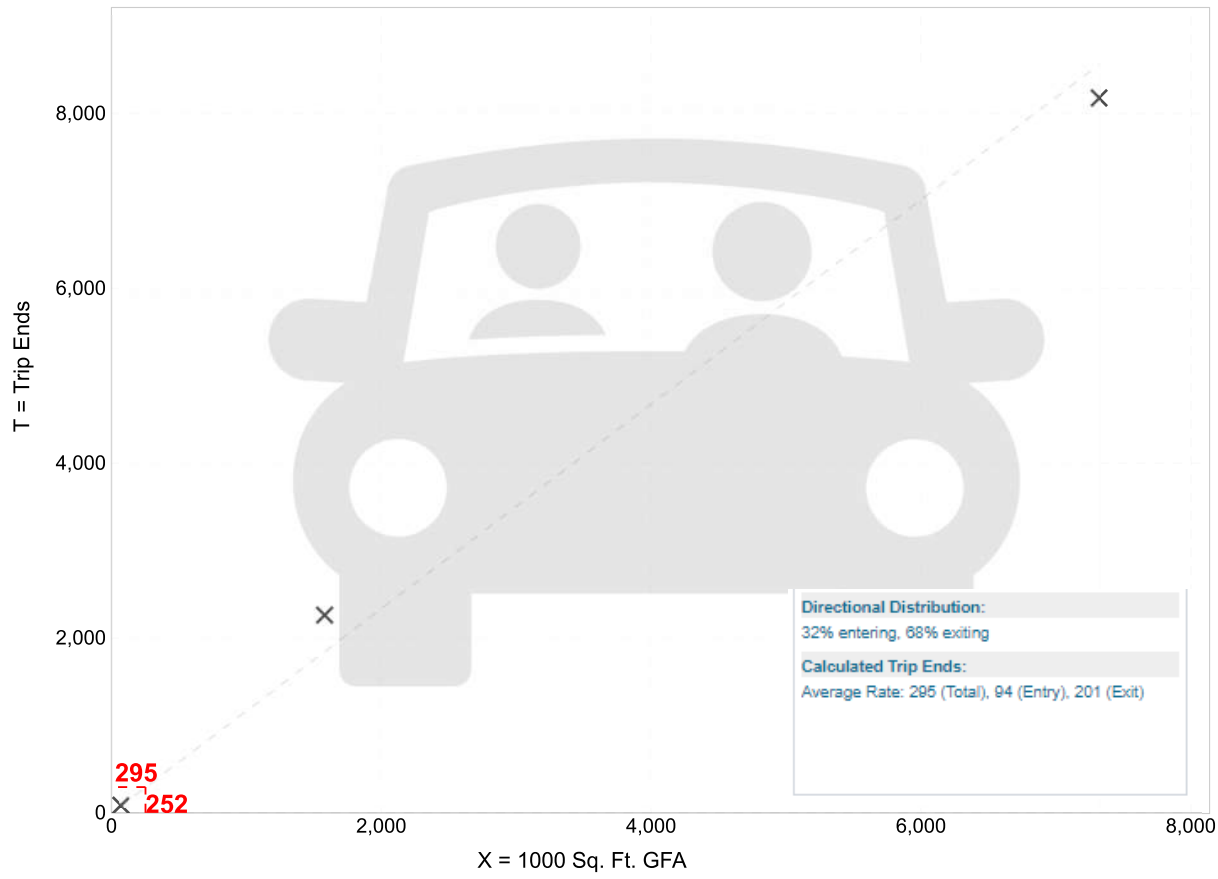
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

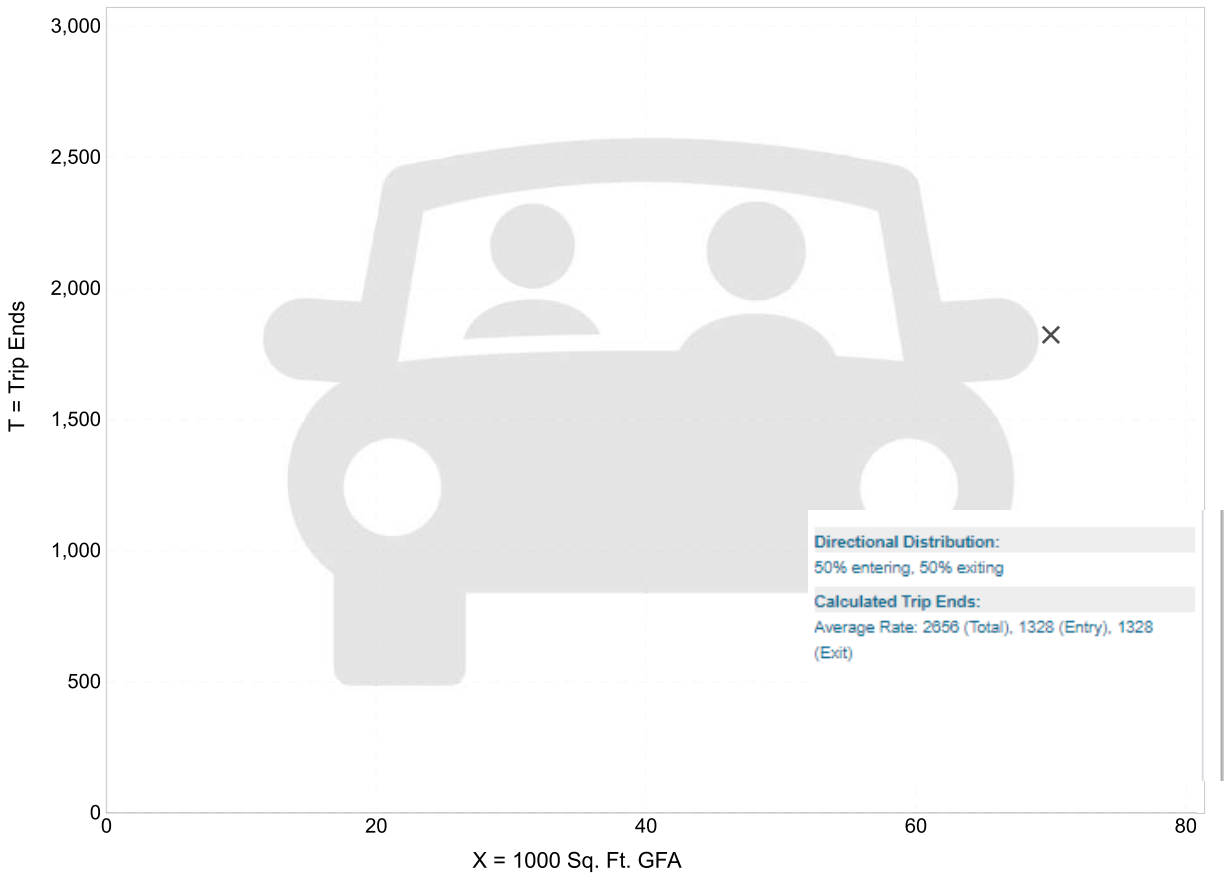
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

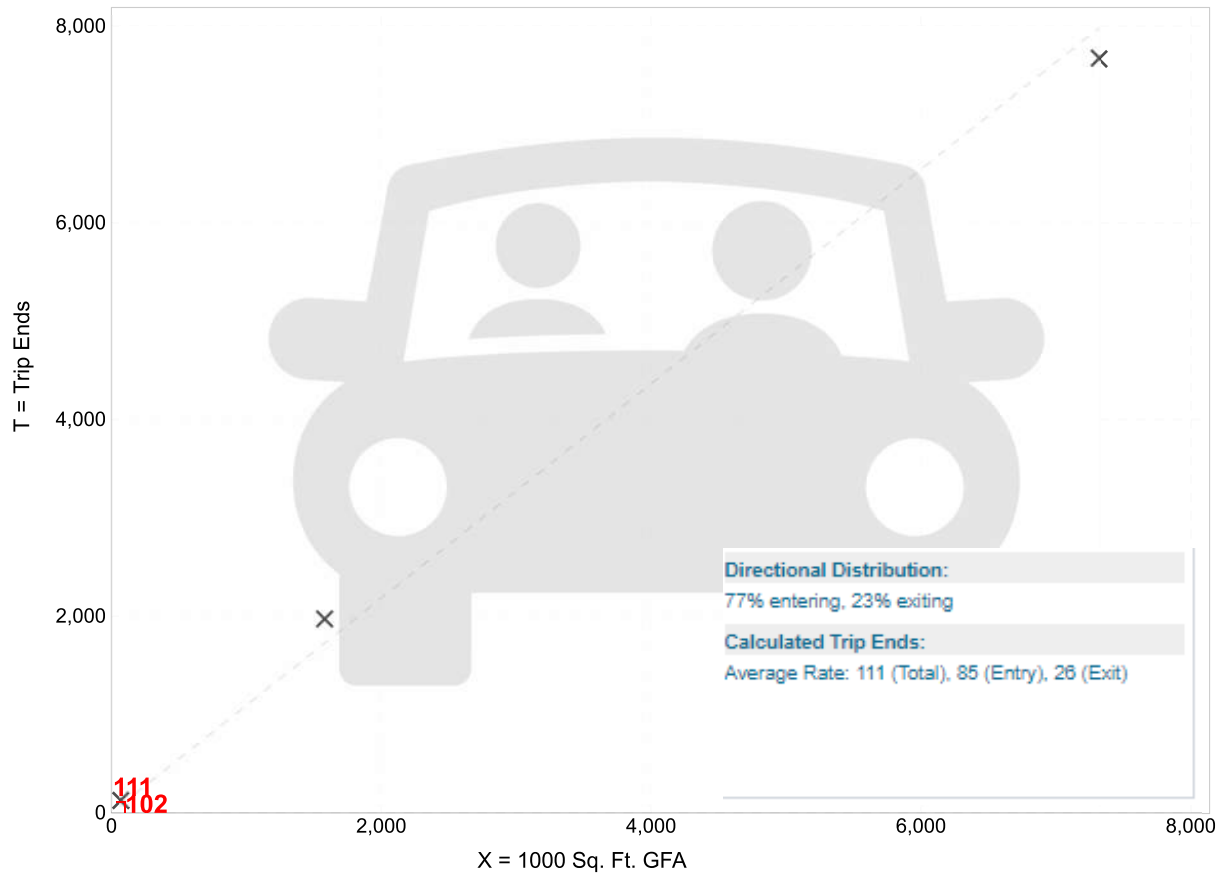
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given** **$R^2$= ****

# University/College
(550)

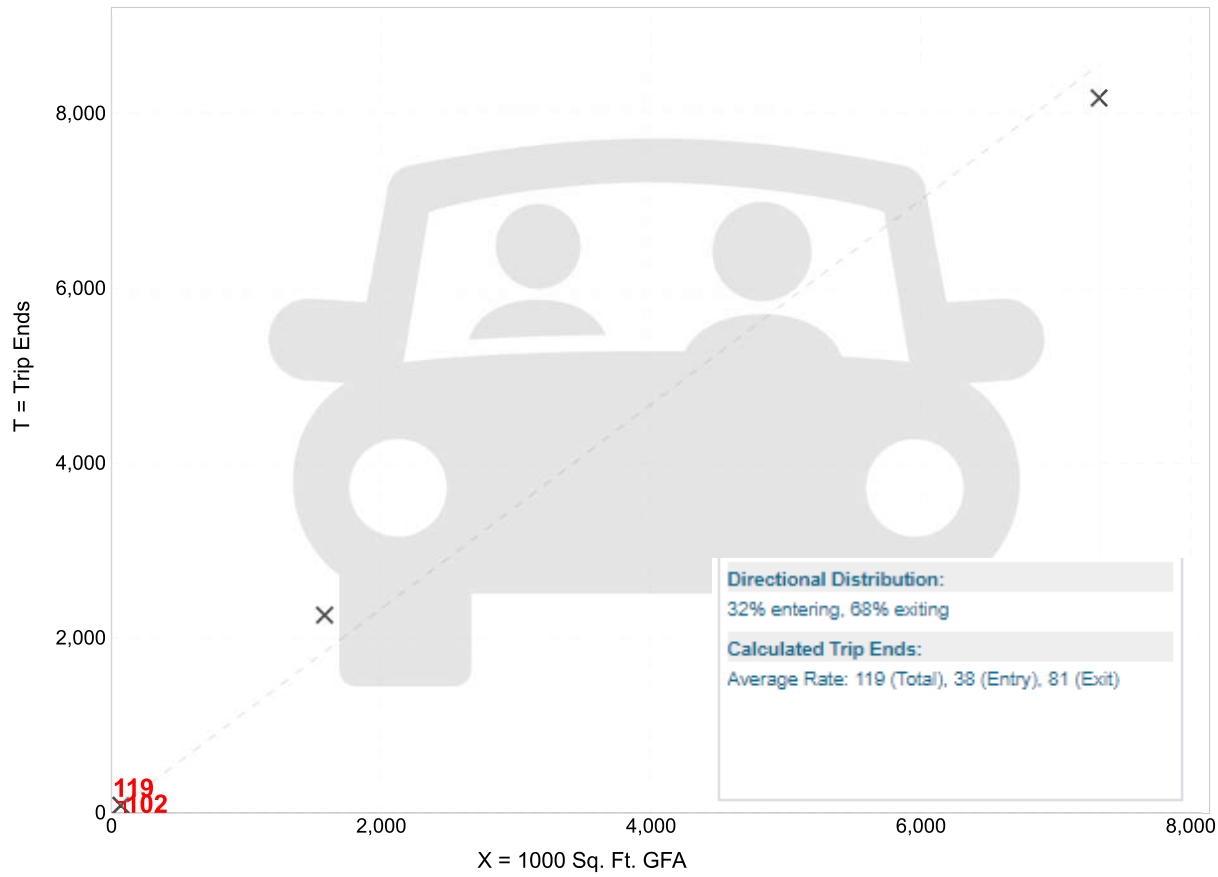
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

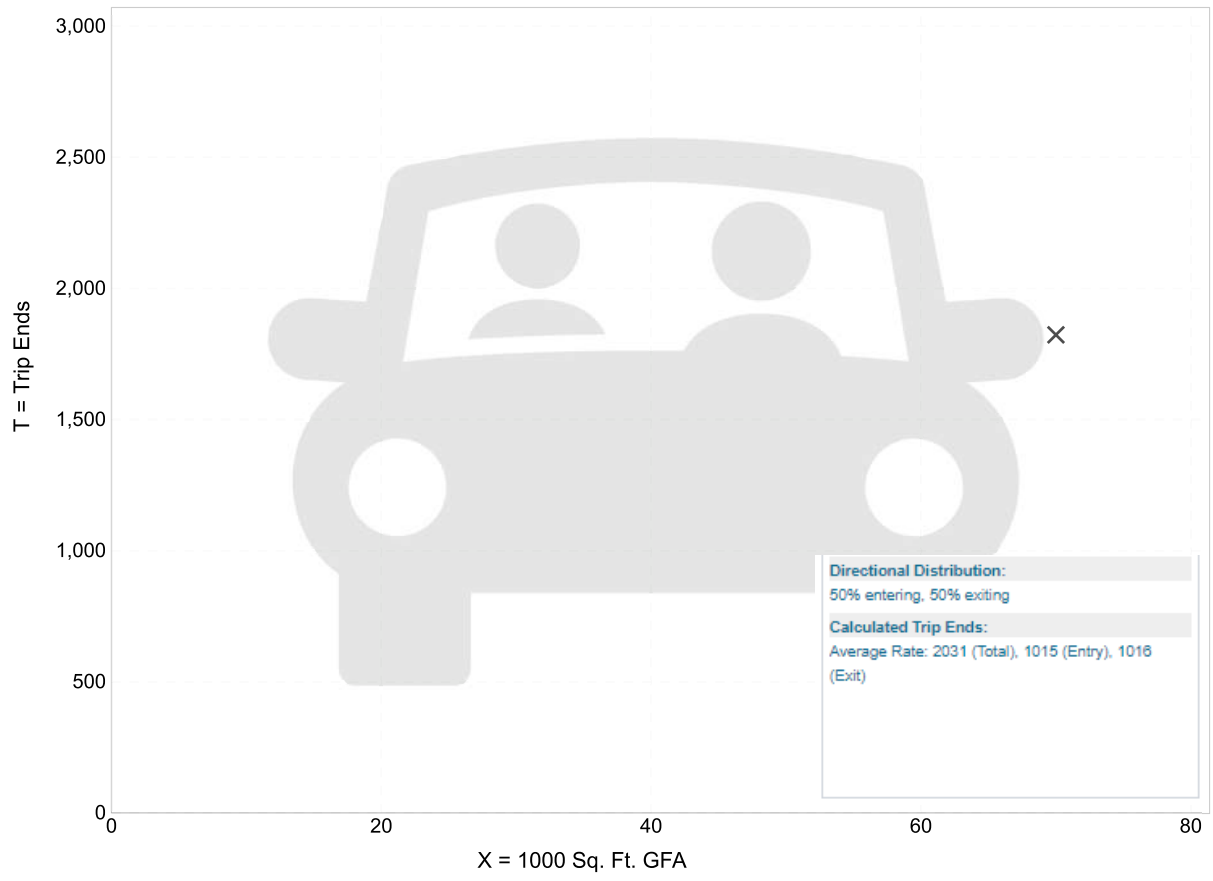
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




× **Study Site** **Average Rate**

**Fitted Curve Equation: Not Given** **$R^2$= ****

# University/College
(550)

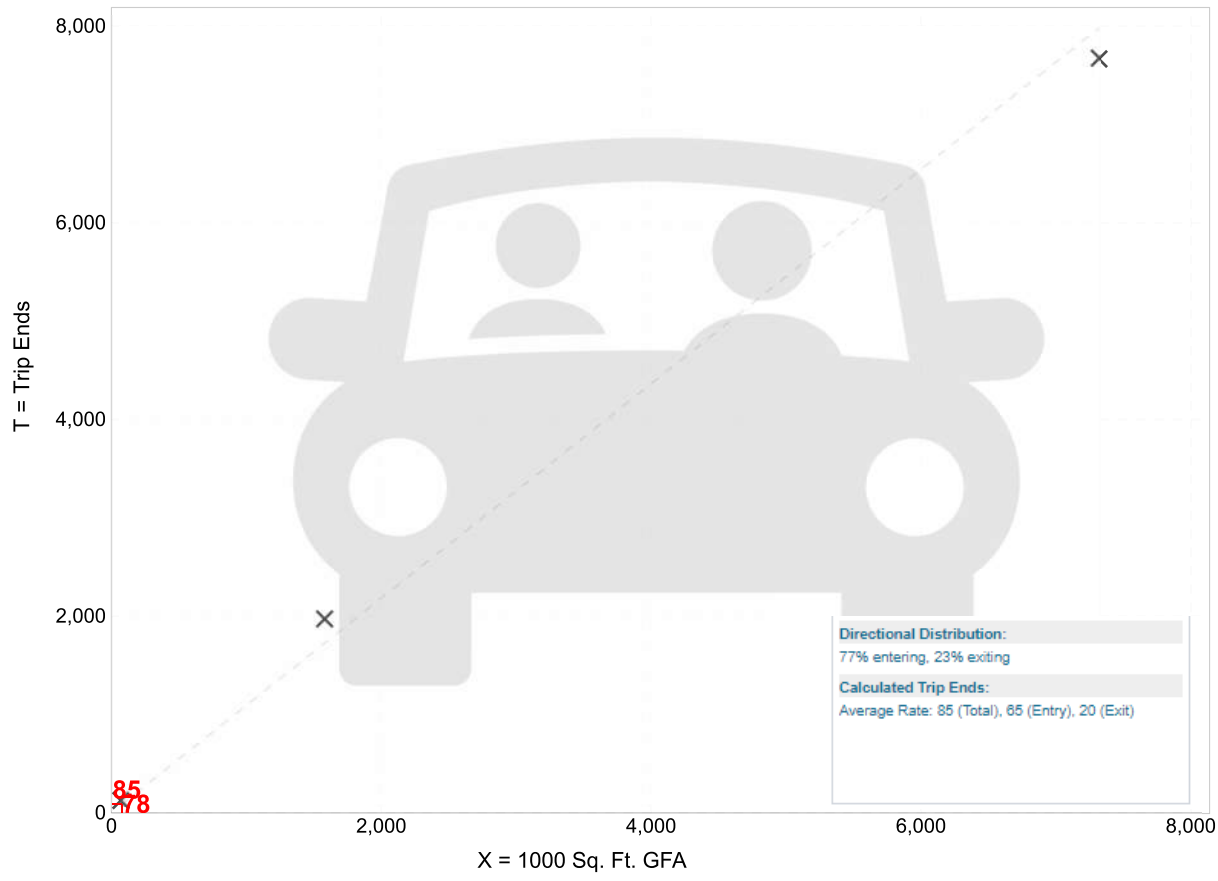
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

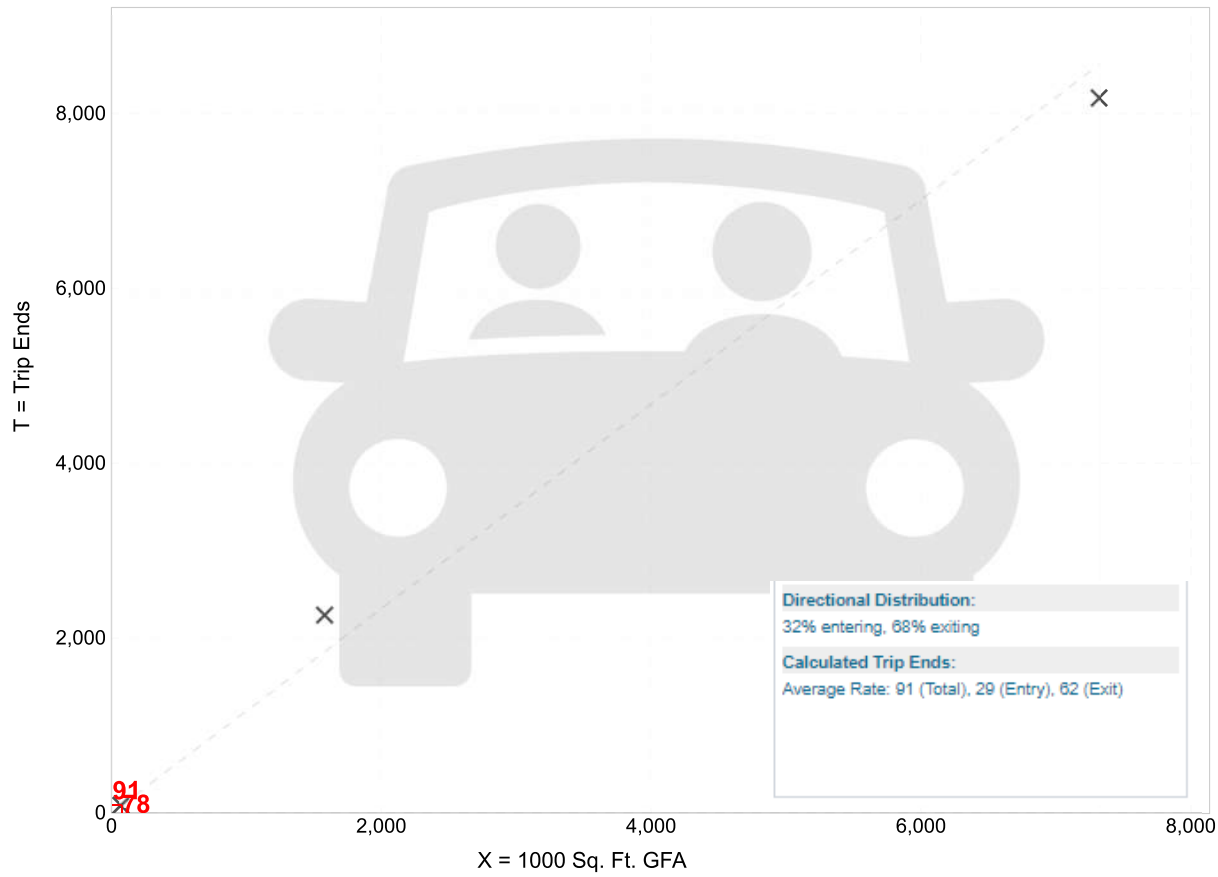
| | |
|---|---|
| **Vehicle Trip Ends vs:** | **1000 Sq. Ft. GFA** |
| **On a:** | **Weekday,** |
| | **Peak Hour of Adjacent Street Traffic,** |
| | **One Hour Between 4 and 6 p.m.** |
| **Setting/Location:** | **General Urban/Suburban** |
| Number of Studies: | 3 |
| Avg. 1000 Sq. Ft. GFA: | 2990 |
| Directional Distribution: | 32% entering, 68% exiting |

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

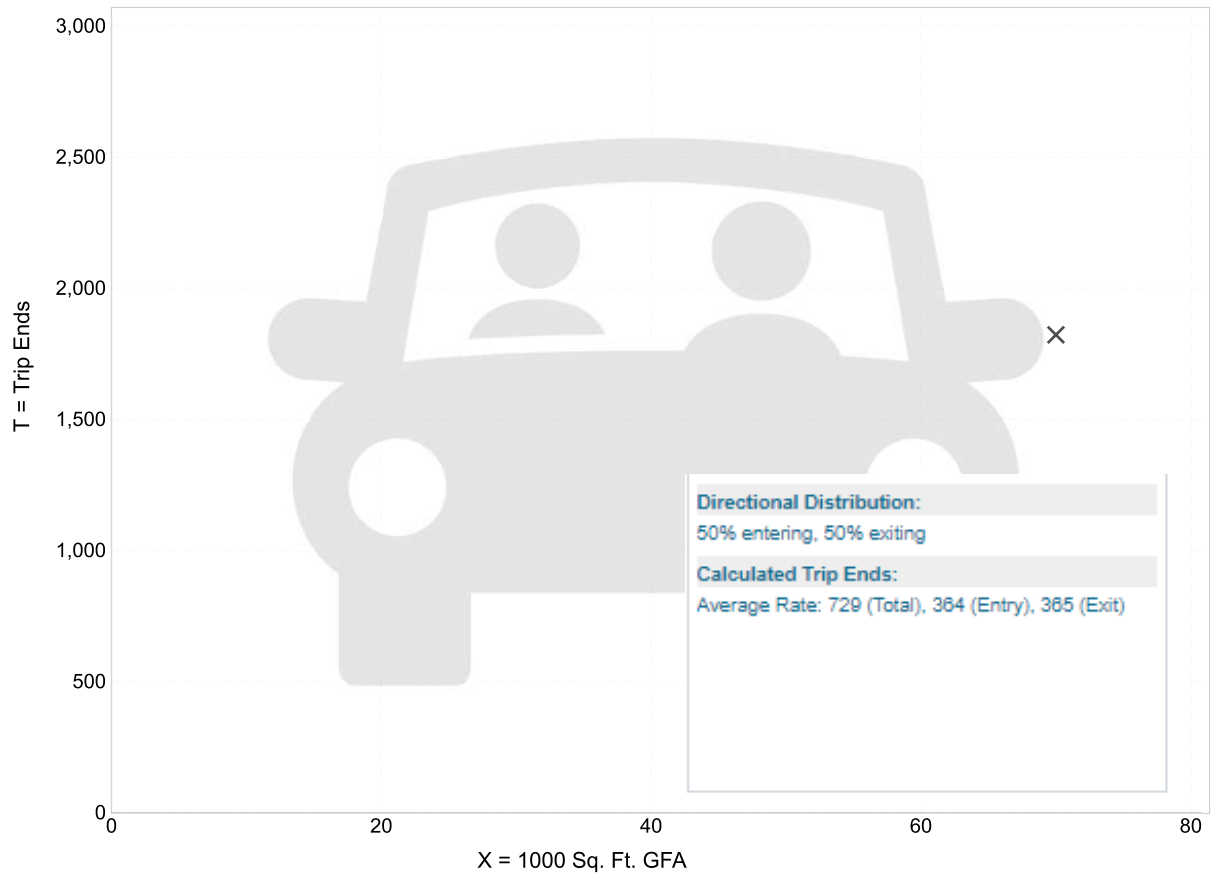
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

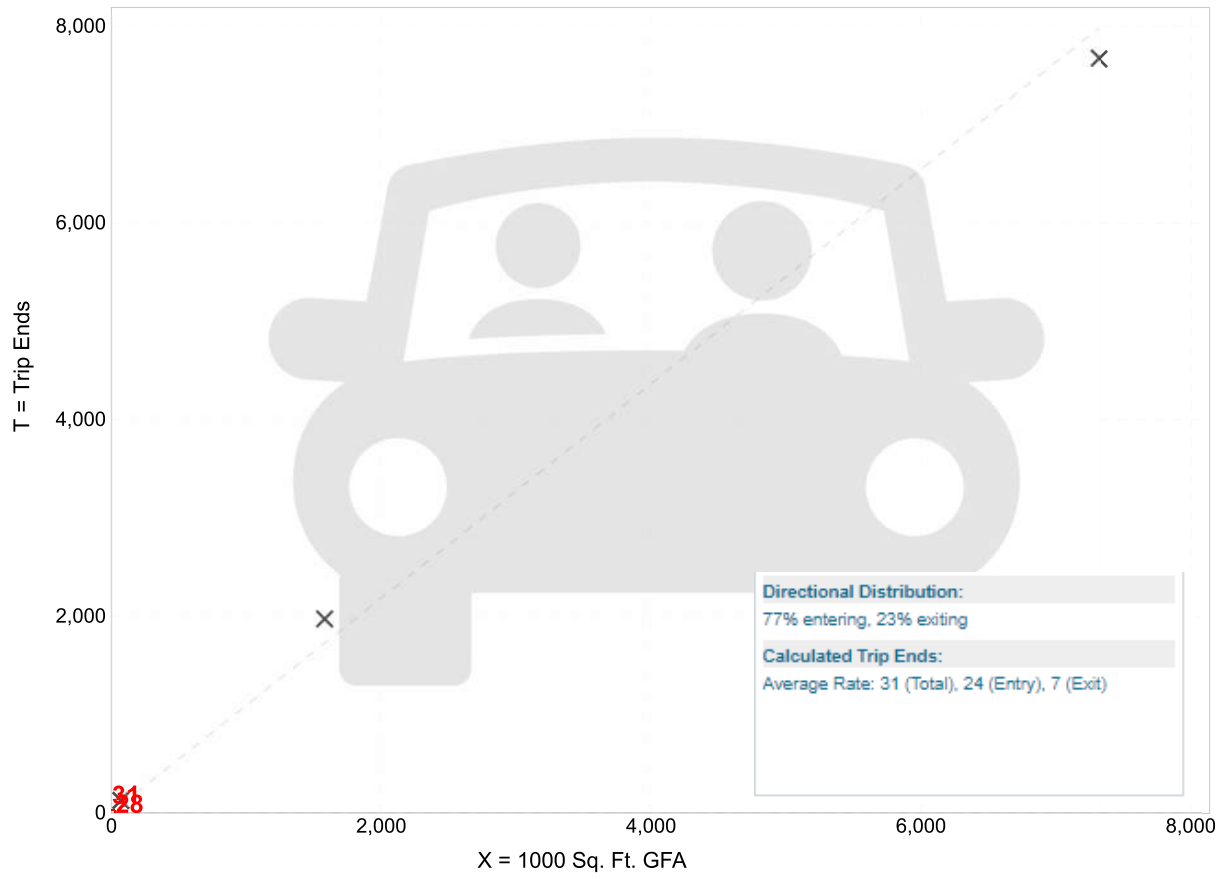
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

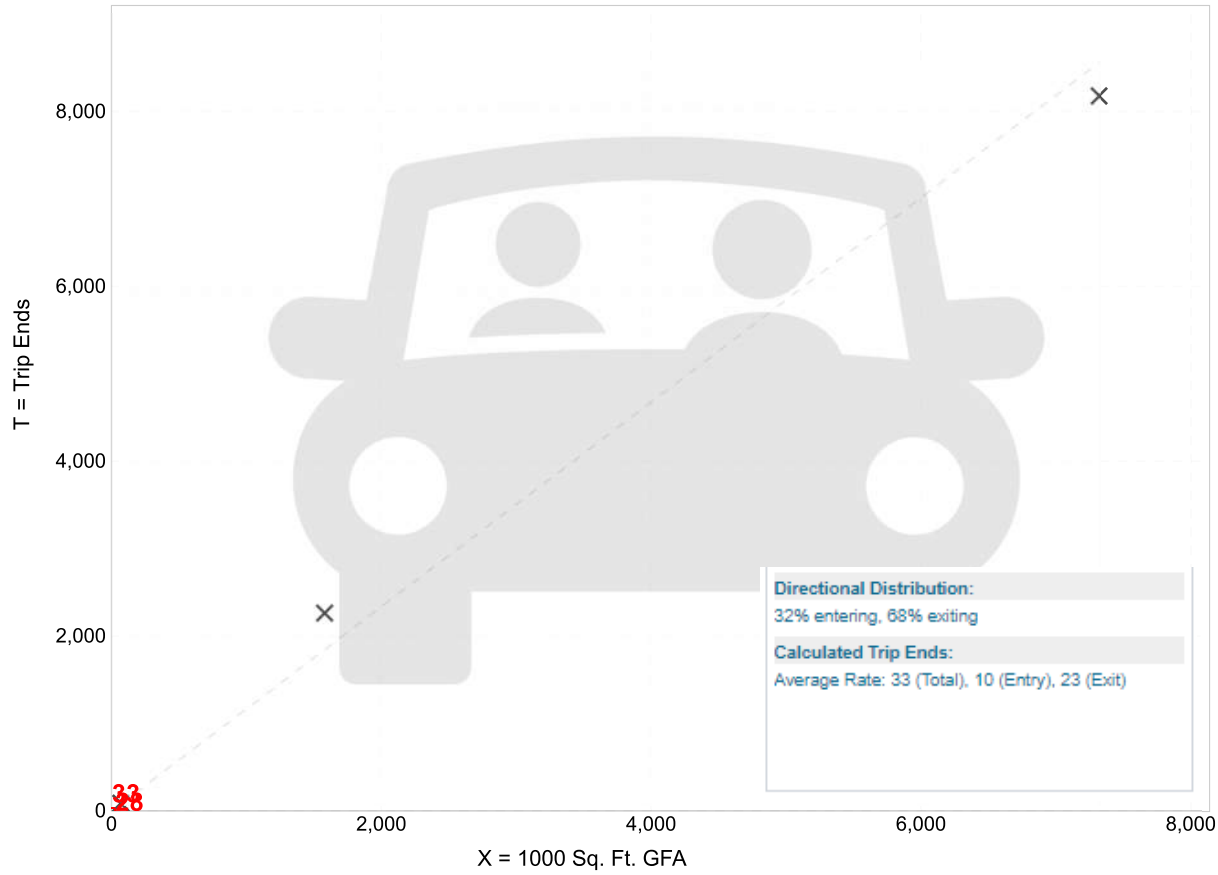
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

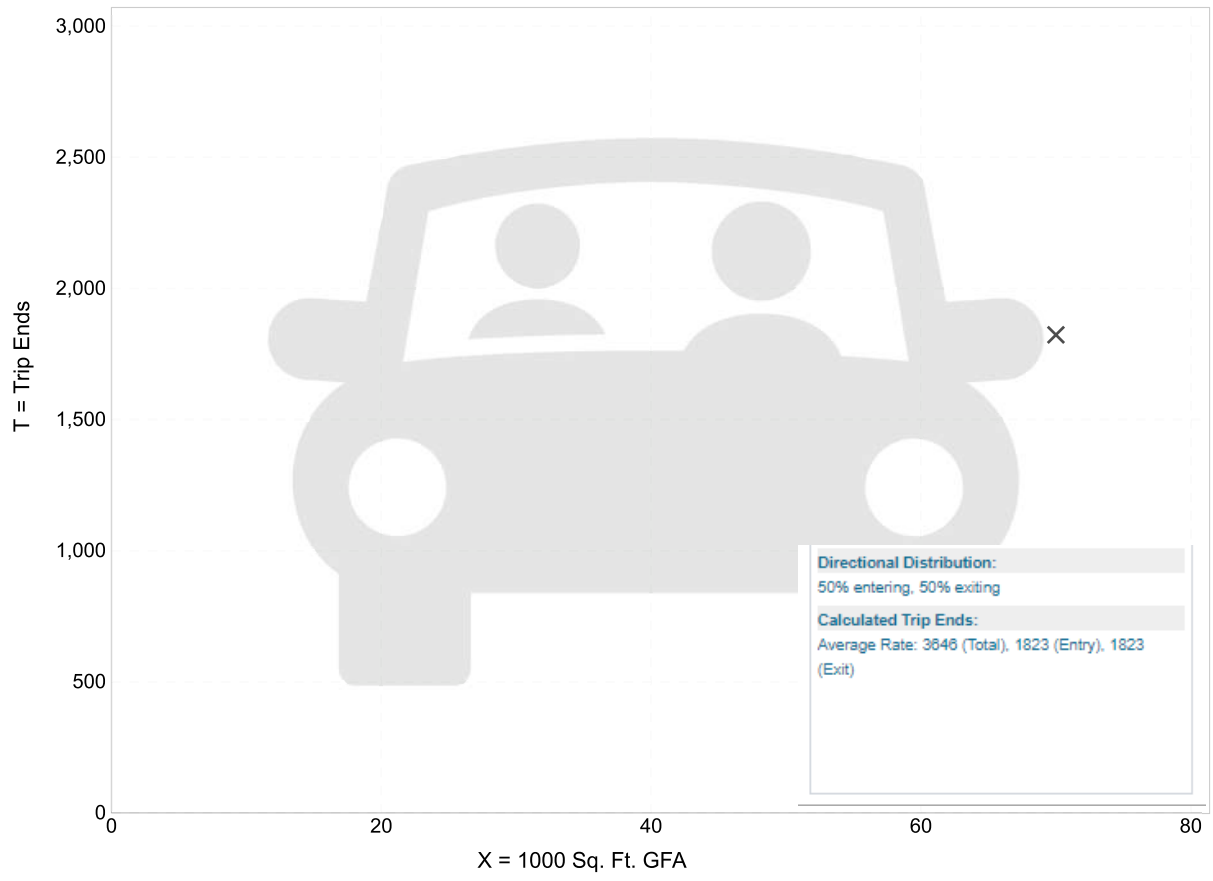
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

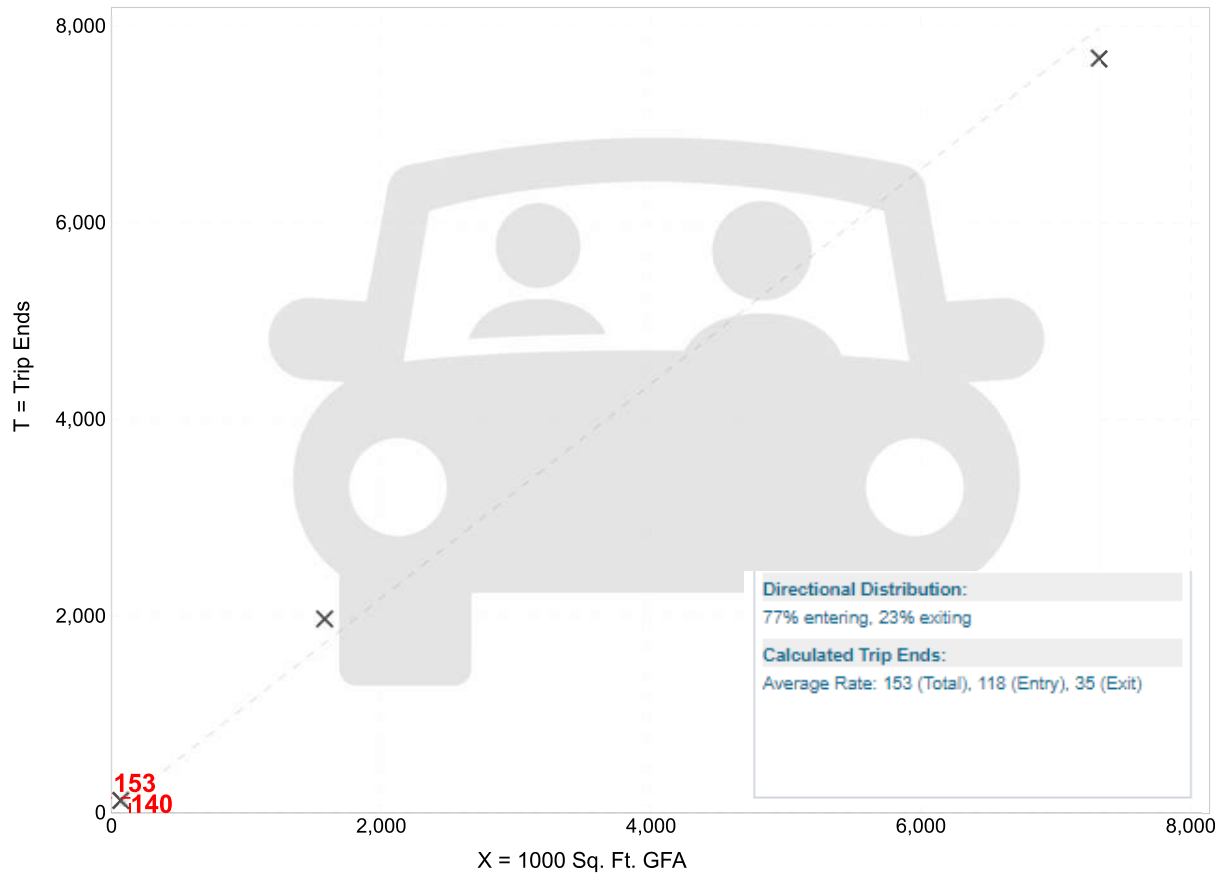
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

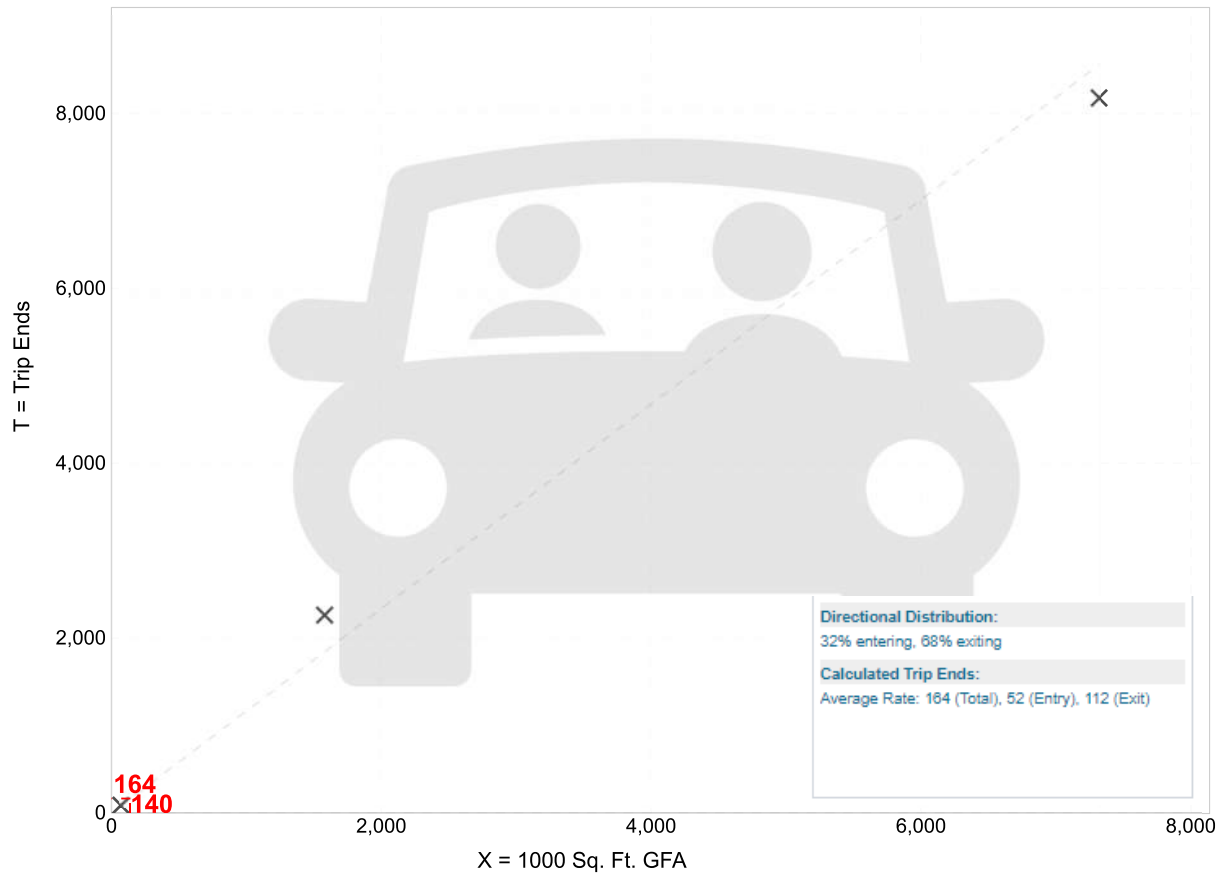
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

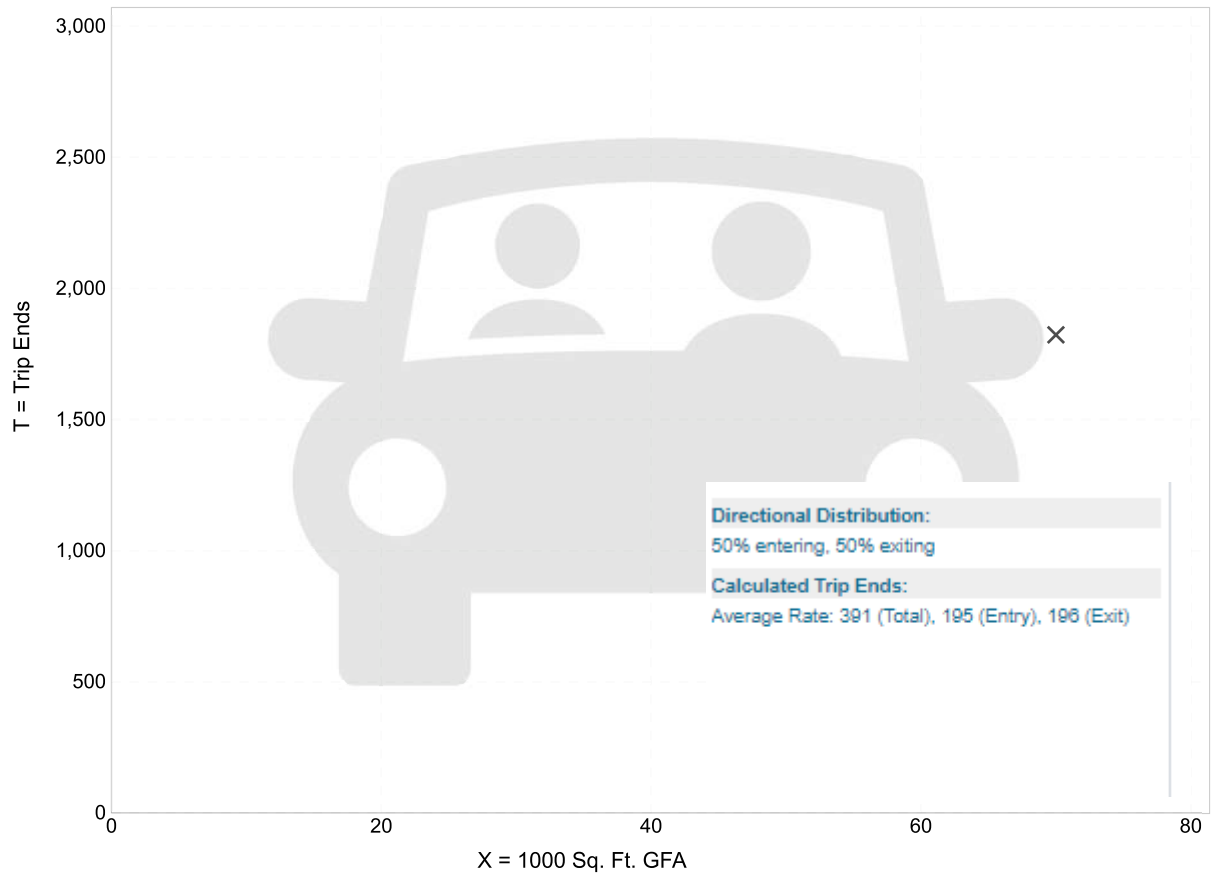
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




× **Study Site** - - - - **Average Rate**

**Fitted Curve Equation: Not Given** **$R^2$= ****

# University/College
(550)

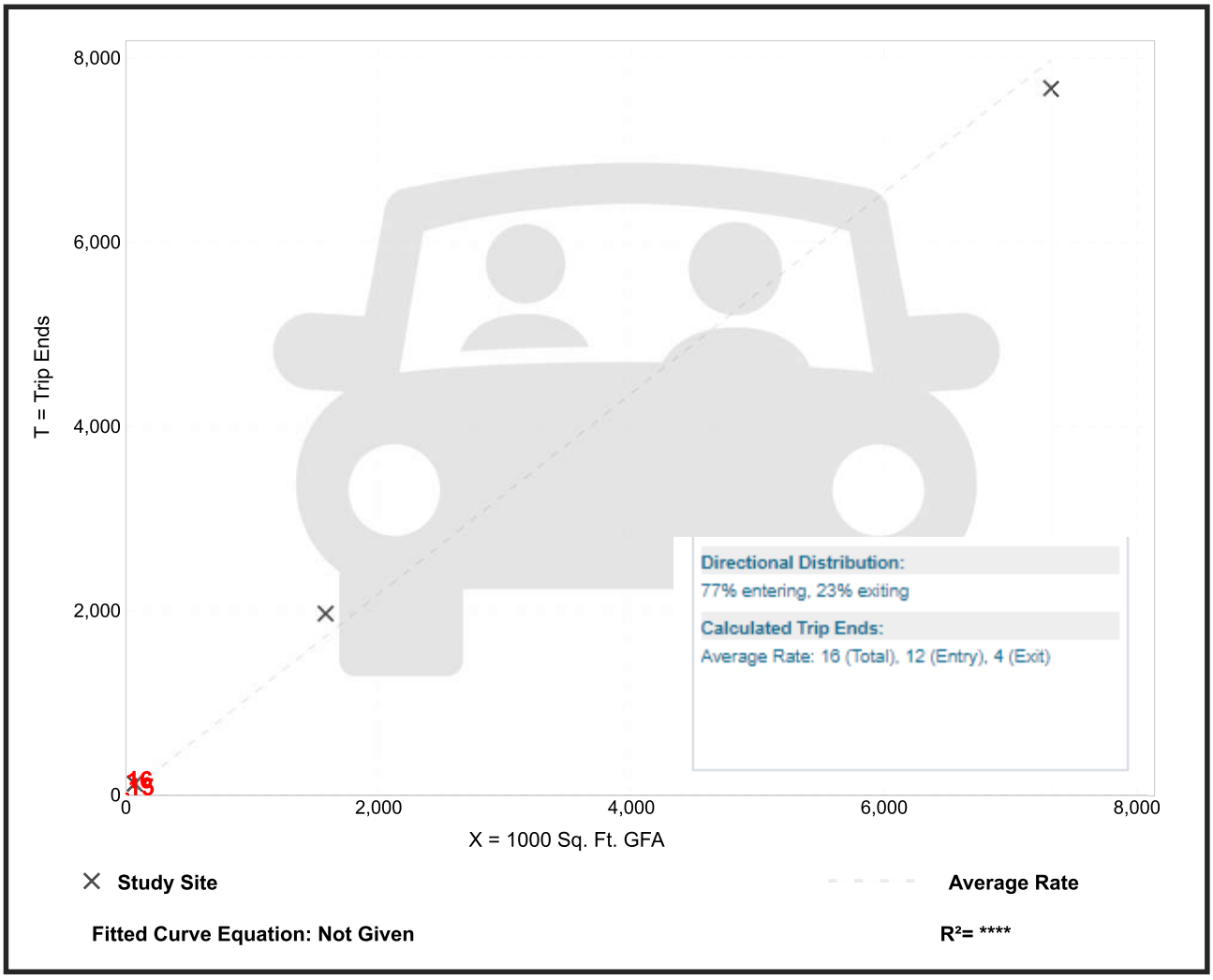
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

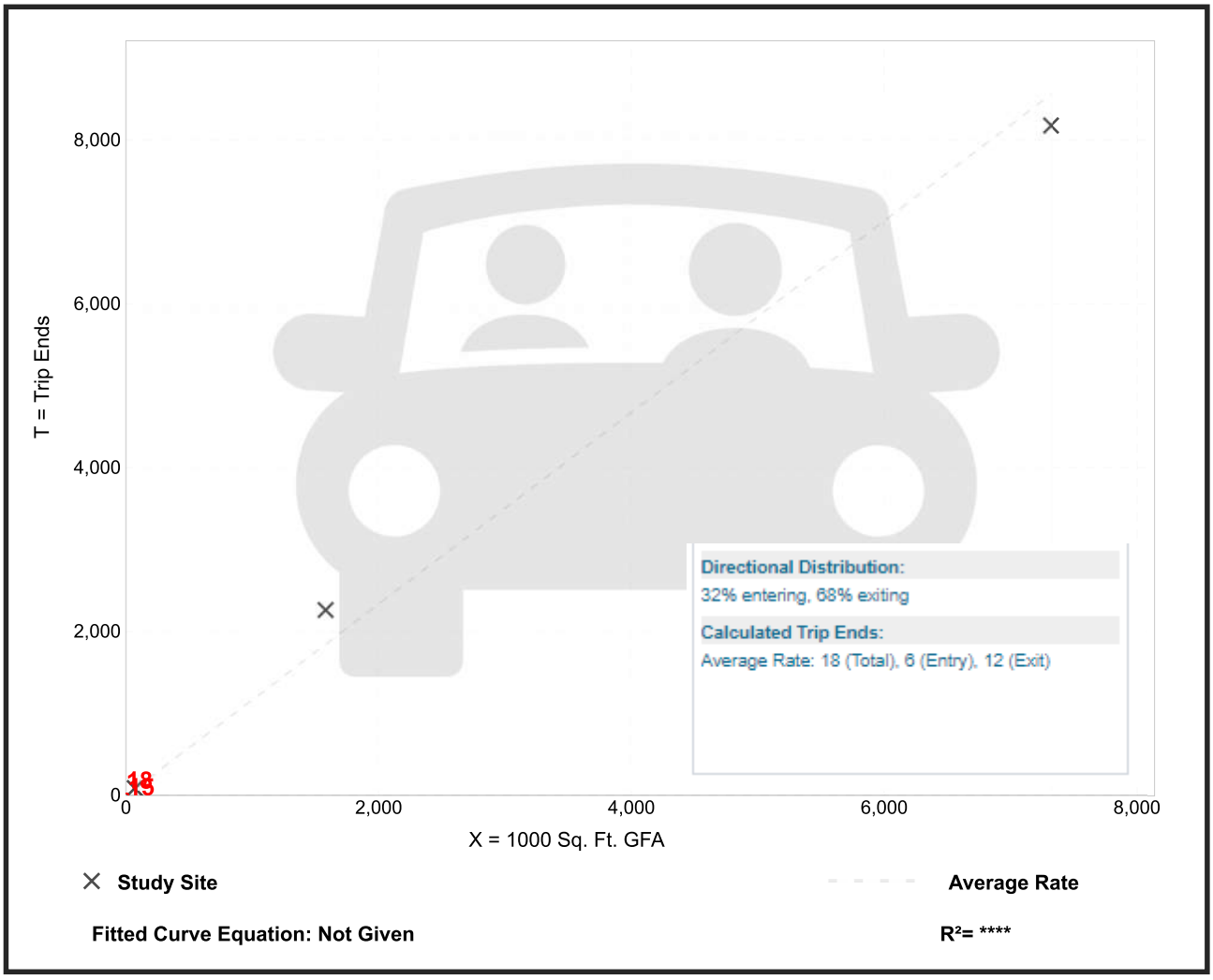
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***

**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

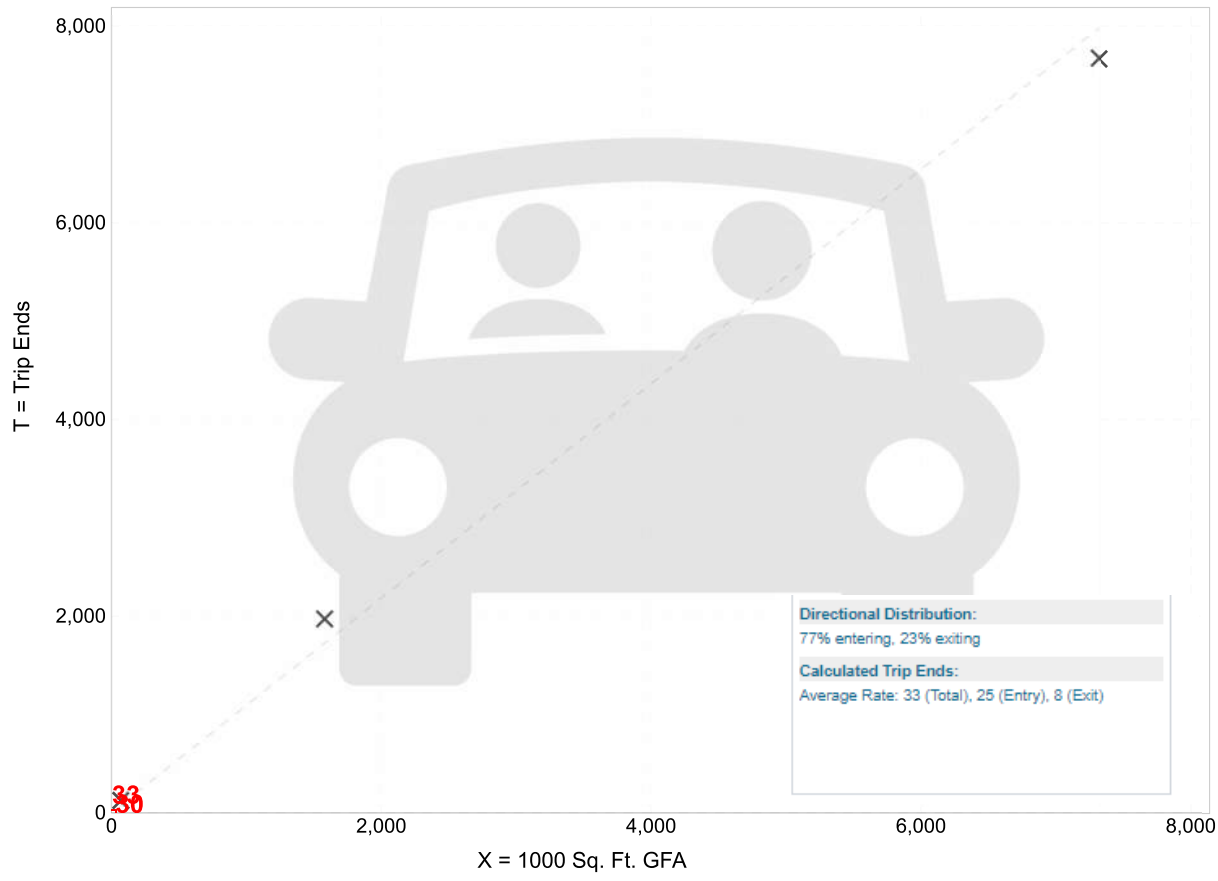
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

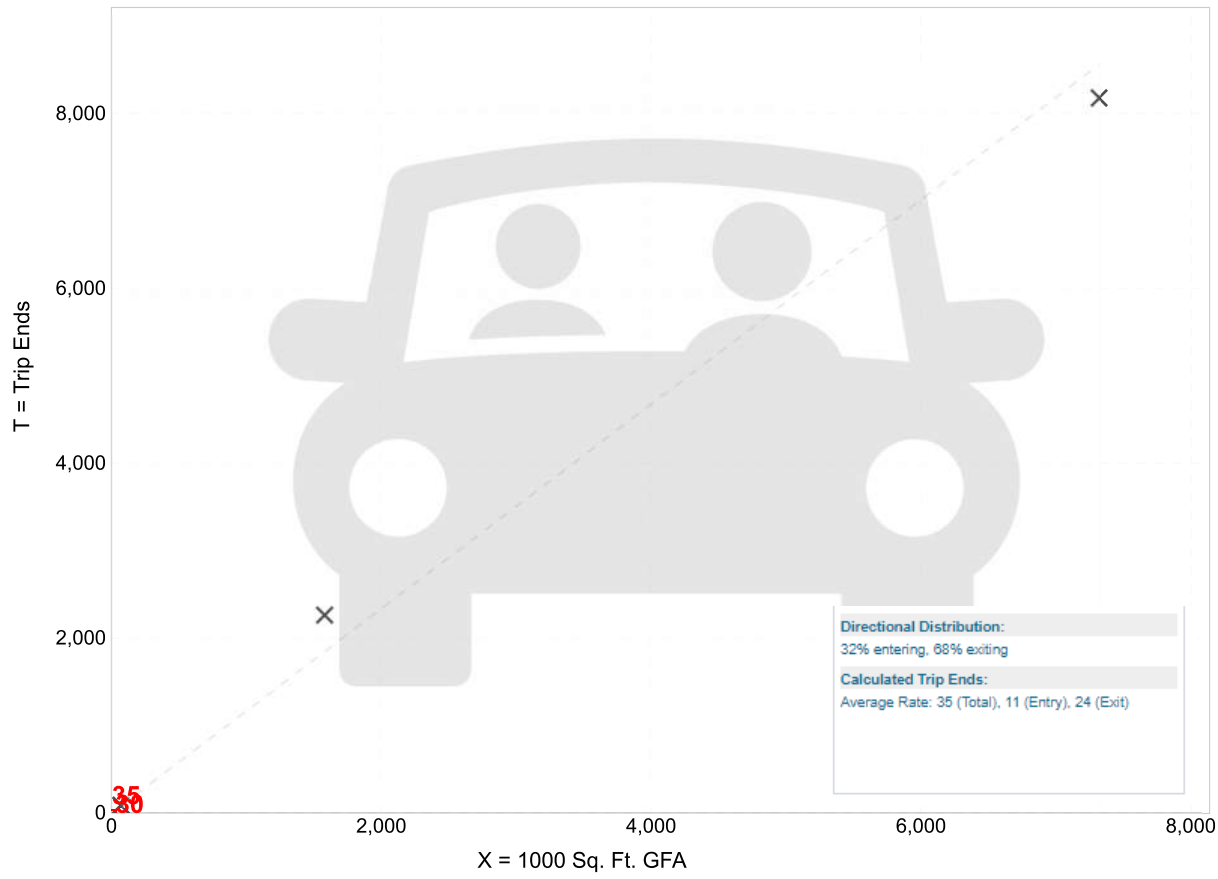
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

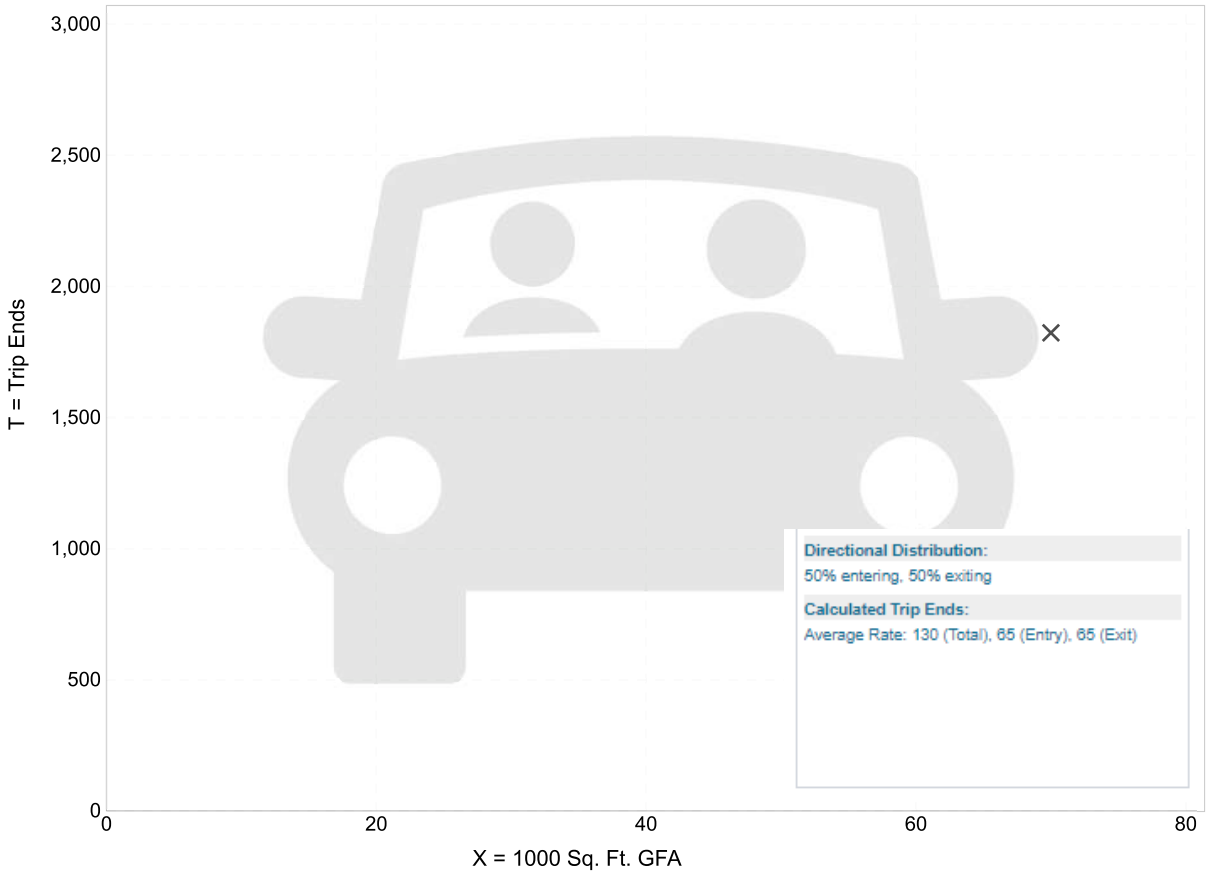
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

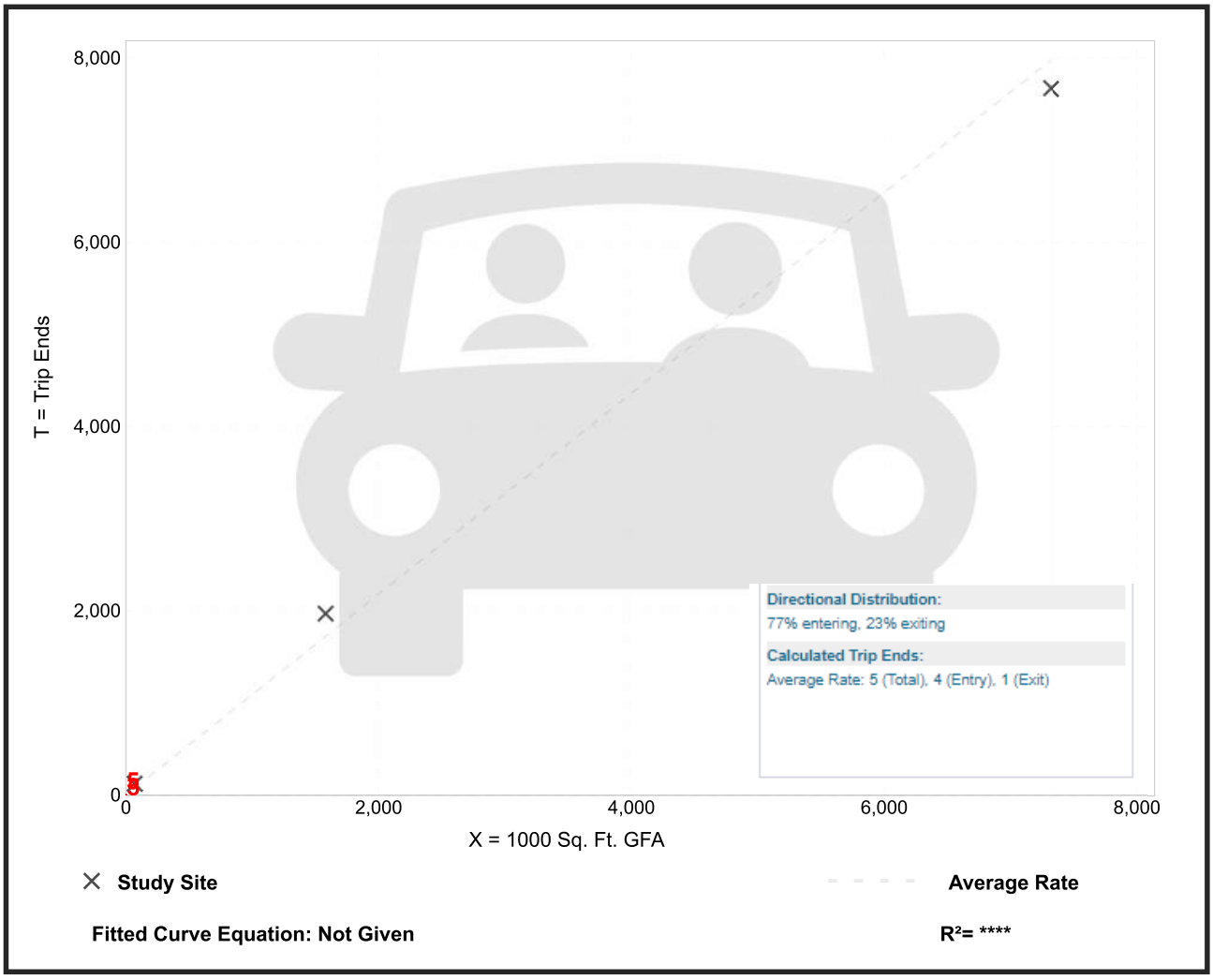
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given** **$R^2$= ****

# University/College
(550)

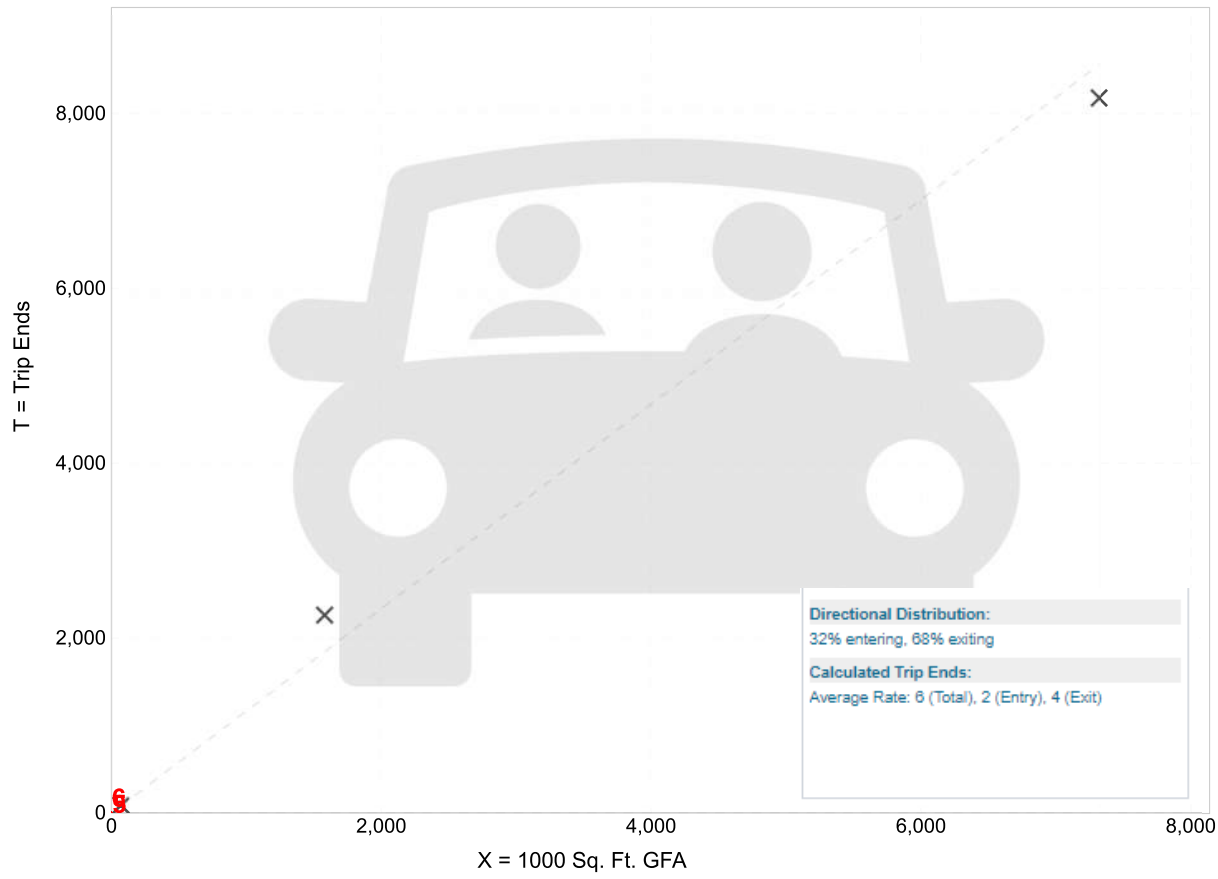
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

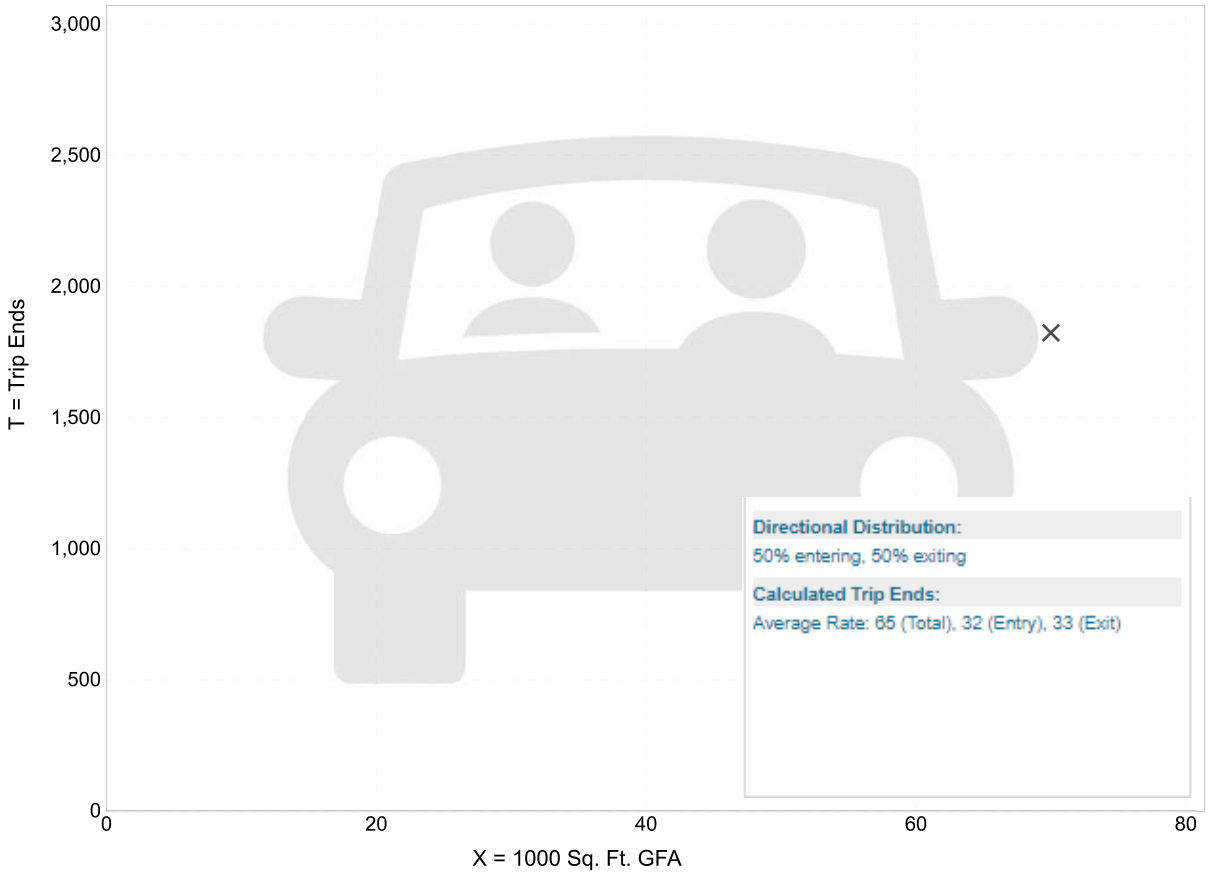
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

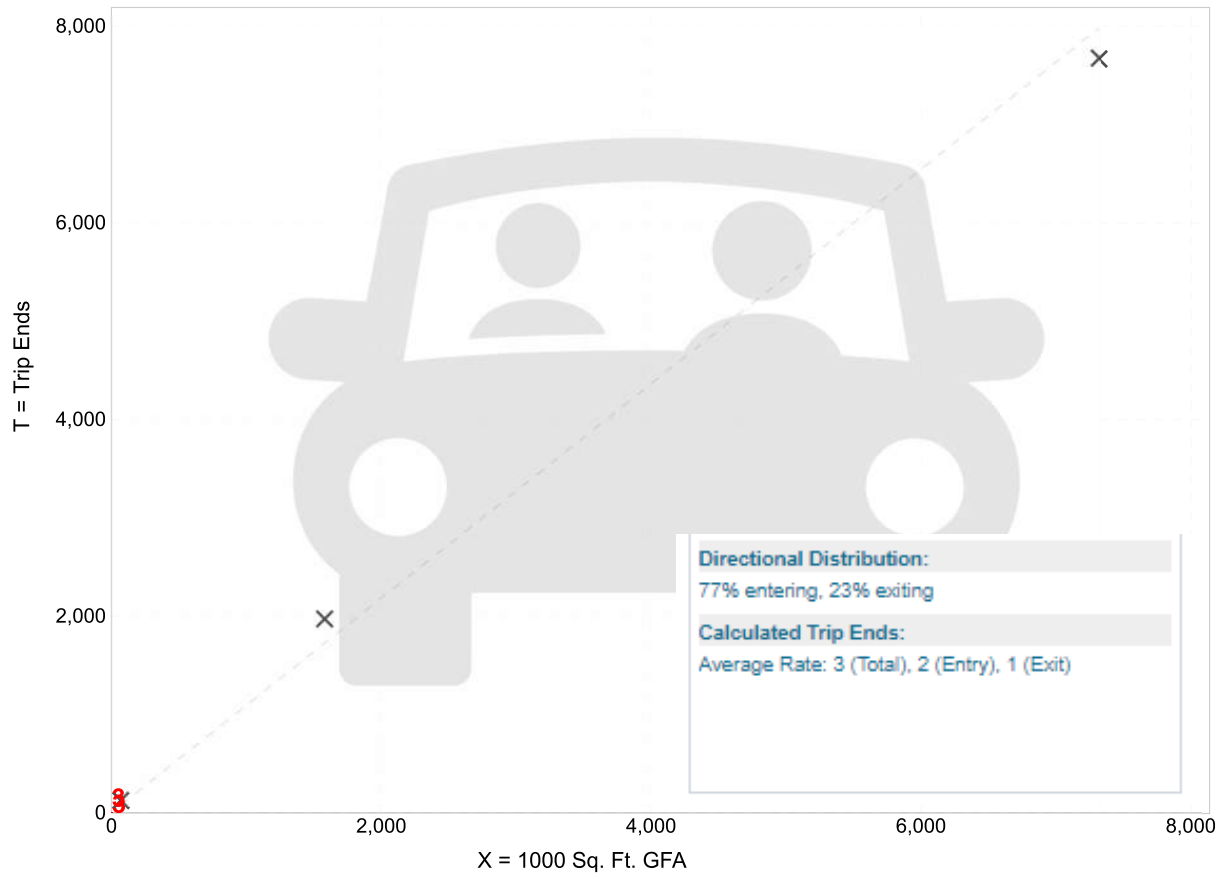
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given** **$R^2$= ****

*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

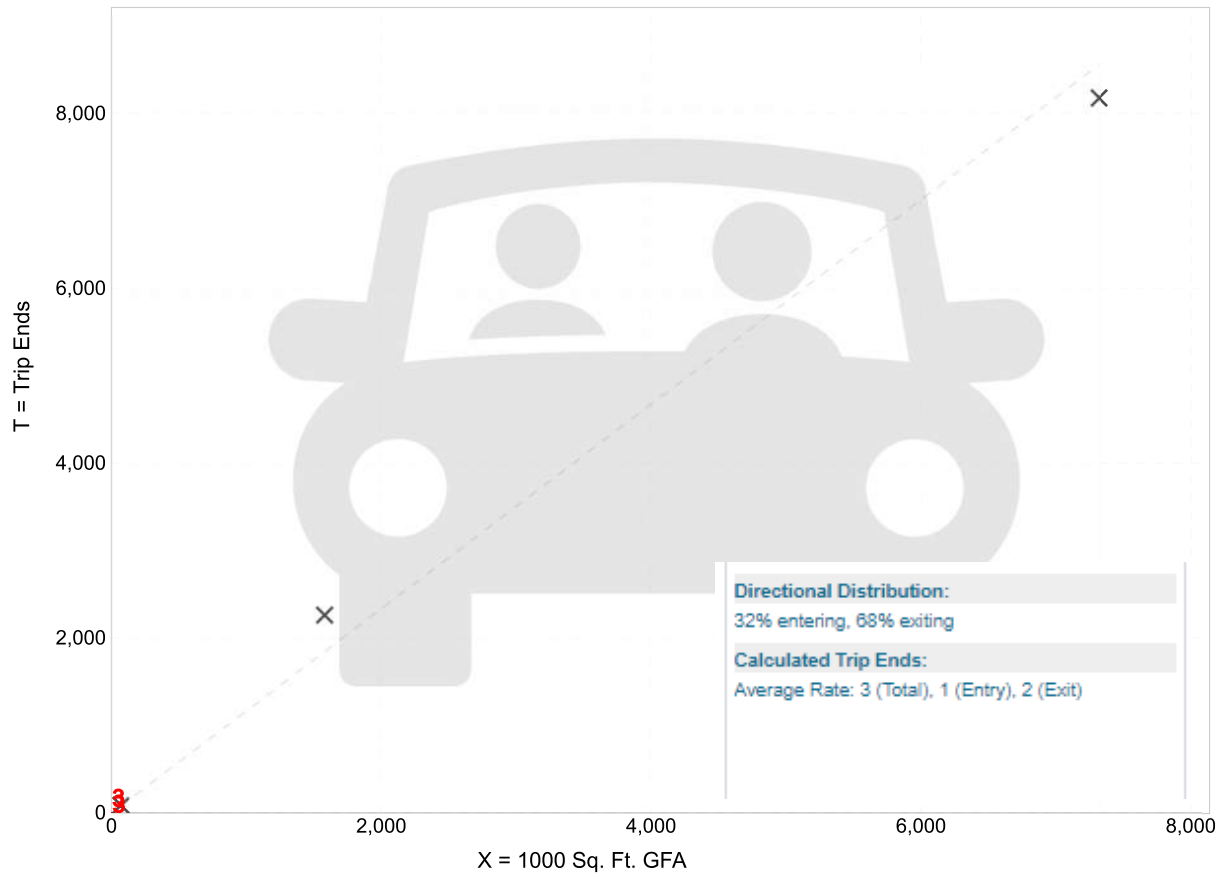
| | |
|---|---|
| **Vehicle Trip Ends vs:** | **1000 Sq. Ft. GFA** |
| **On a:** | **Weekday,** |
| | **Peak Hour of Adjacent Street Traffic,** |
| | **One Hour Between 4 and 6 p.m.** |
| **Setting/Location:** | **General Urban/Suburban** |
| Number of Studies: | 3 |
| Avg. 1000 Sq. Ft. GFA: | 2990 |
| Directional Distribution: | 32% entering, 68% exiting |

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given** **$R^2$= ******

*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

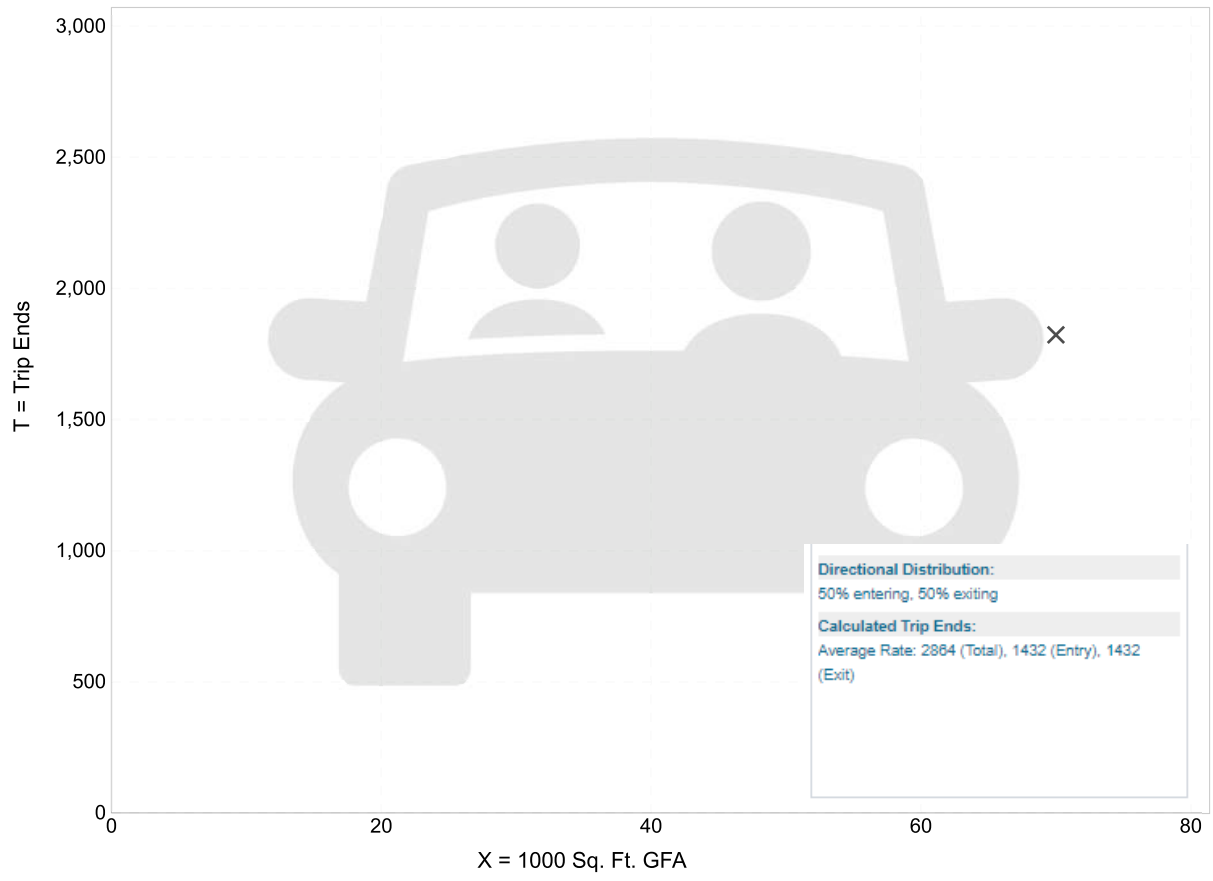
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

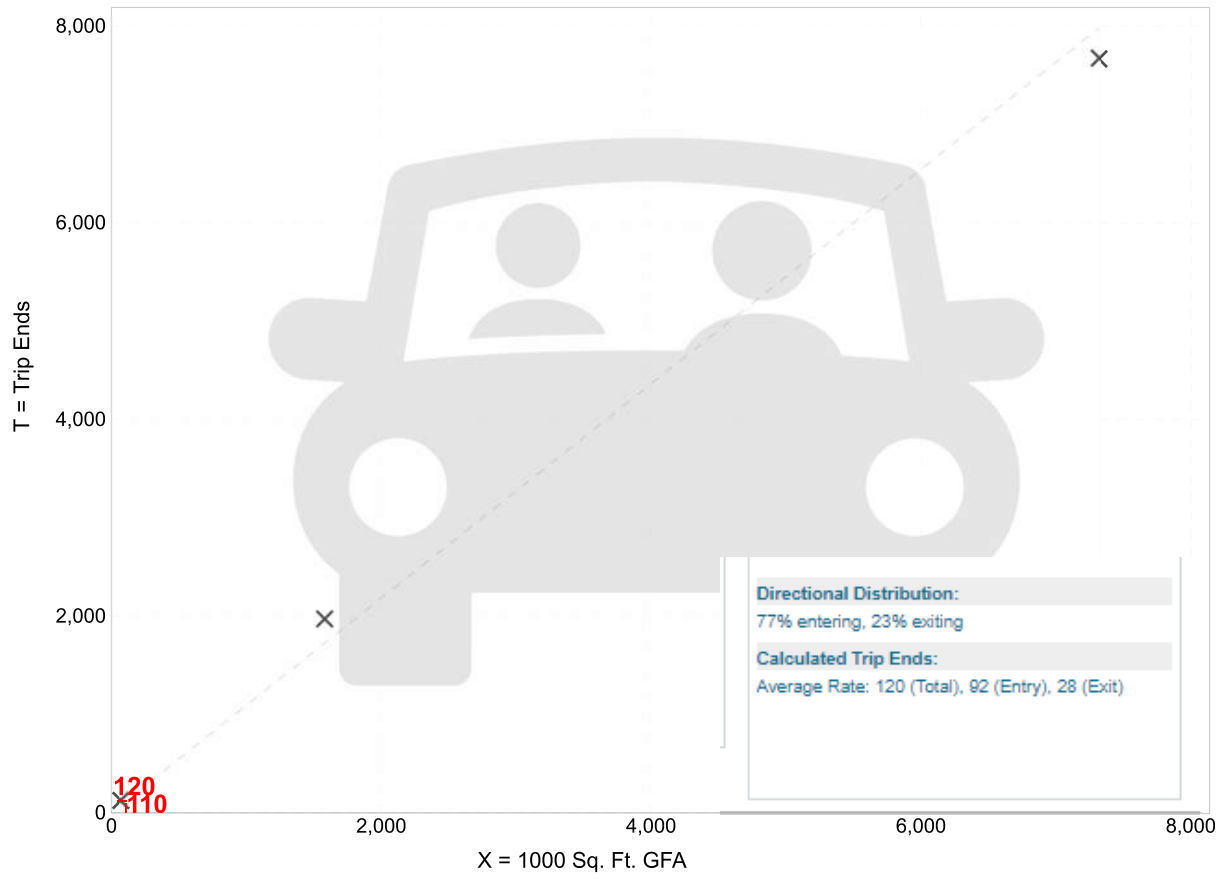
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




× **Study Site** - - - - **Average Rate**

**Fitted Curve Equation: Not Given** **$R^2$= ******

# University/College
(550)

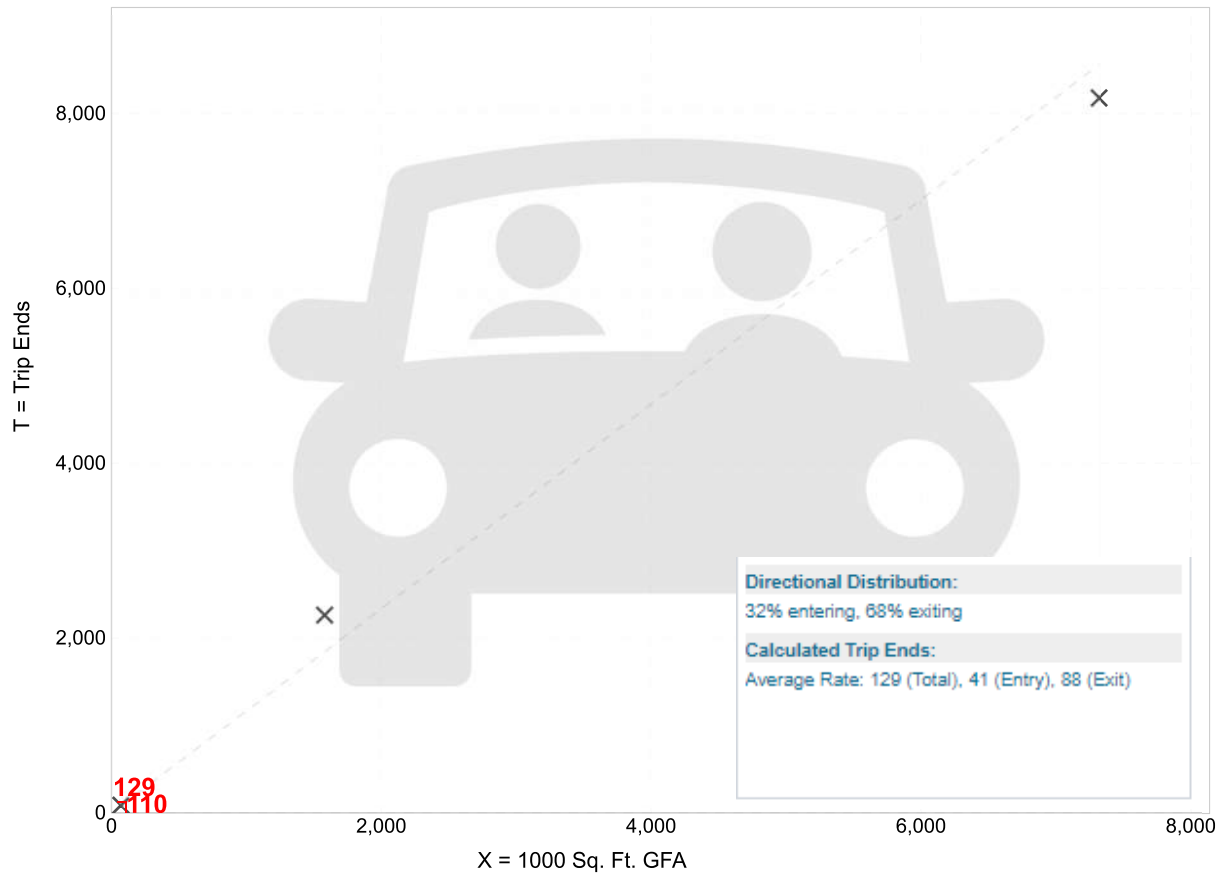
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

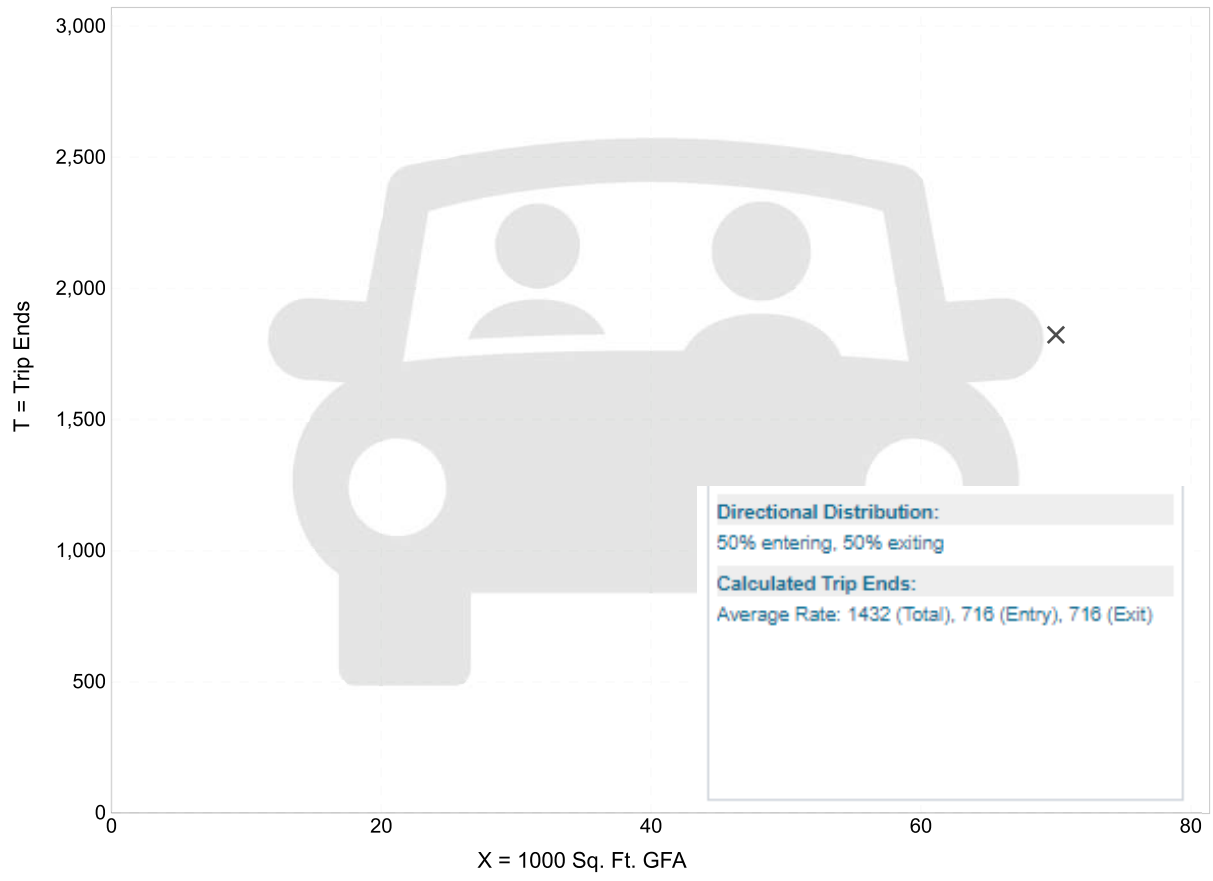
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




× **Study Site** - - - - **Average Rate**

**Fitted Curve Equation: Not Given** **$R^2$= ****

# University/College
(550)

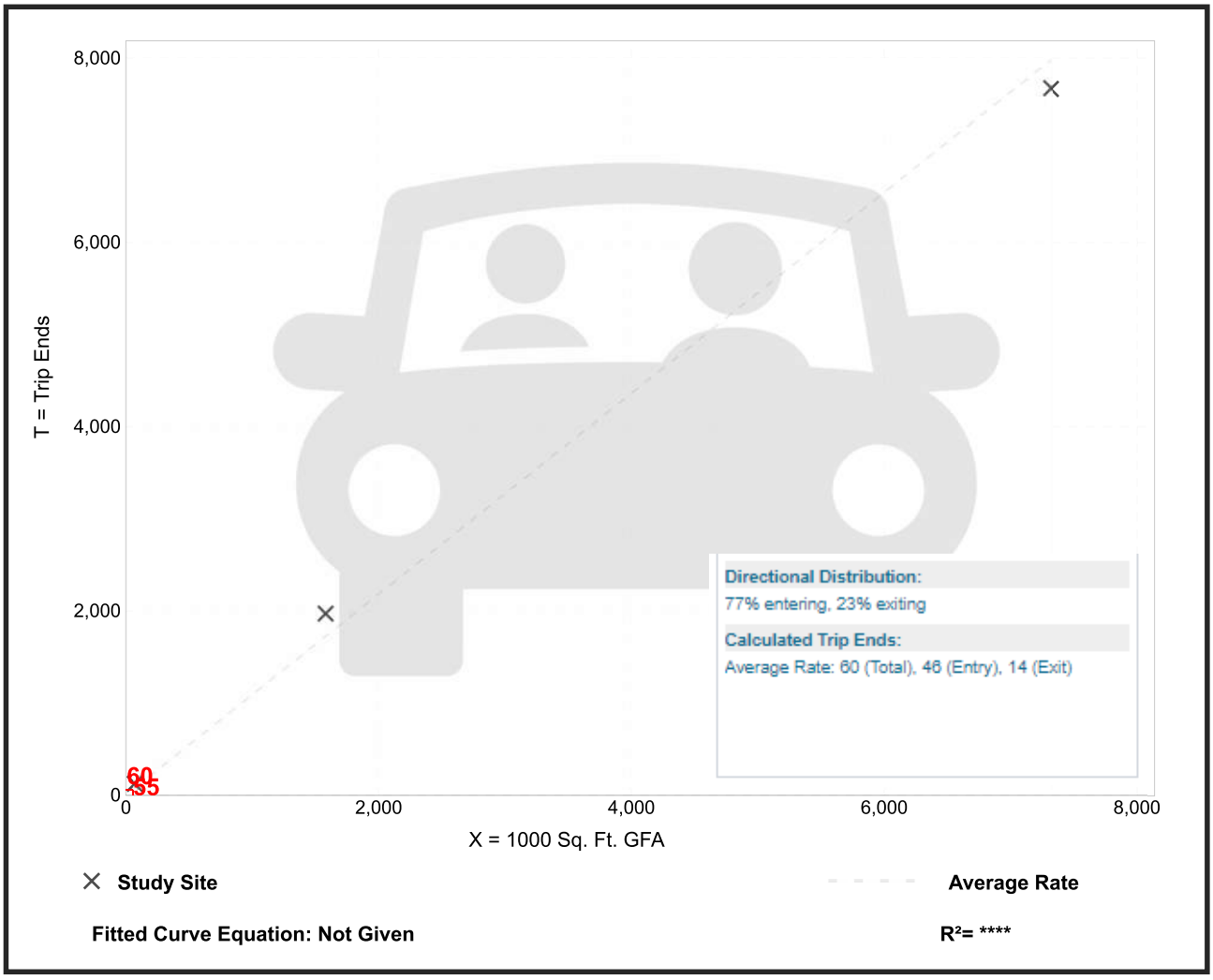
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

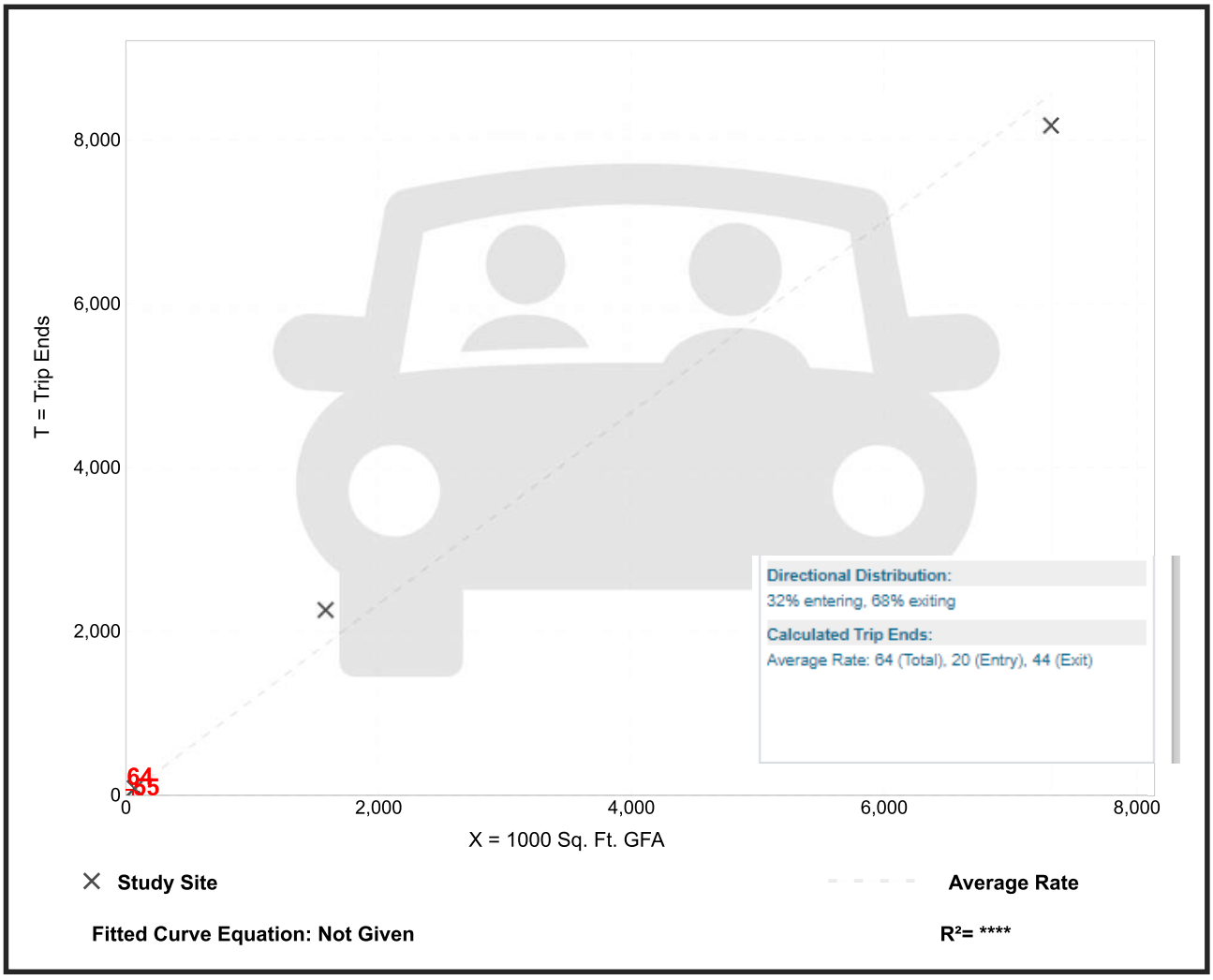
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

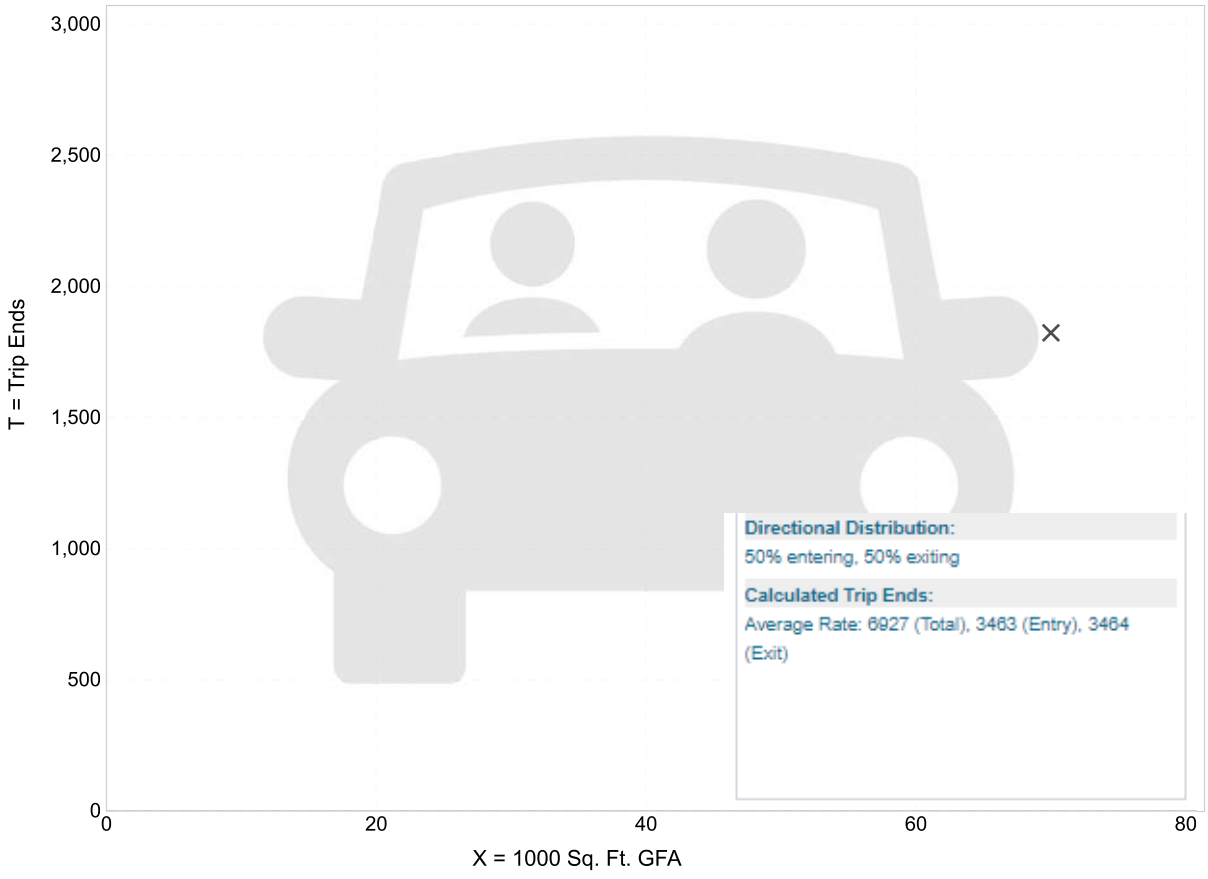
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

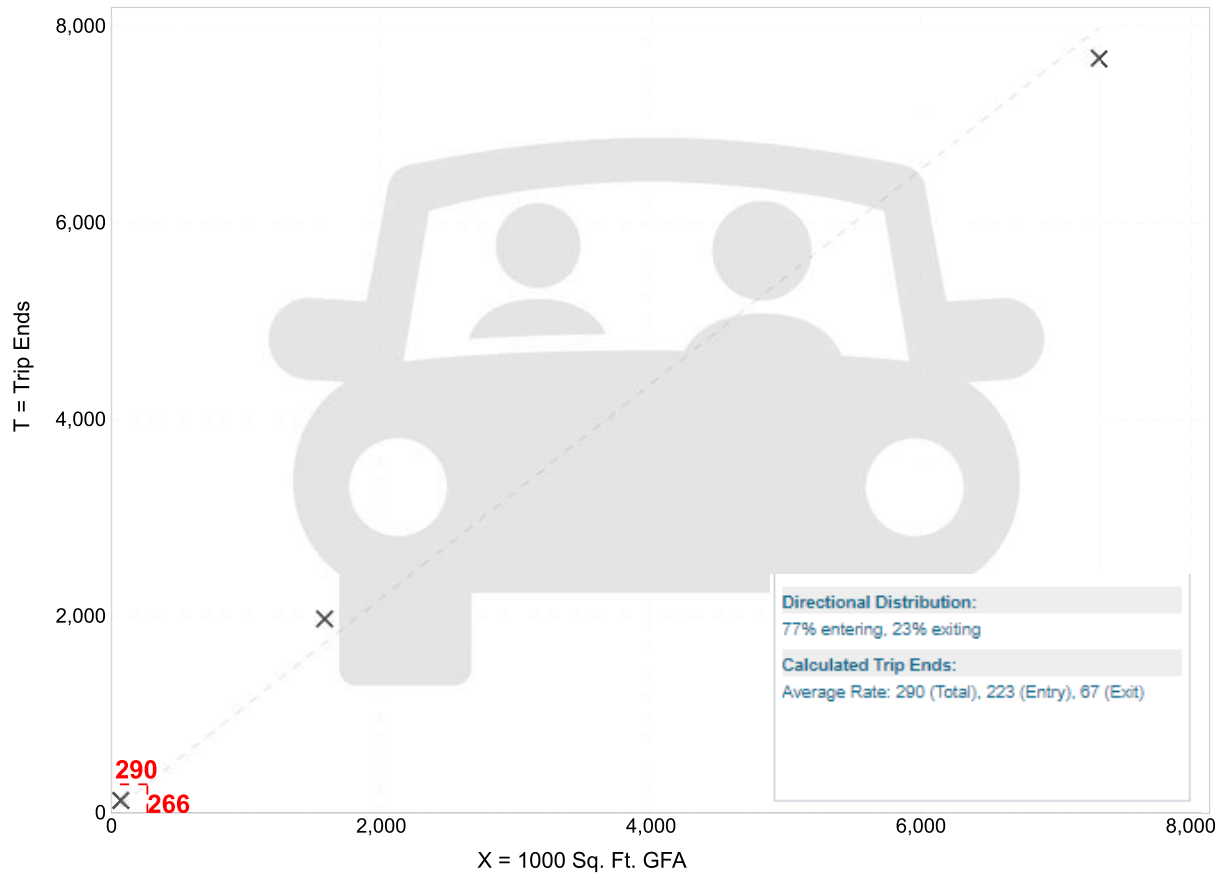
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

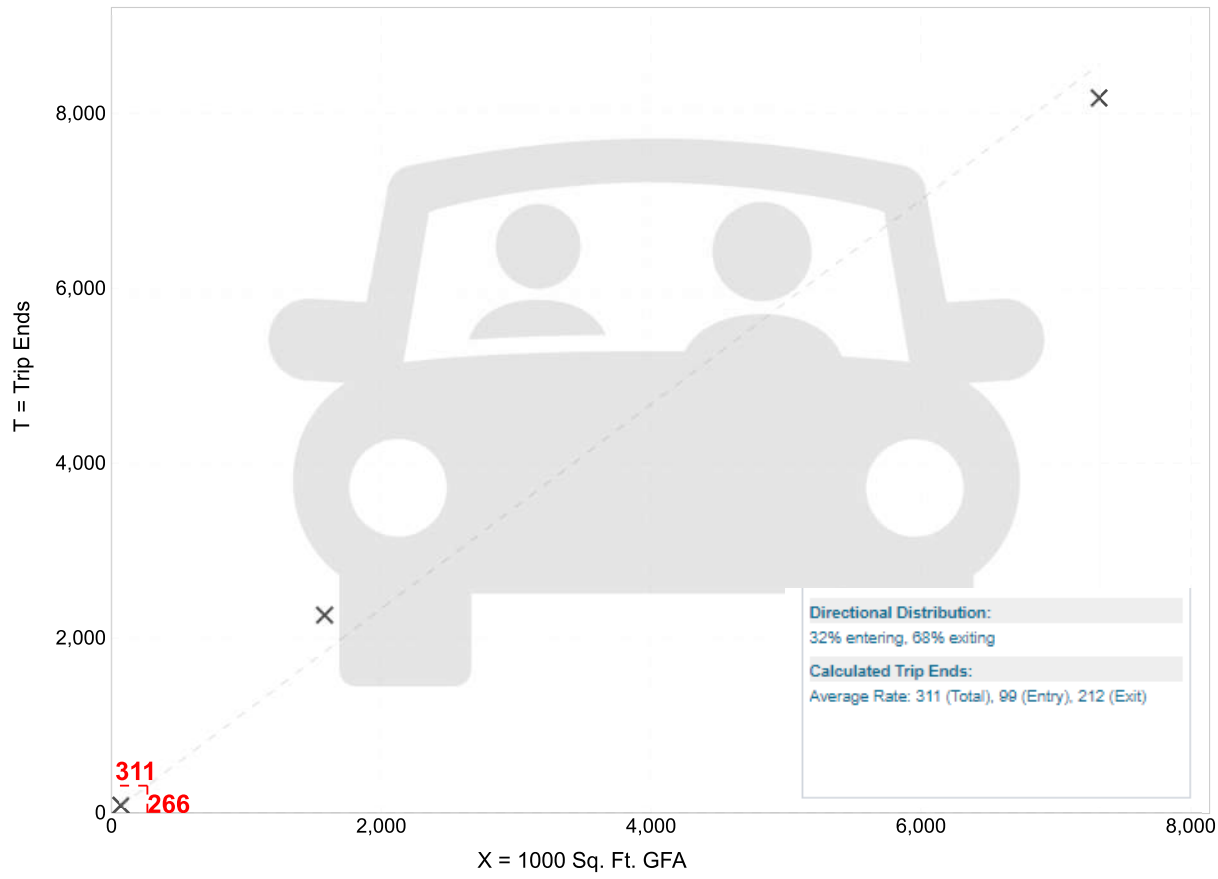
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***

**Fitted Curve Equation: Not Given** **$R^2$= ****

# University/College
(550)

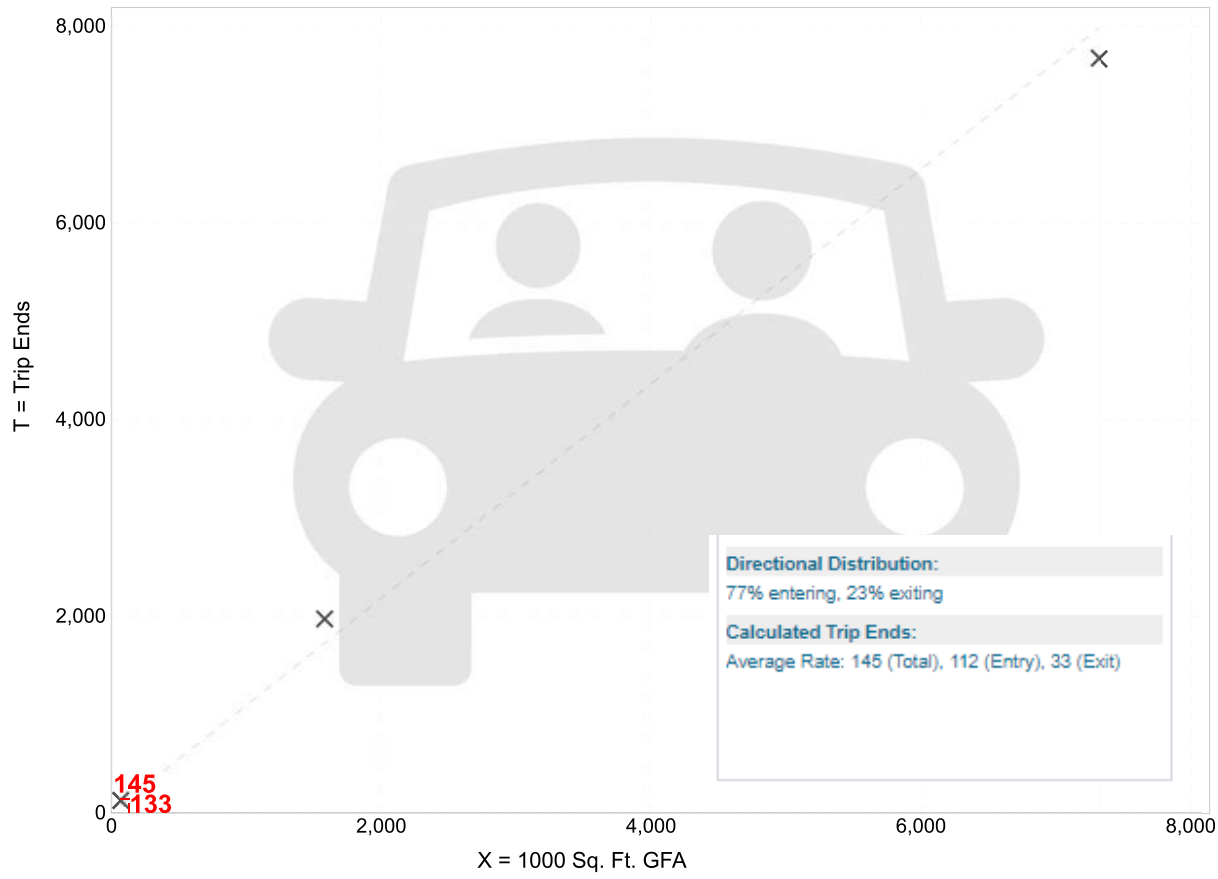
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

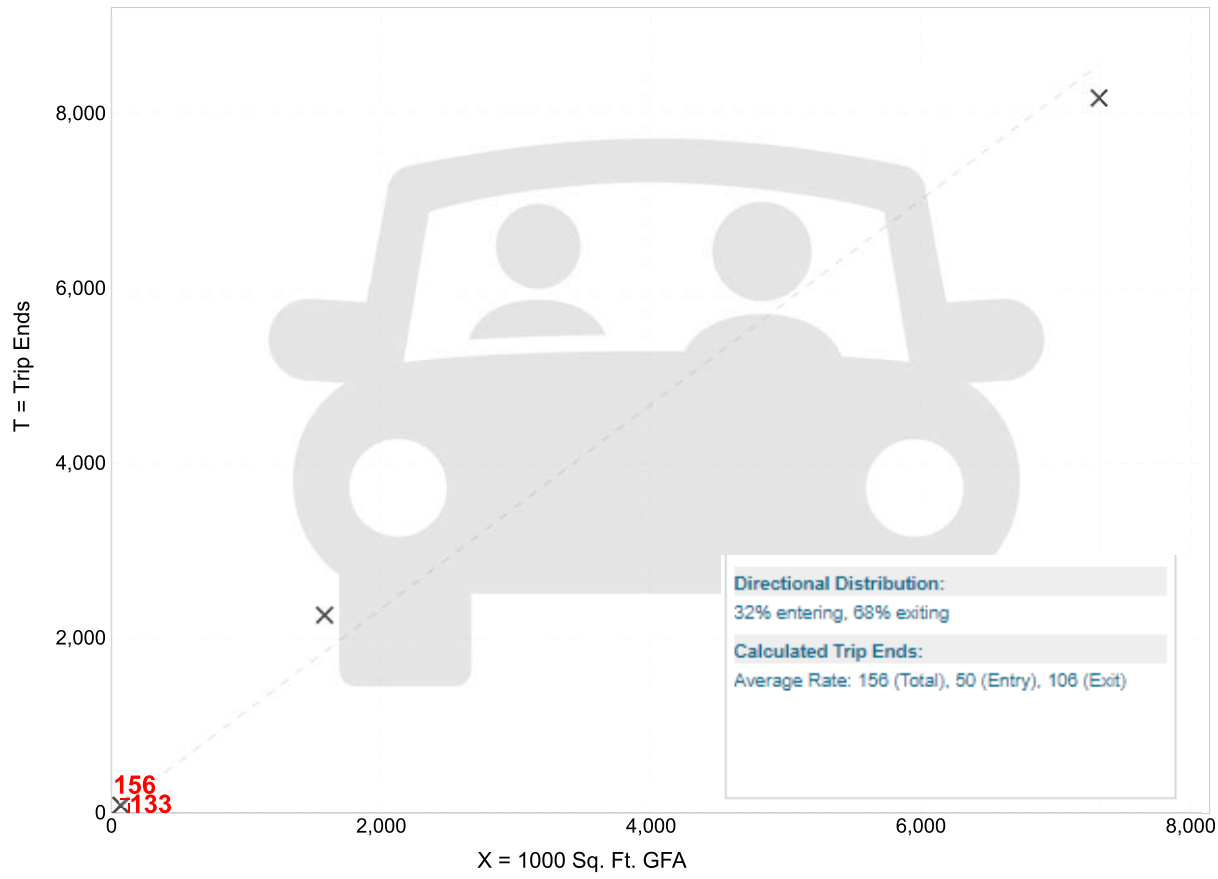
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

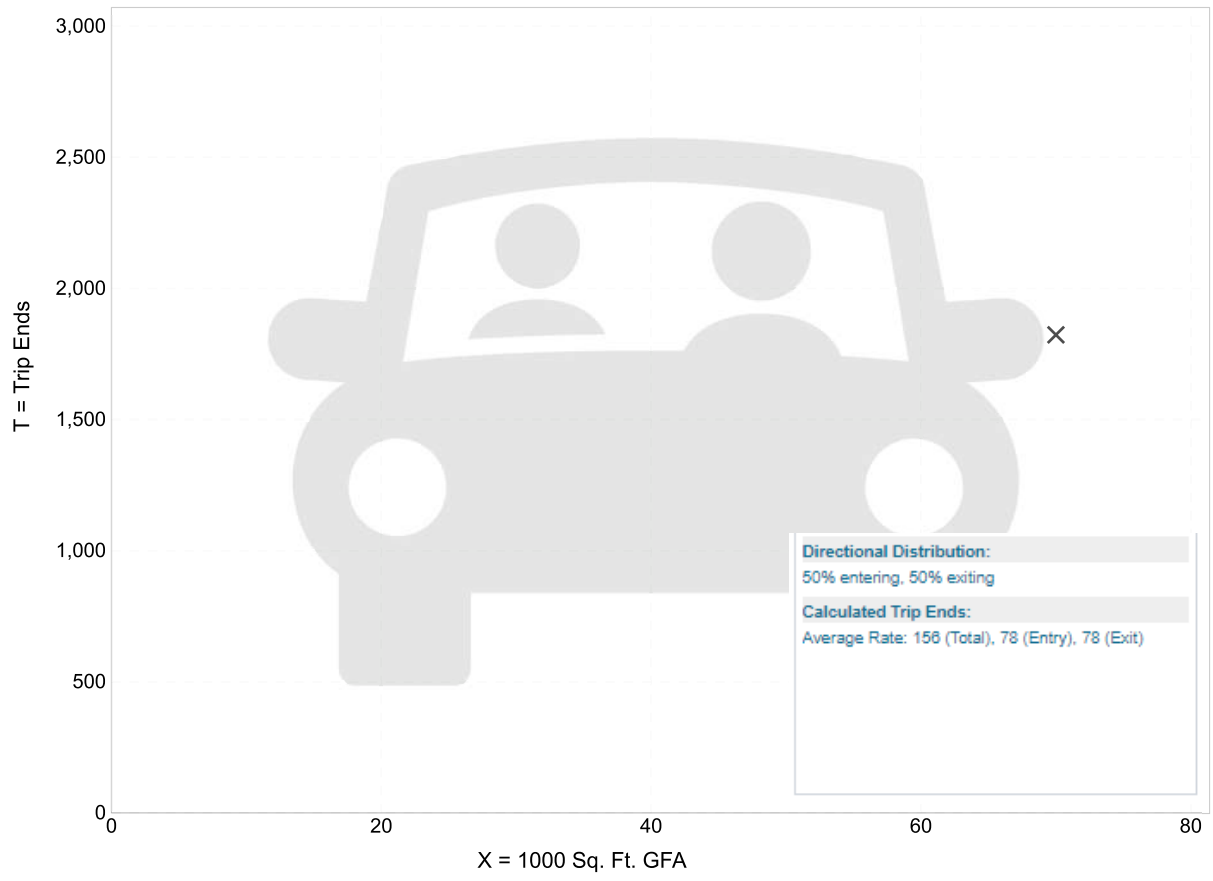
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

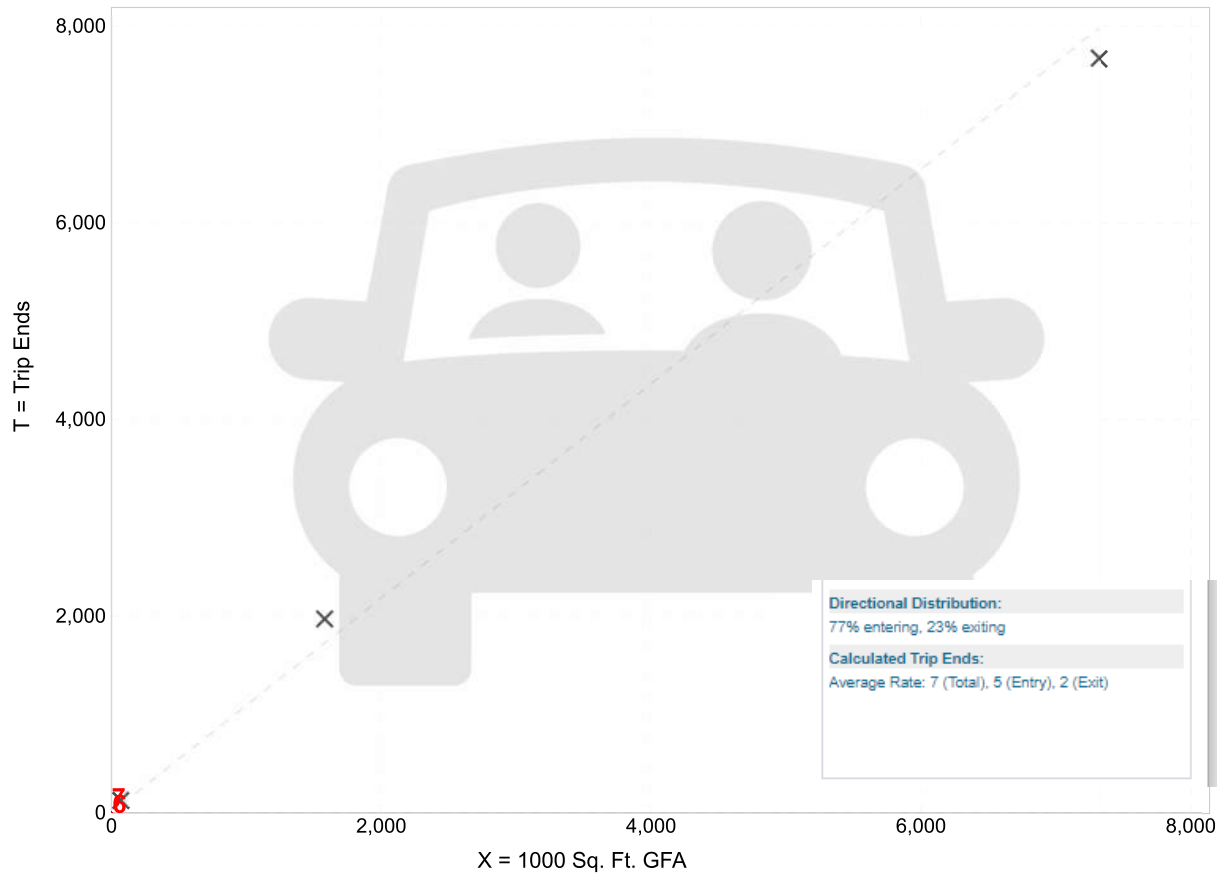
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given** **$R^2$= ****

# University/College
(550)

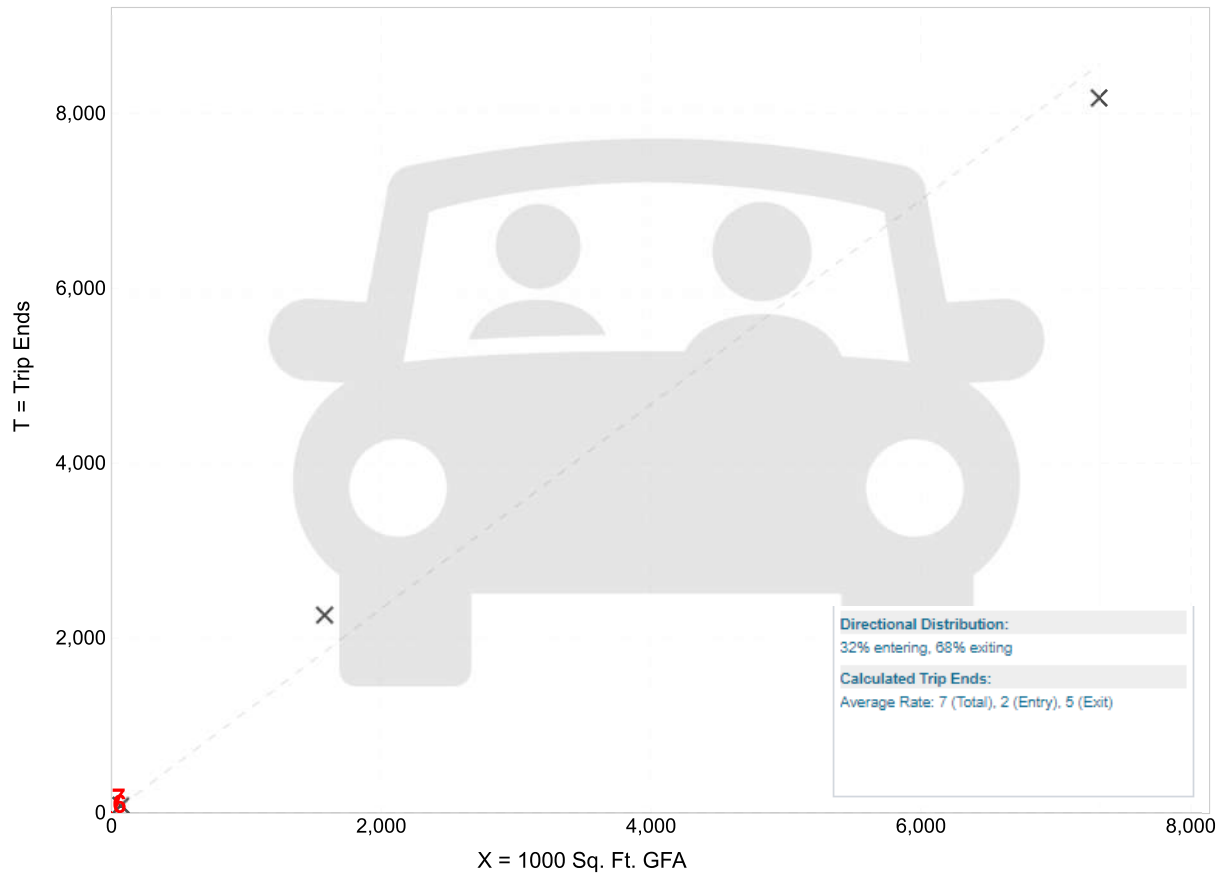
| | |
|---|---|
| **Vehicle Trip Ends vs:** | **1000 Sq. Ft. GFA** |
| **On a:** | **Weekday,** |
| | **Peak Hour of Adjacent Street Traffic,** |
| | **One Hour Between 4 and 6 p.m.** |
| **Setting/Location:** | **General Urban/Suburban** |
| Number of Studies: | 3 |
| Avg. 1000 Sq. Ft. GFA: | 2990 |
| Directional Distribution: | 32% entering, 68% exiting |

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given** **$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

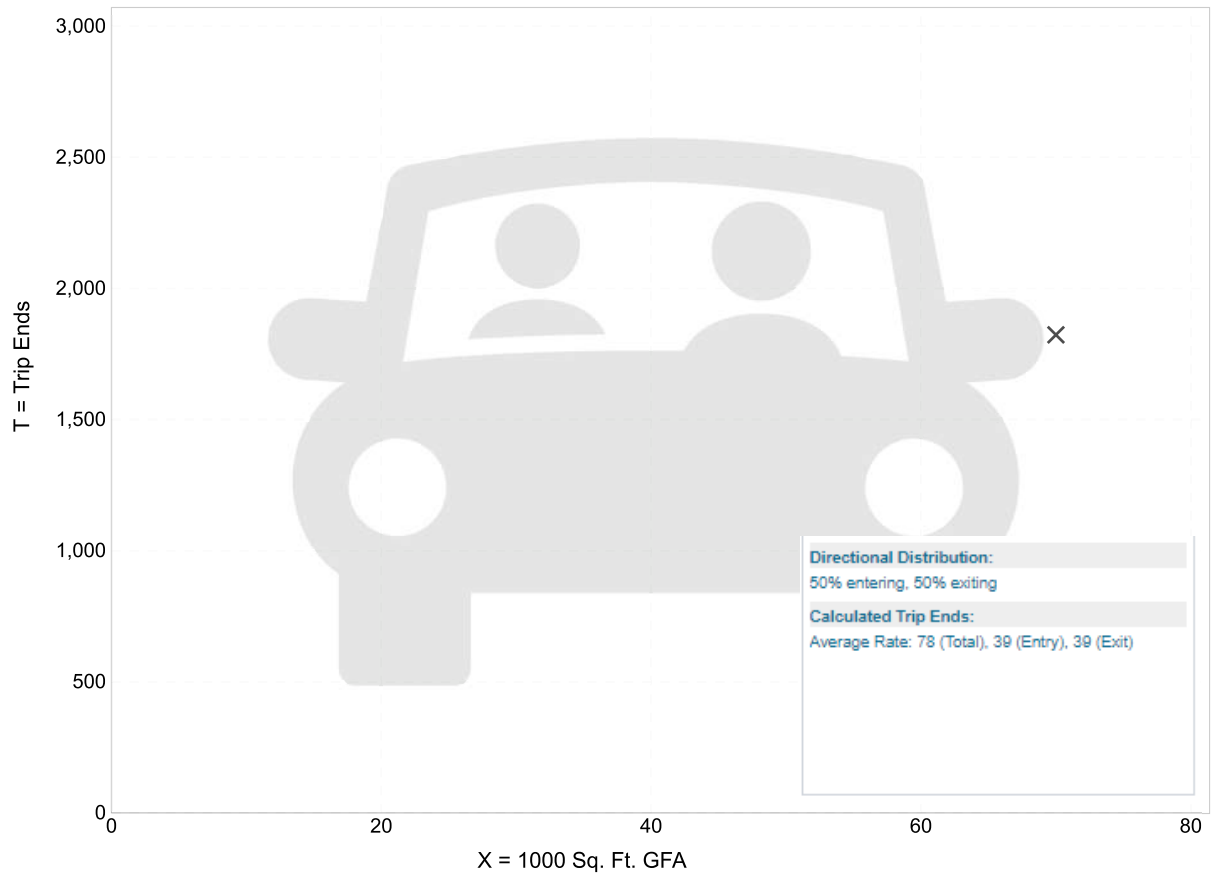
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




× **Study Site** **Average Rate**

**Fitted Curve Equation: Not Given** **$R^2$= ****

# University/College
(550)

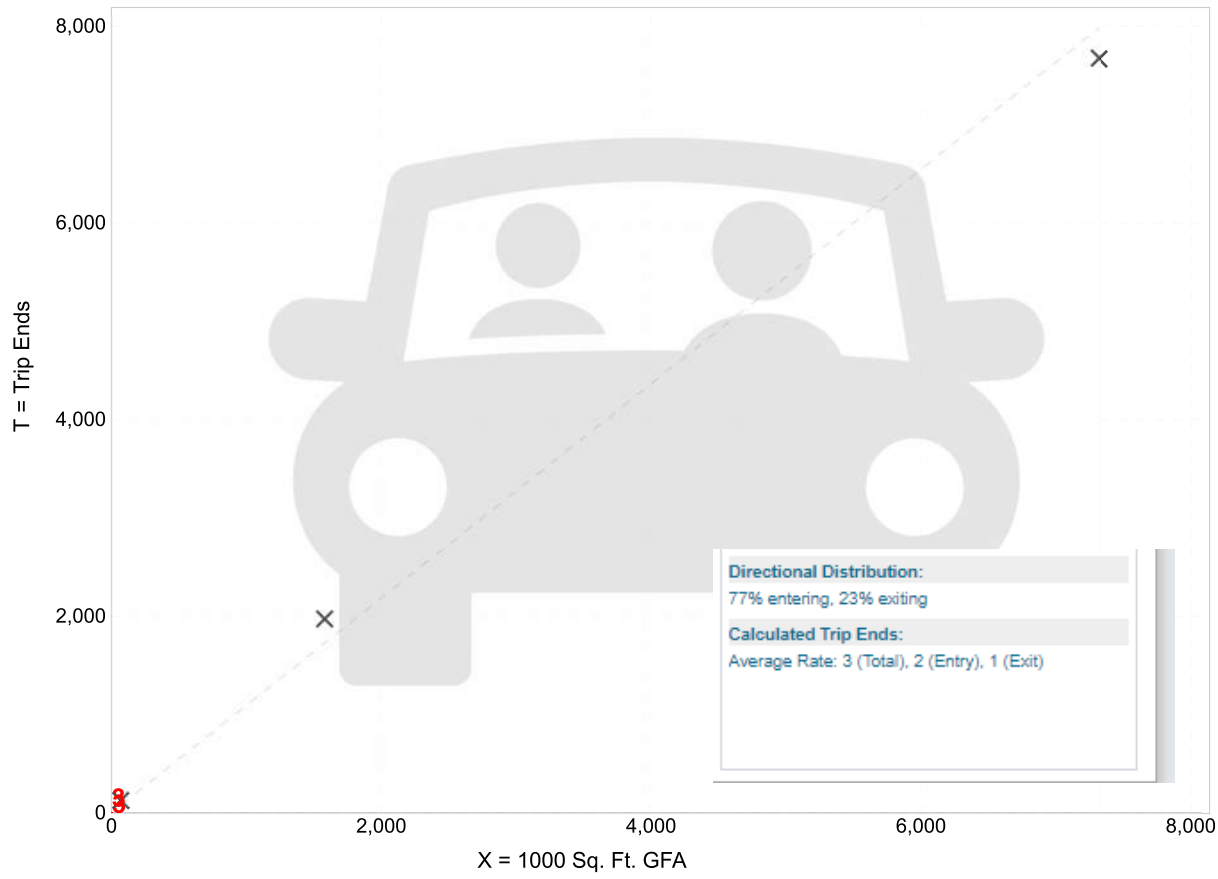
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given** **$R^2$= ****

*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

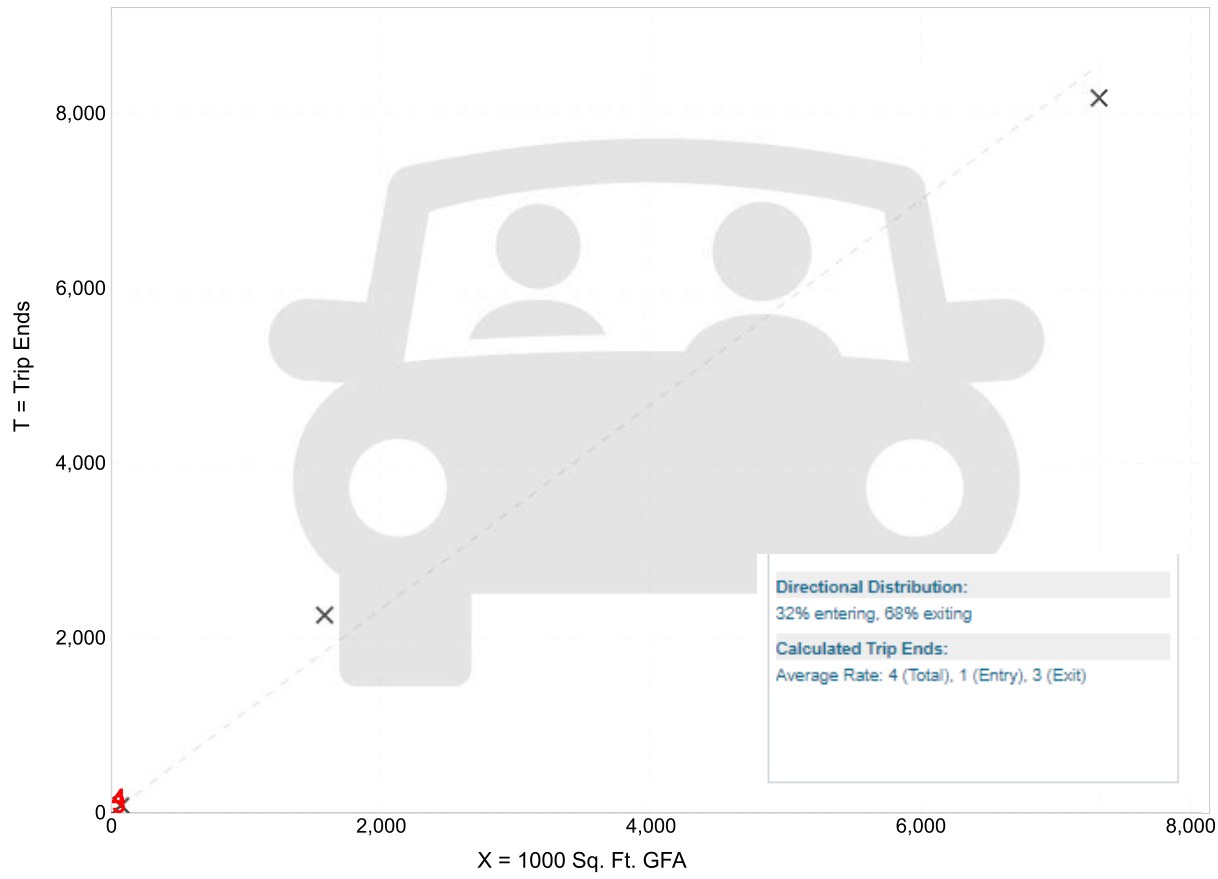
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

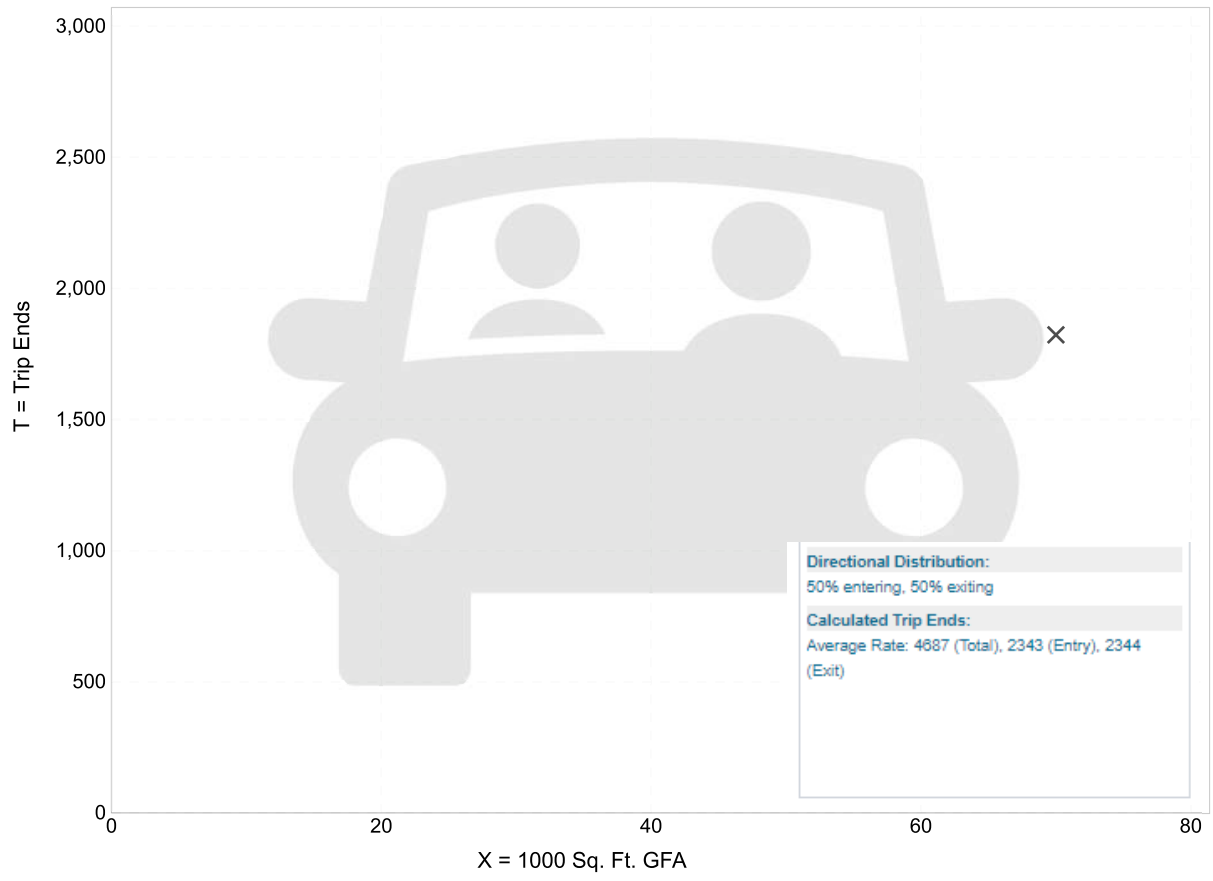
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

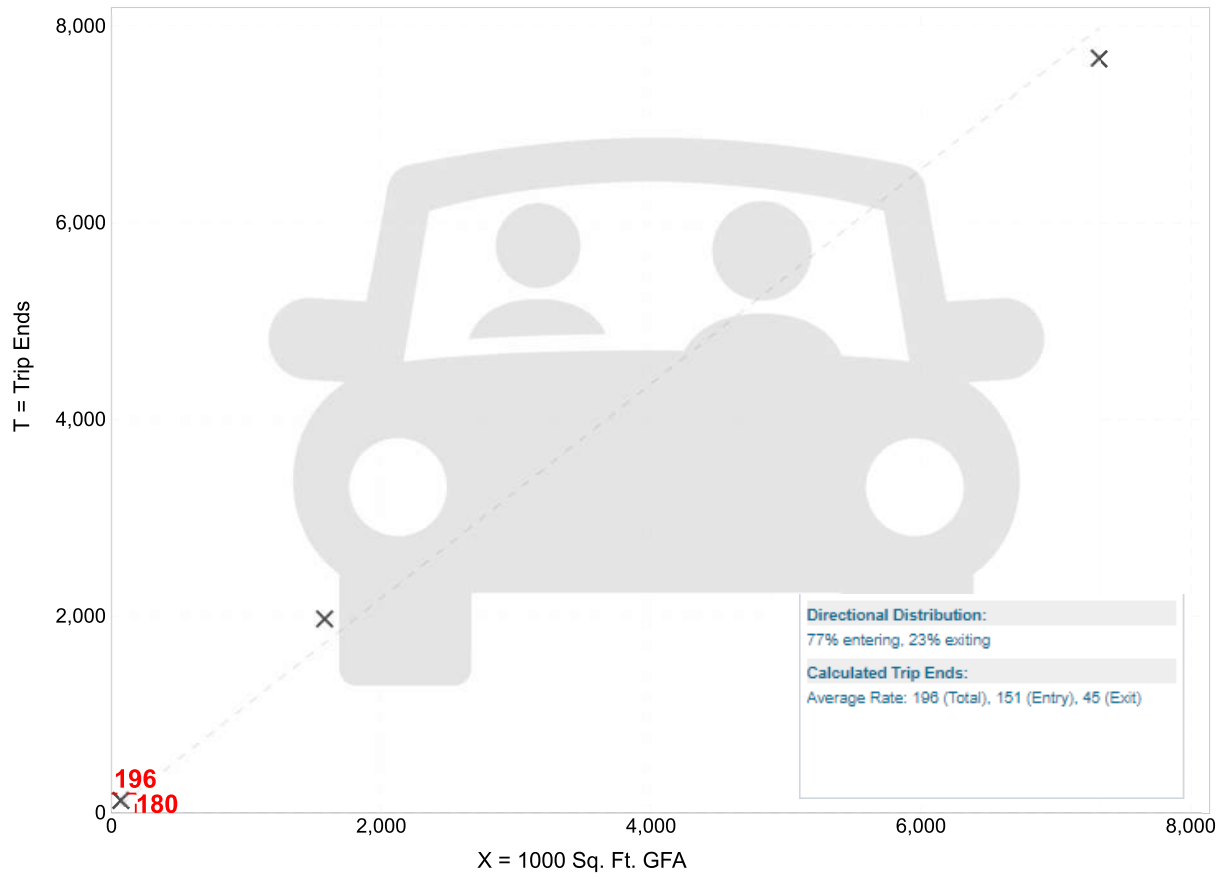
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given** **$R^2$= ****

*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

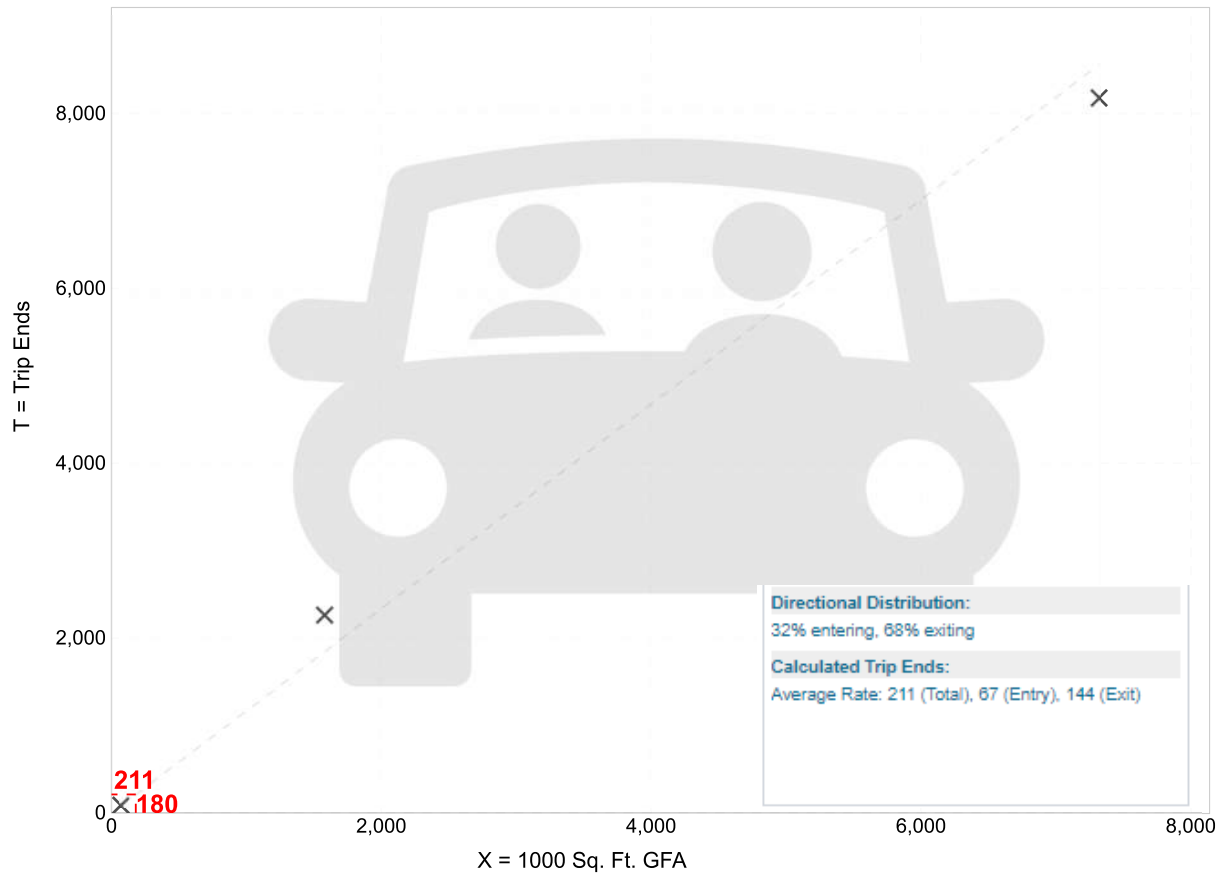
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

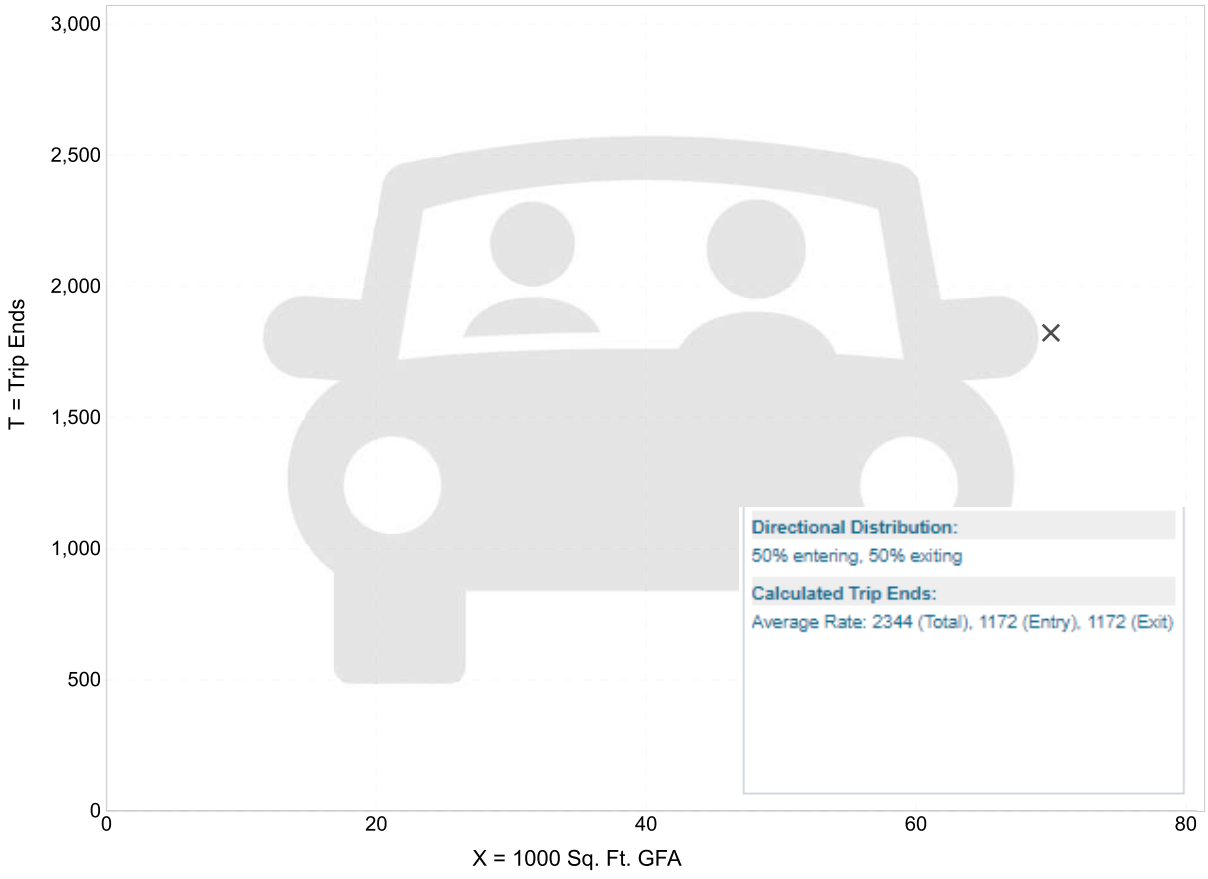
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

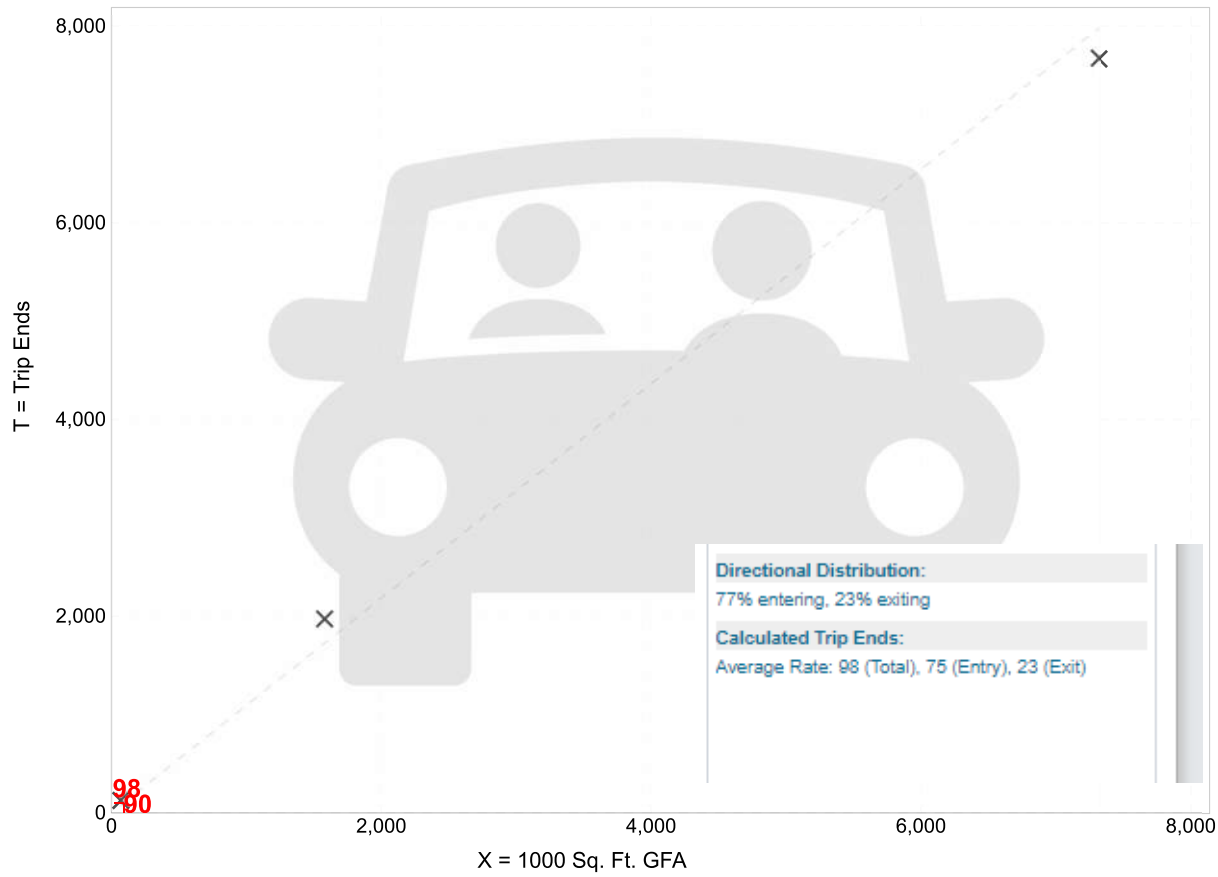
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

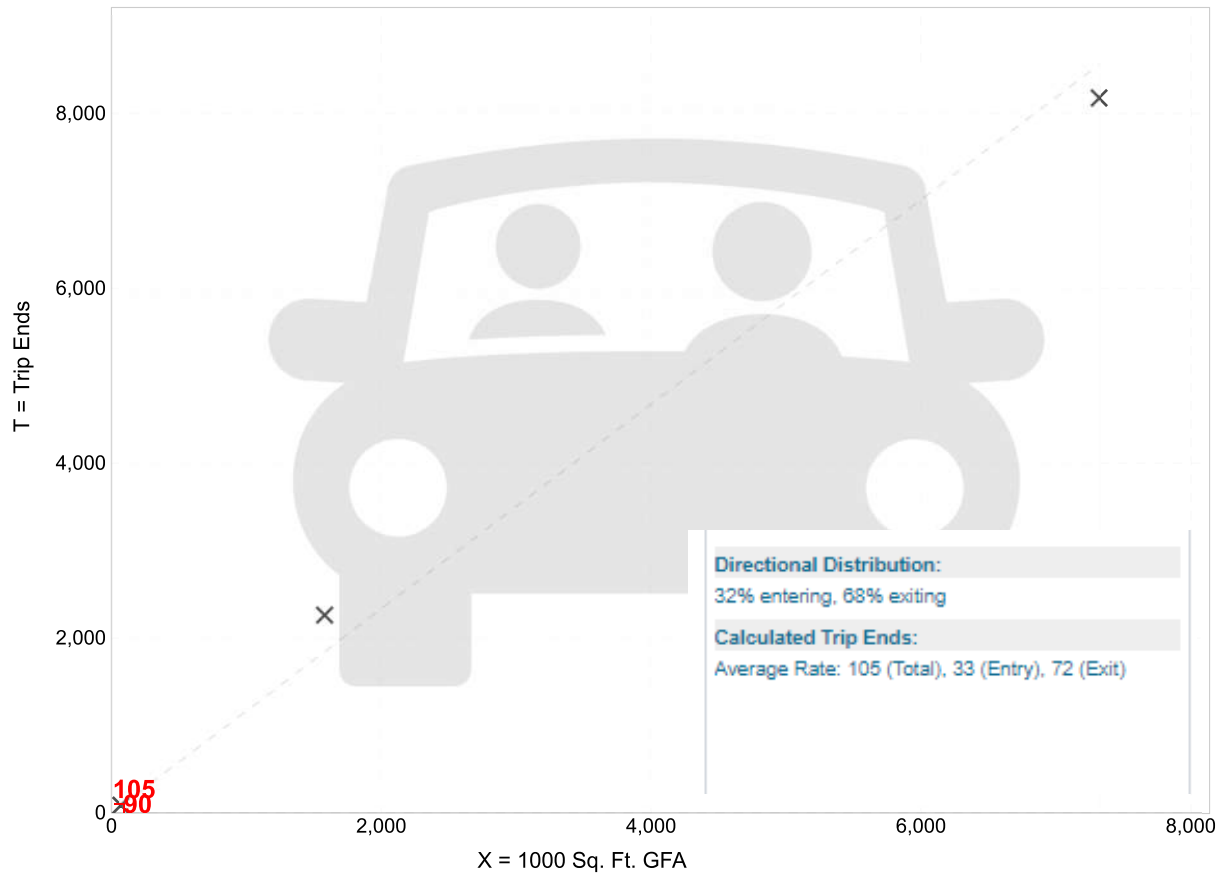
| | |
|---|---|
| **Vehicle Trip Ends vs:** | **1000 Sq. Ft. GFA** |
| **On a:** | **Weekday,** |
| | **Peak Hour of Adjacent Street Traffic,** |
| | **One Hour Between 4 and 6 p.m.** |
| **Setting/Location:** | **General Urban/Suburban** |
| Number of Studies: | 3 |
| Avg. 1000 Sq. Ft. GFA: | 2990 |
| Directional Distribution: | 32% entering, 68% exiting |

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

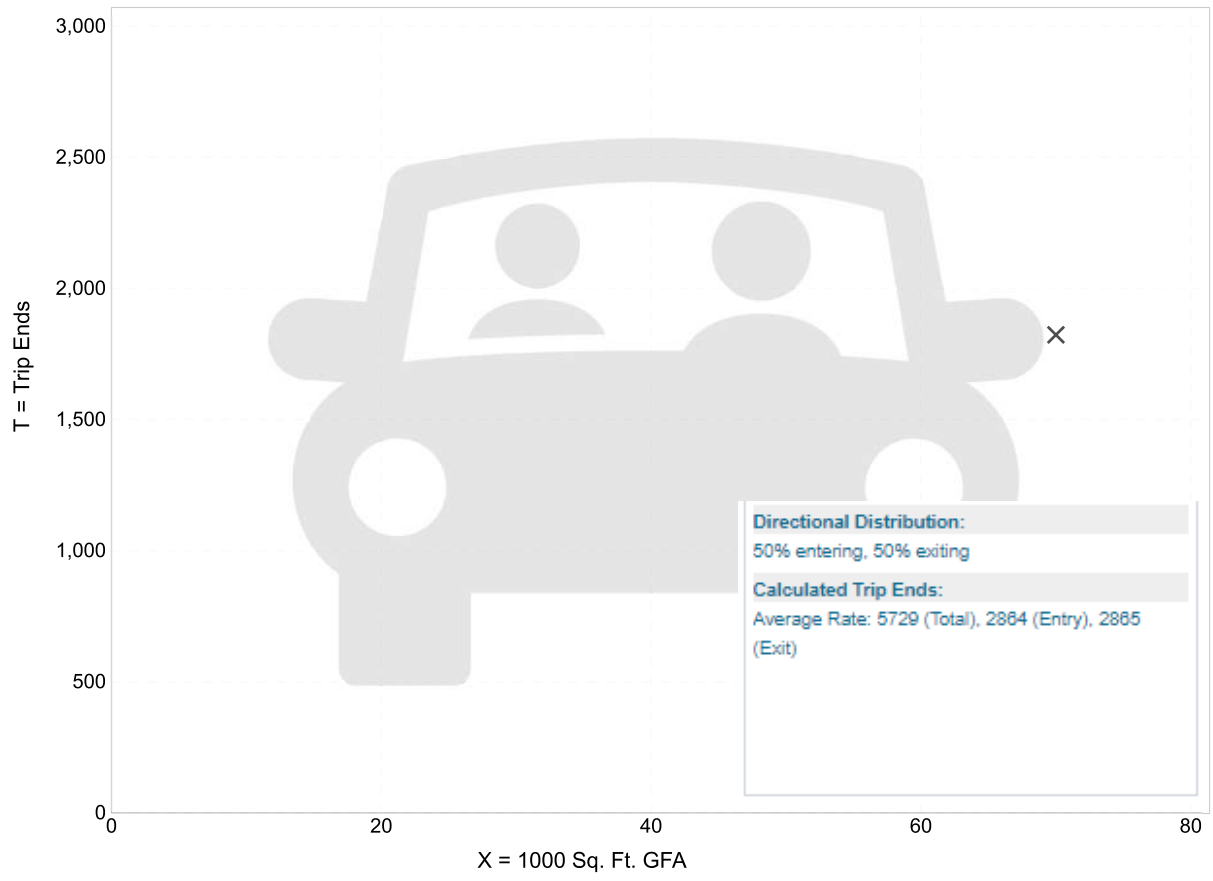
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

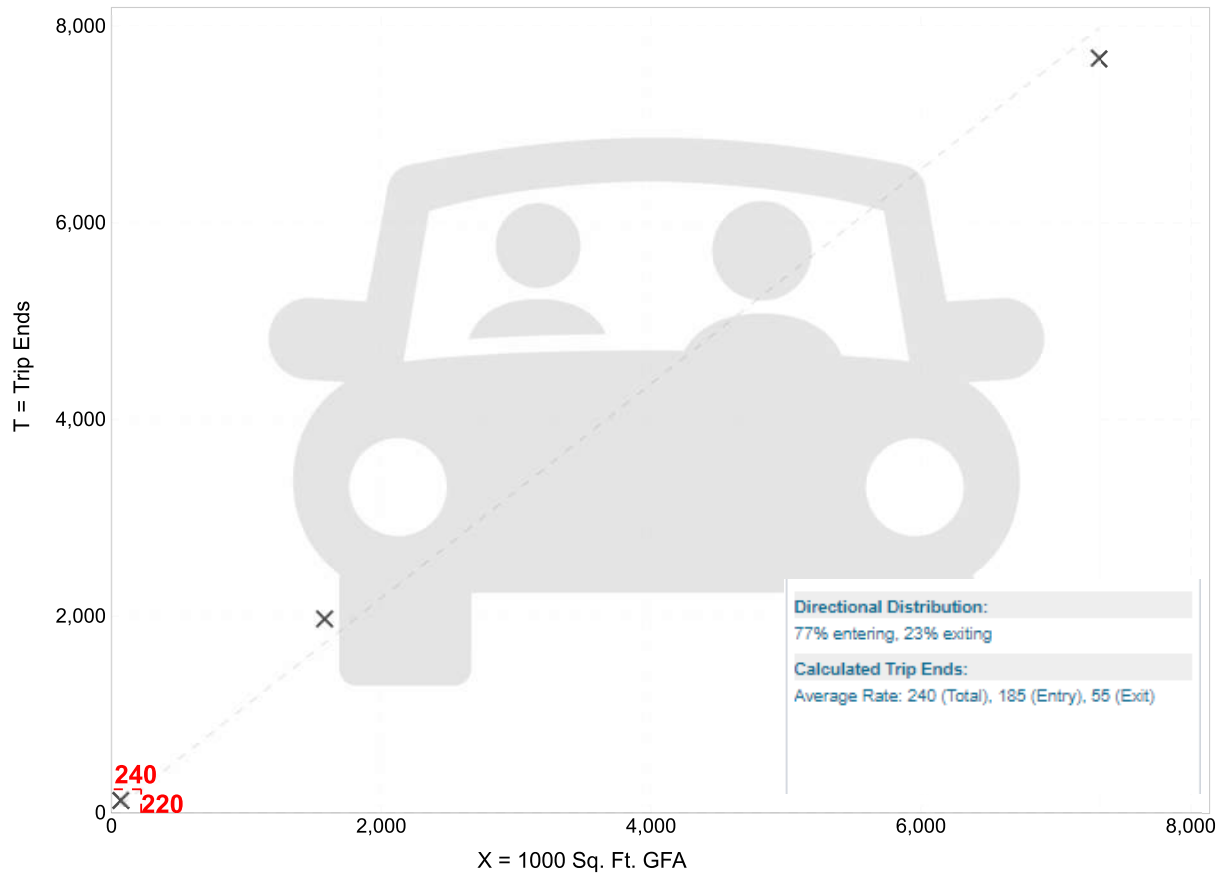
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

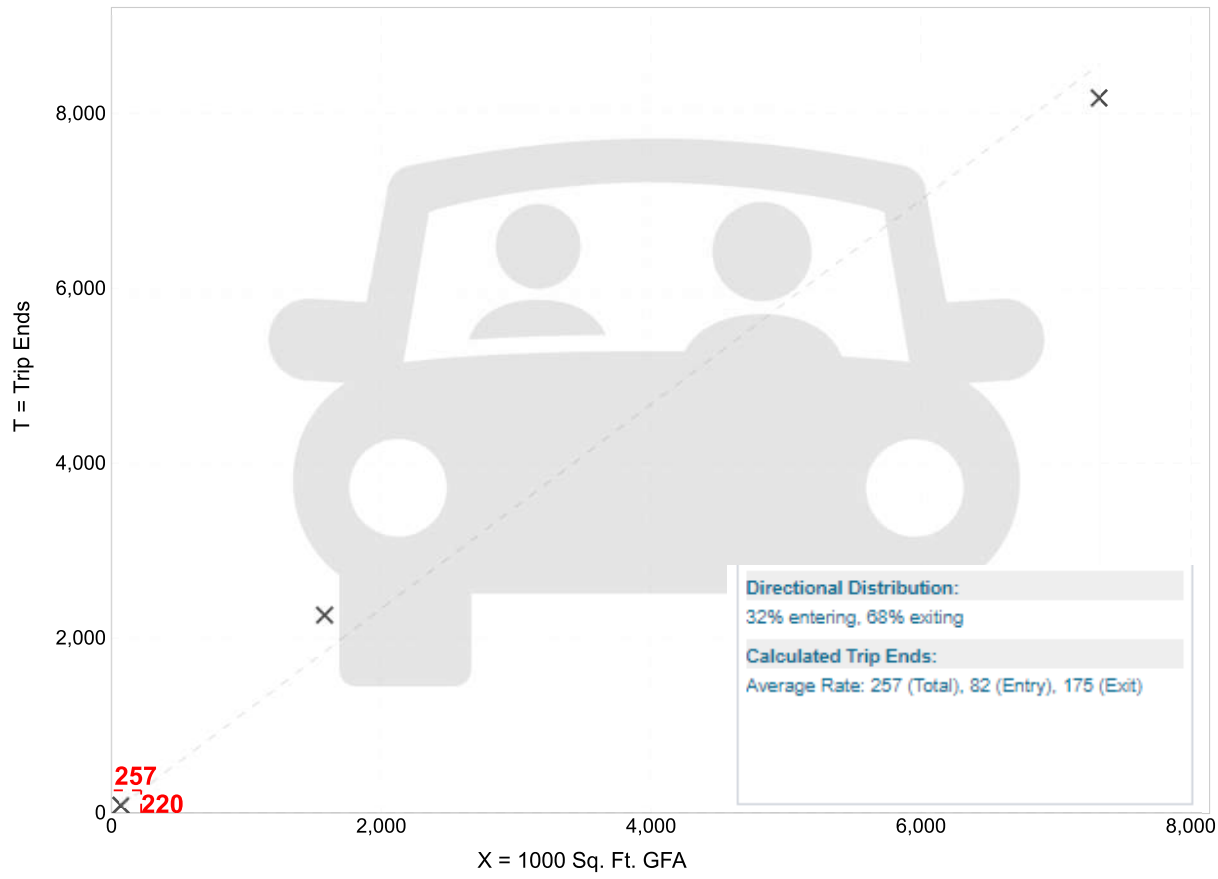
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***

**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

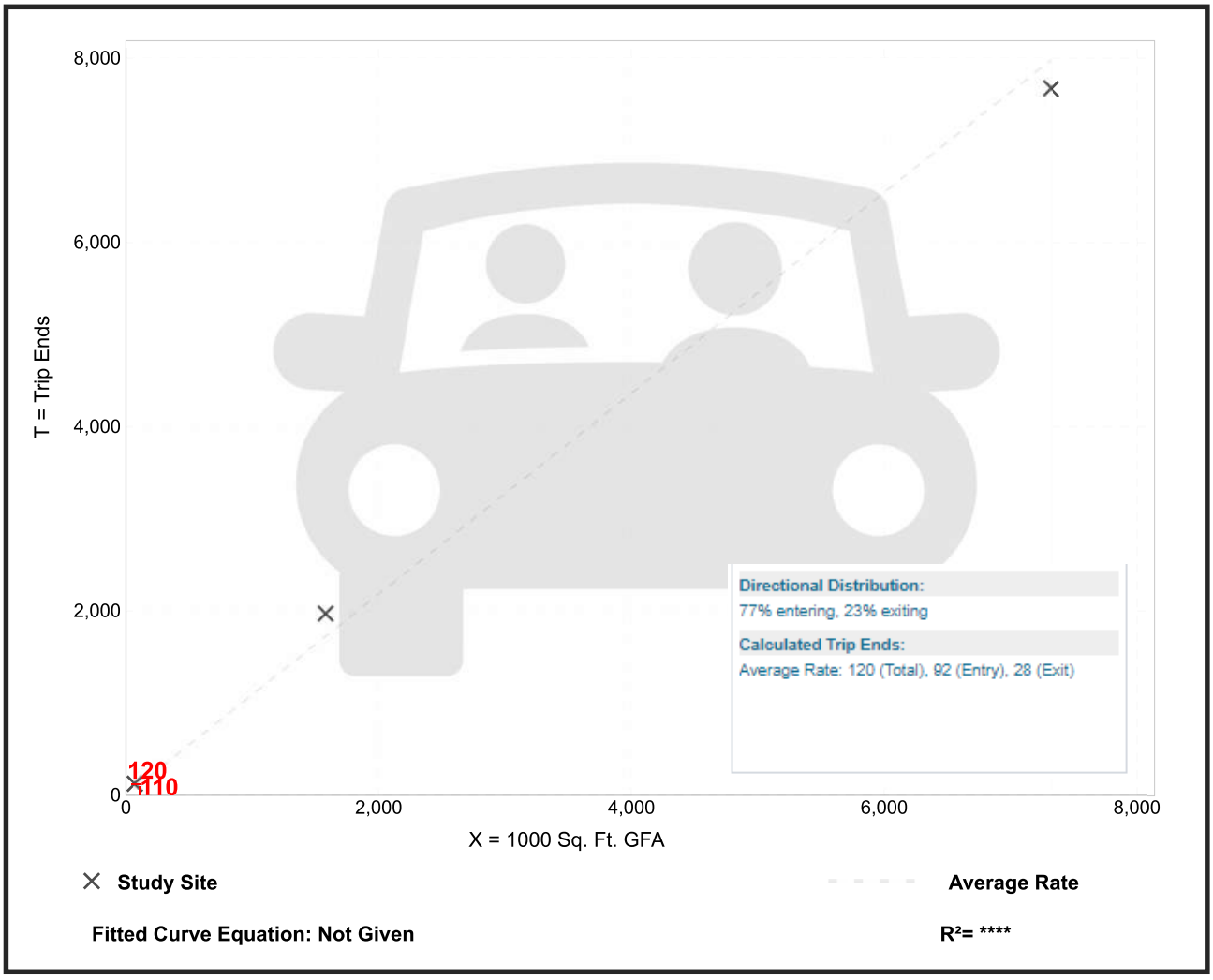
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***



# University/College
(550)

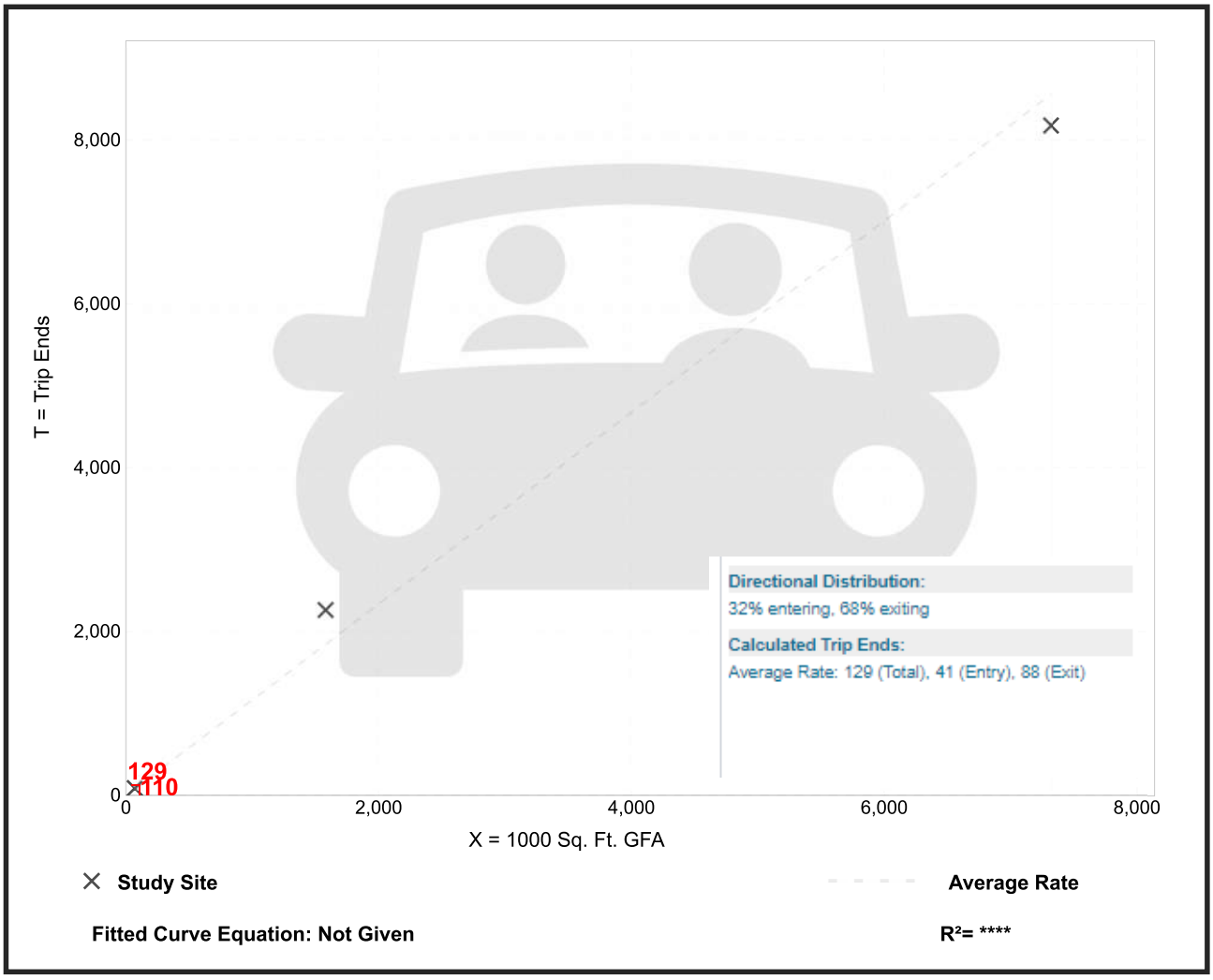
| | |
|---|---|
| **Vehicle Trip Ends vs:** | **1000 Sq. Ft. GFA** |
| **On a:** | **Weekday,** |
| | **Peak Hour of Adjacent Street Traffic,** |
| | **One Hour Between 4 and 6 p.m.** |
| **Setting/Location:** | **General Urban/Suburban** |
| Number of Studies: | 3 |
| Avg. 1000 Sq. Ft. GFA: | 2990 |
| Directional Distribution: | 32% entering, 68% exiting |

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***



# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

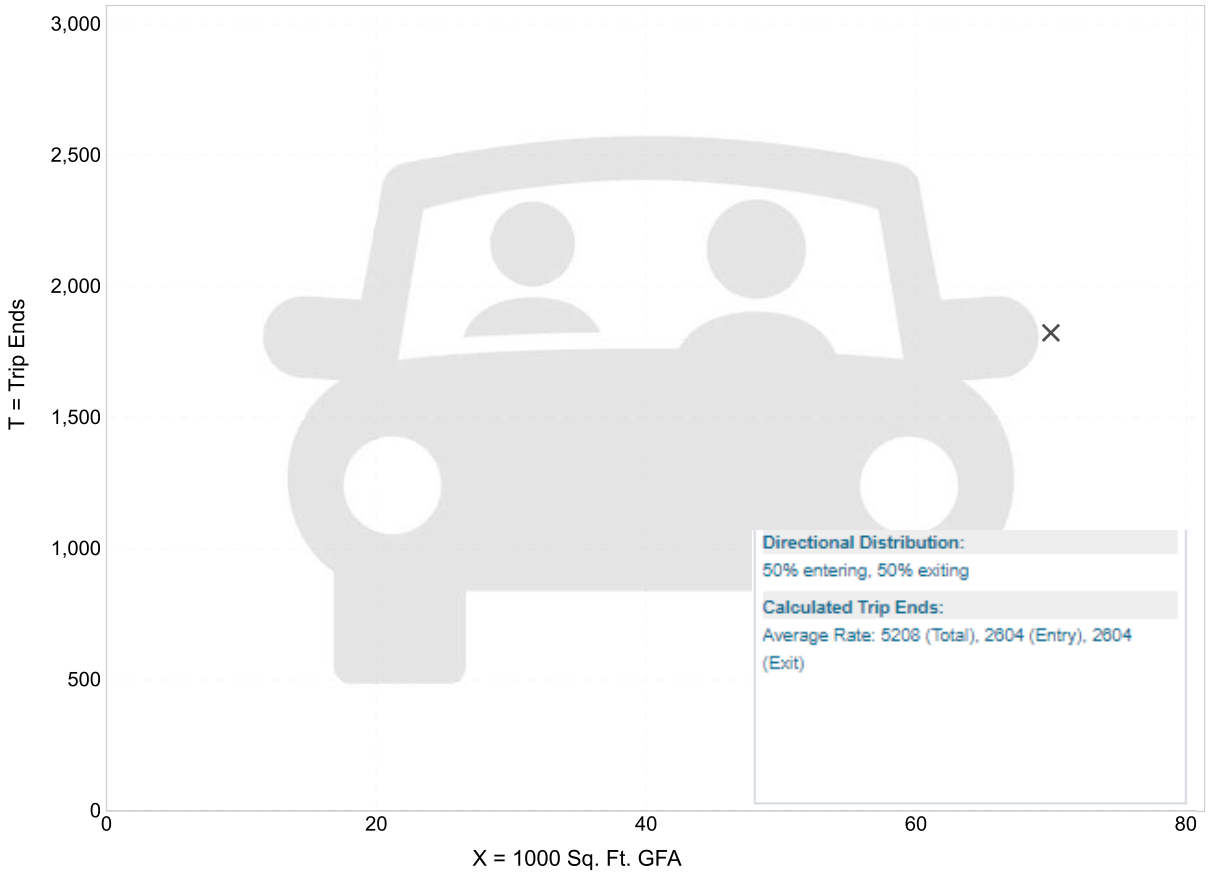
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

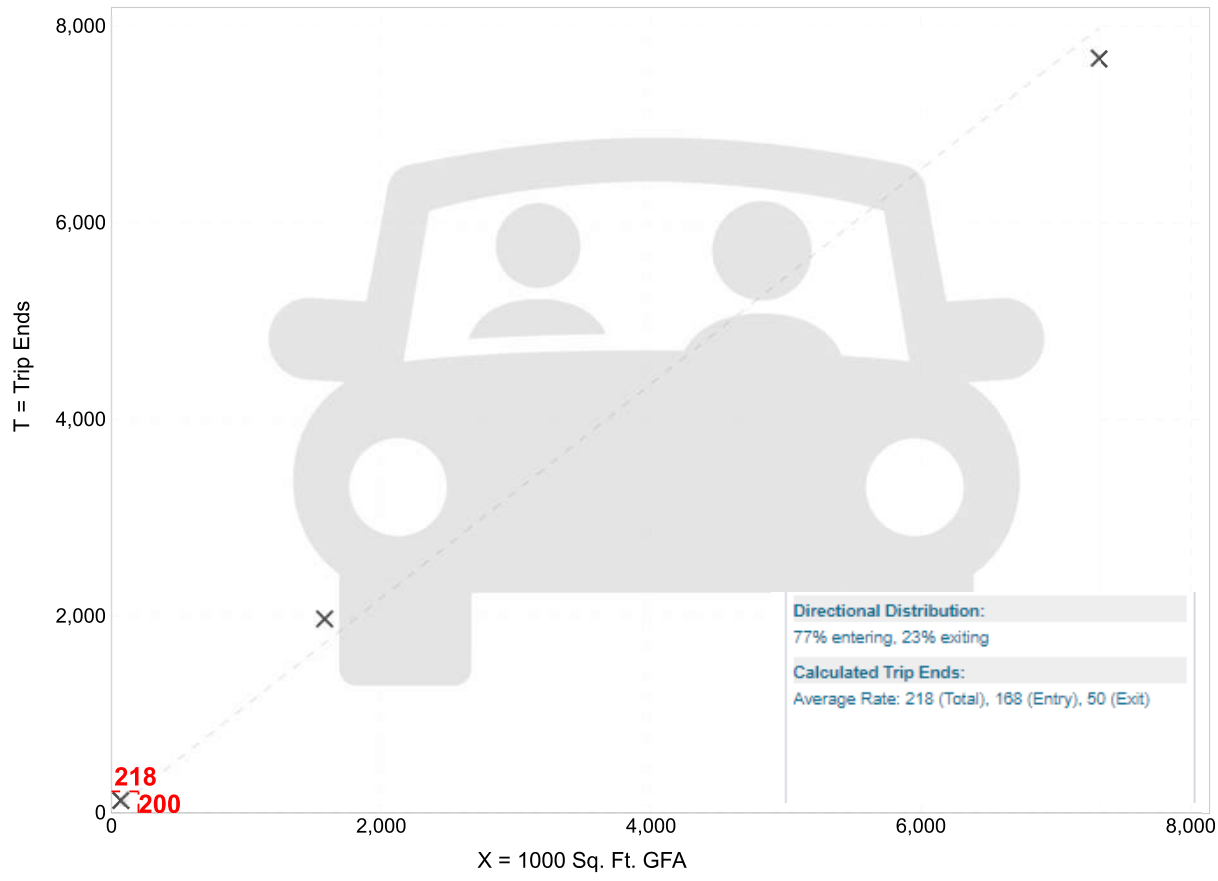
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

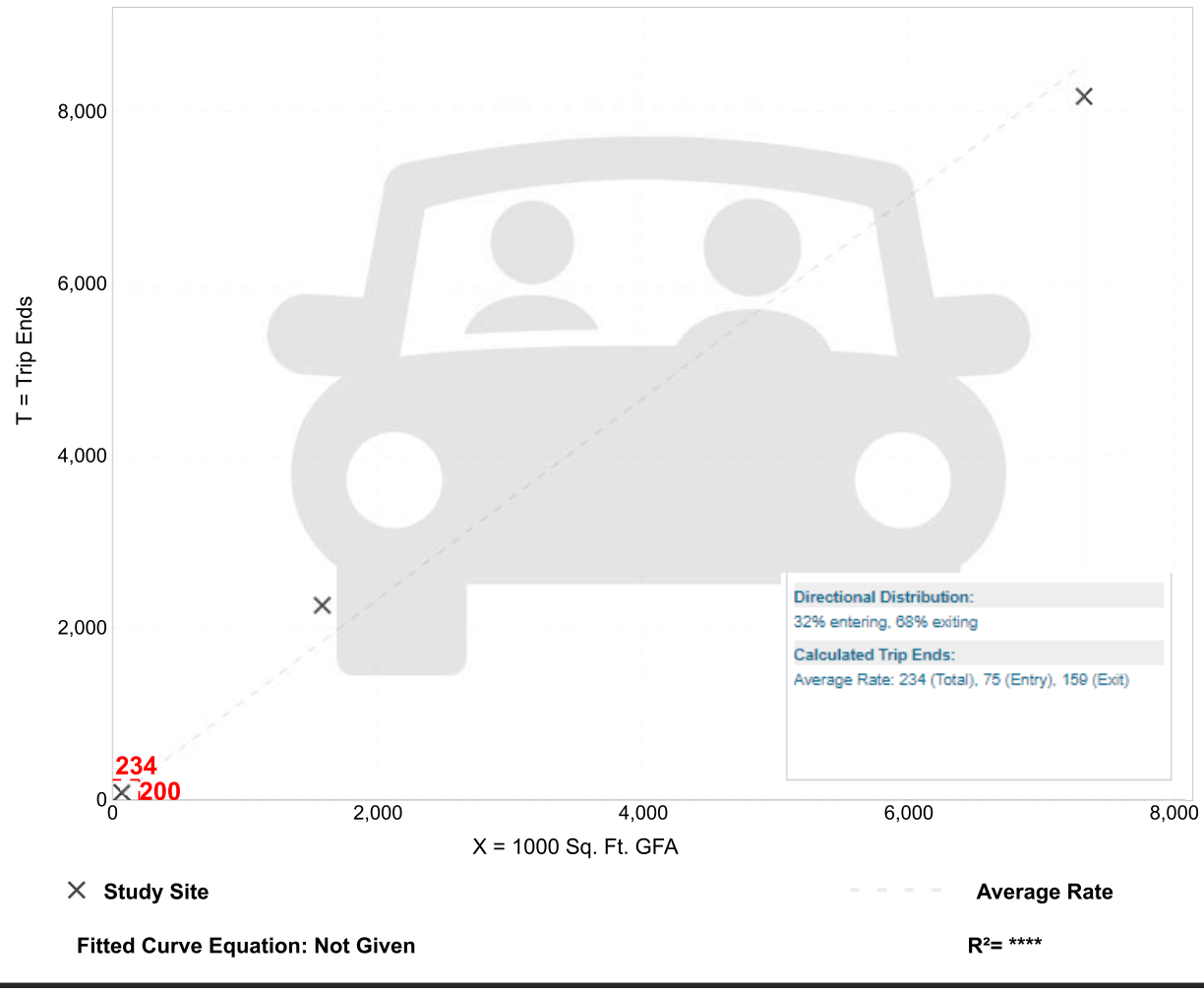
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***



# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

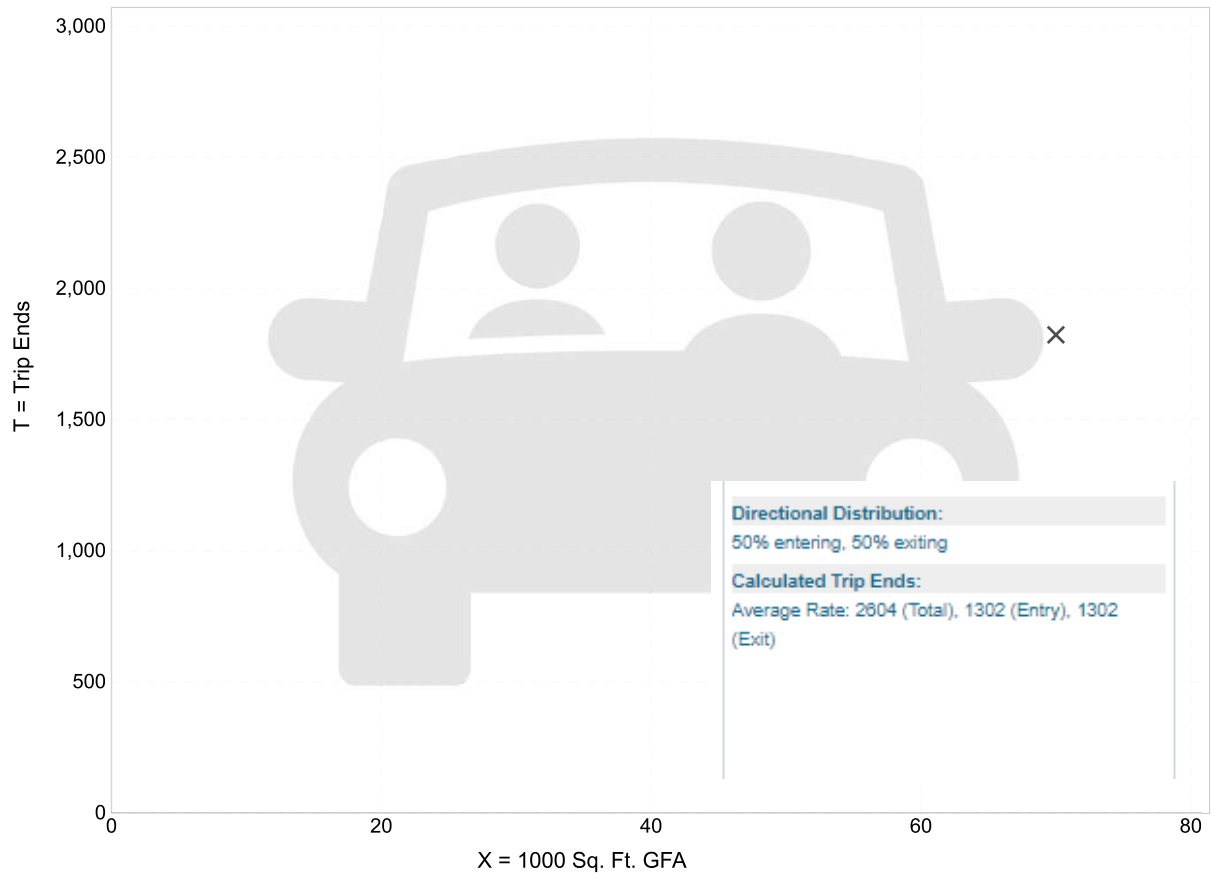
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

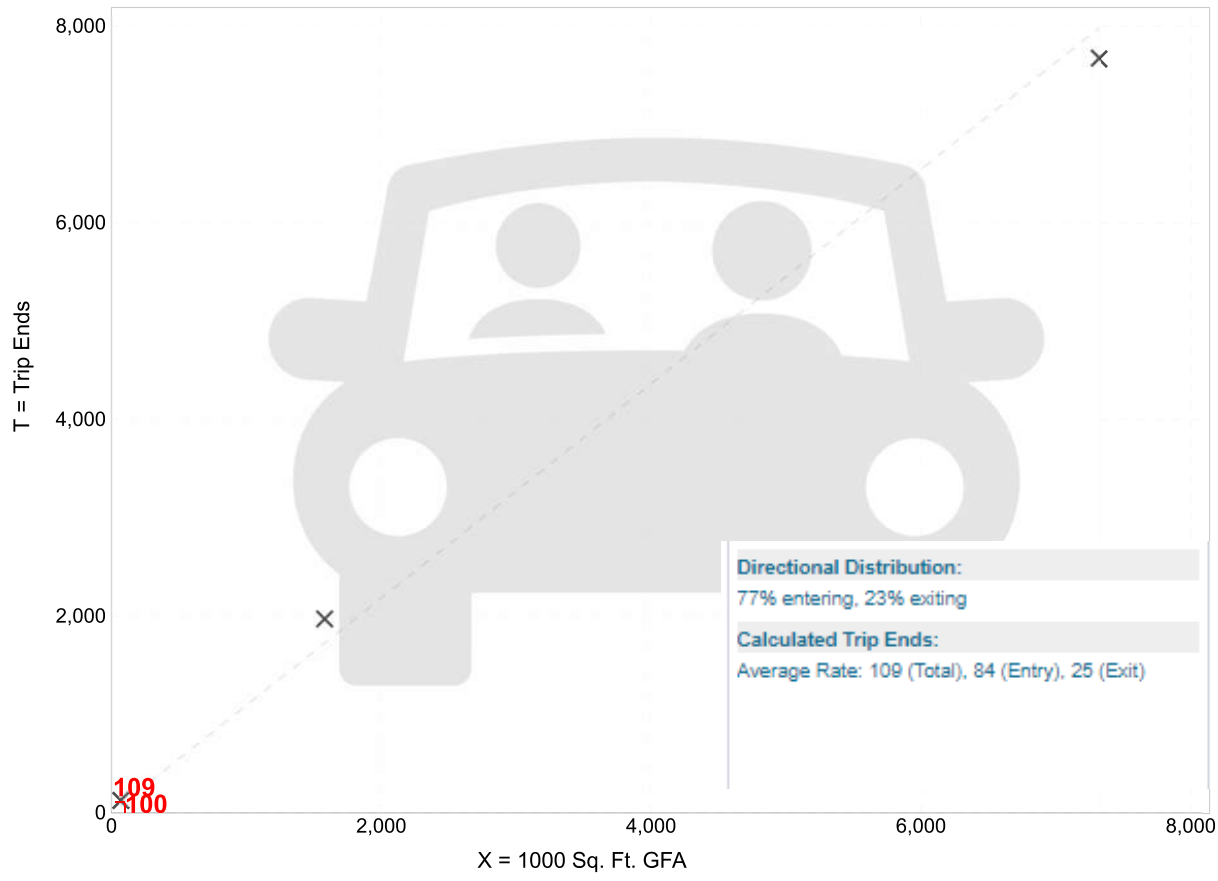
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

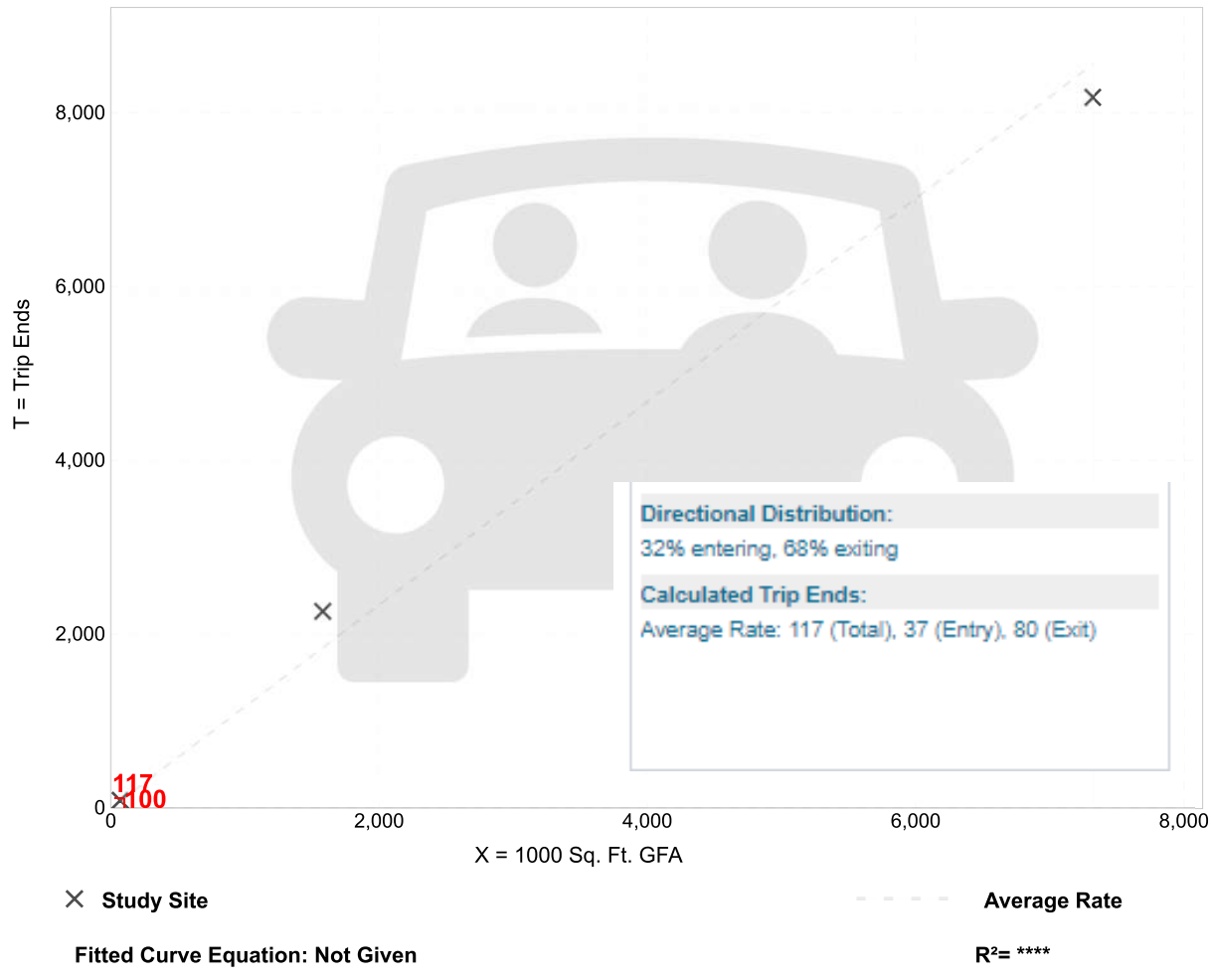
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

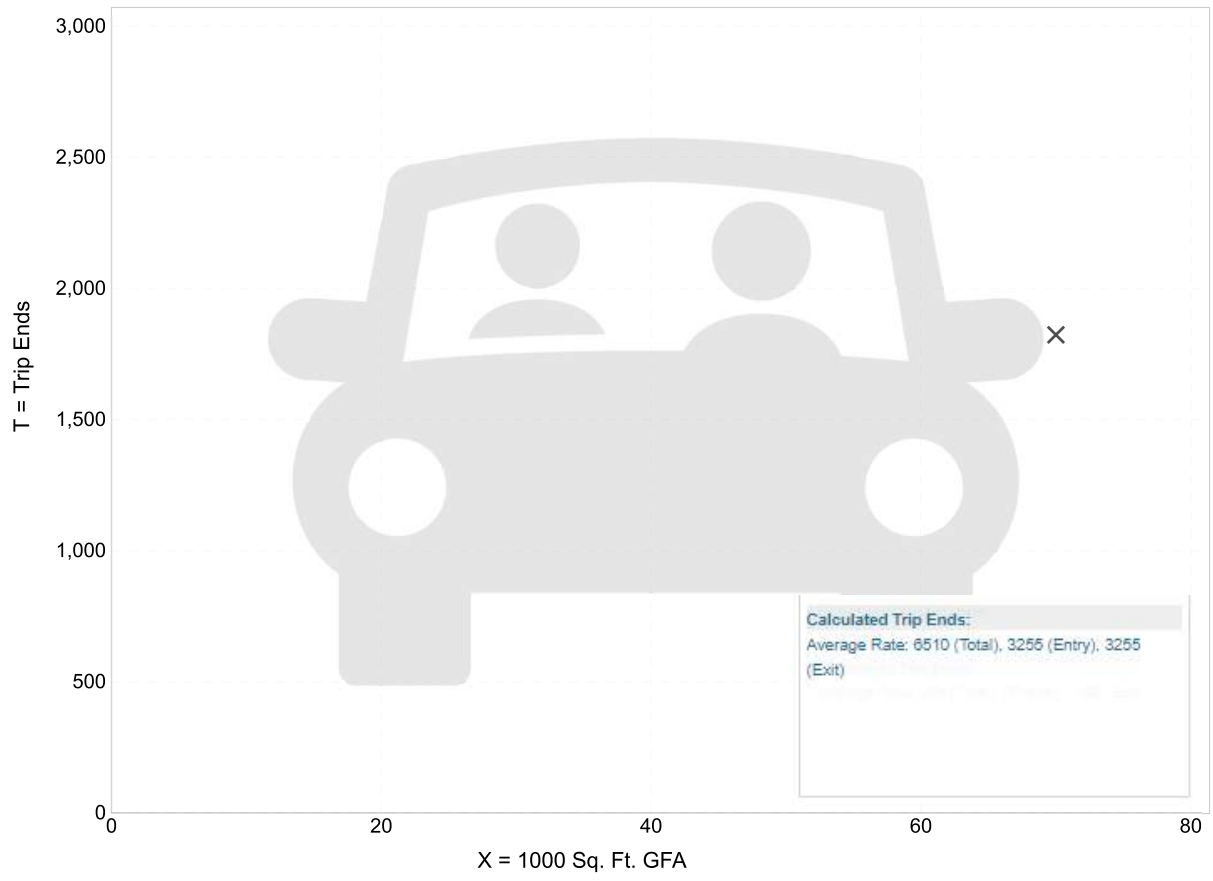
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

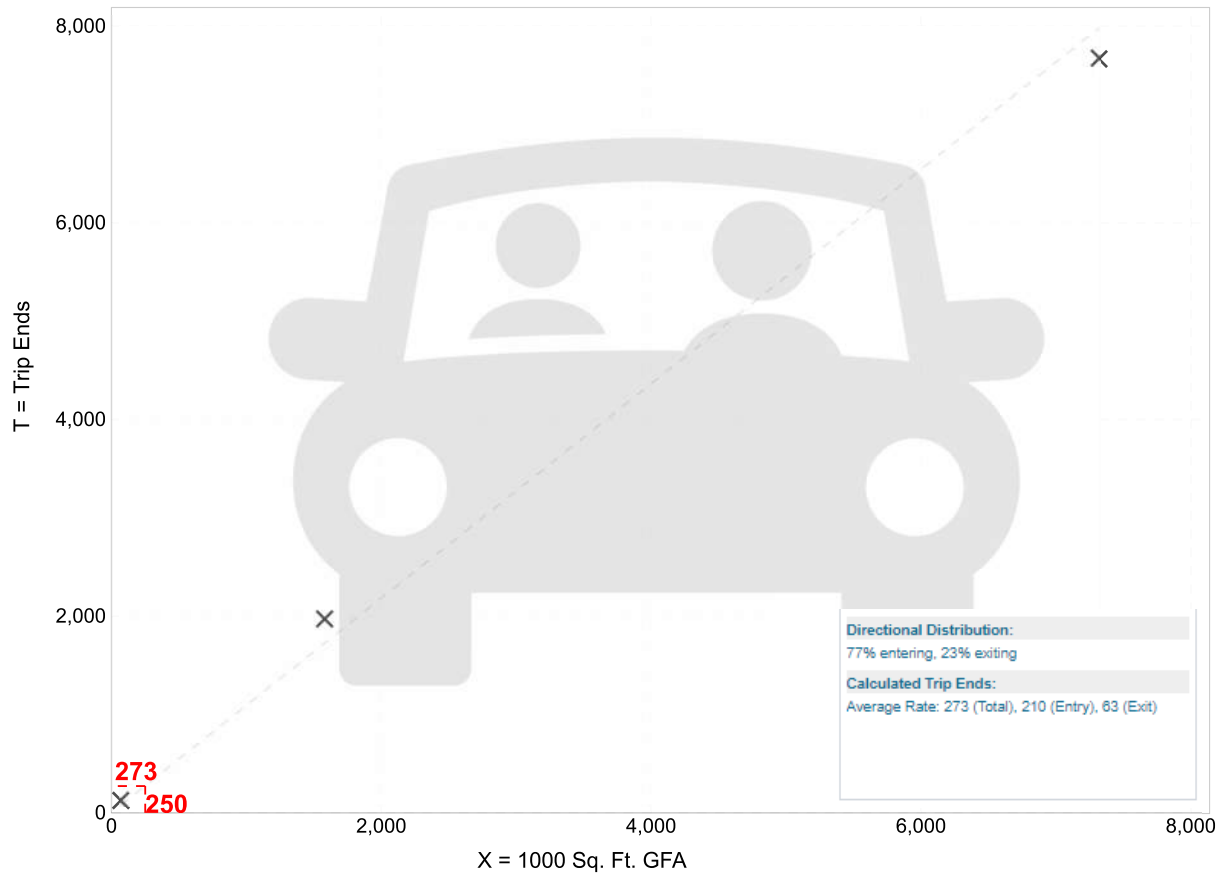
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

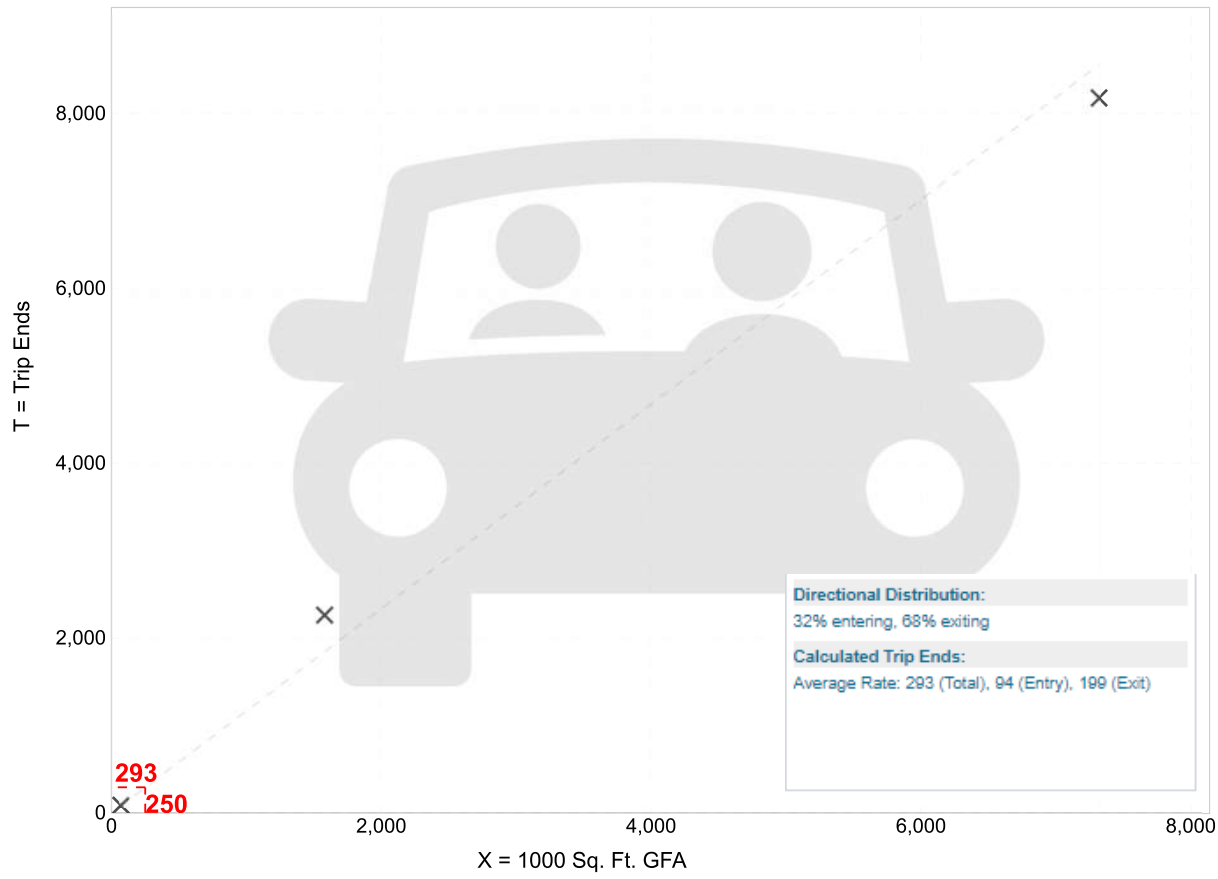
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

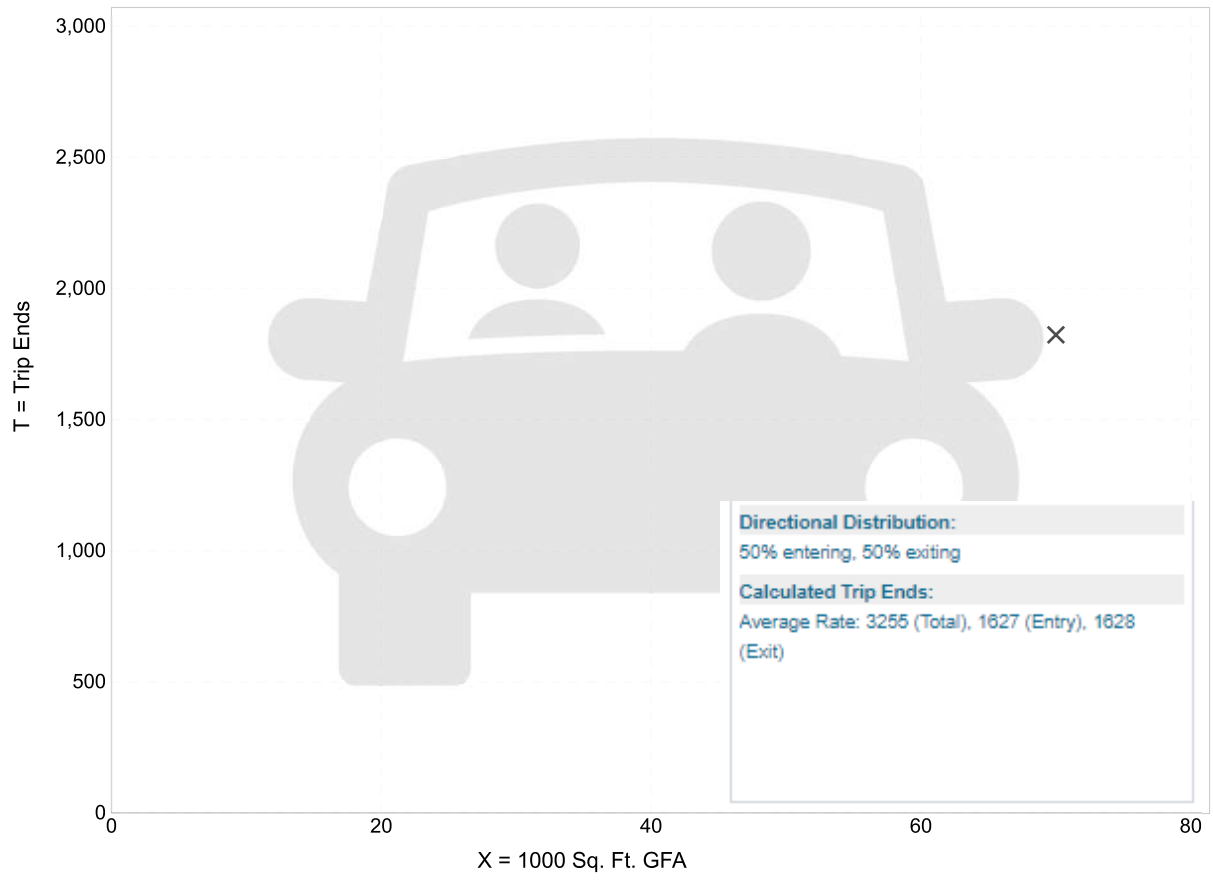
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

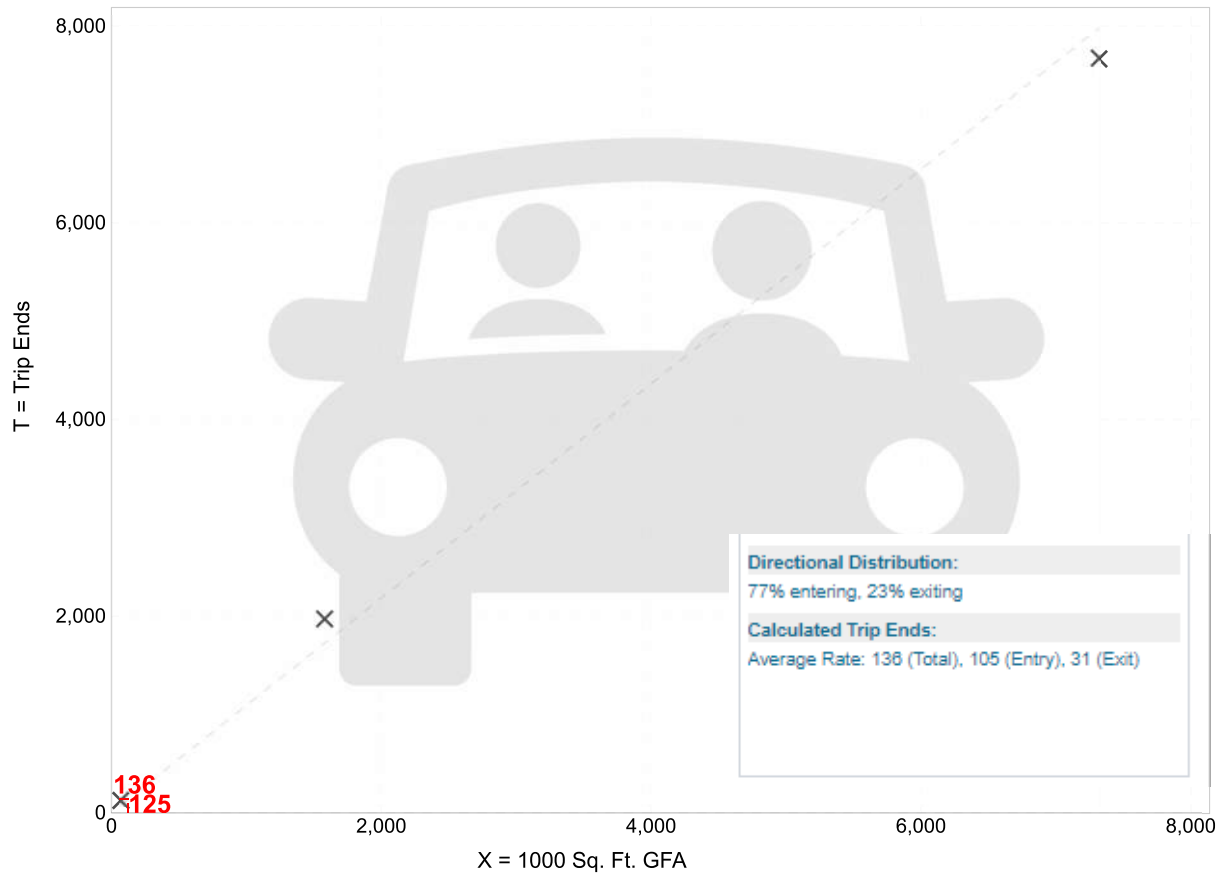
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

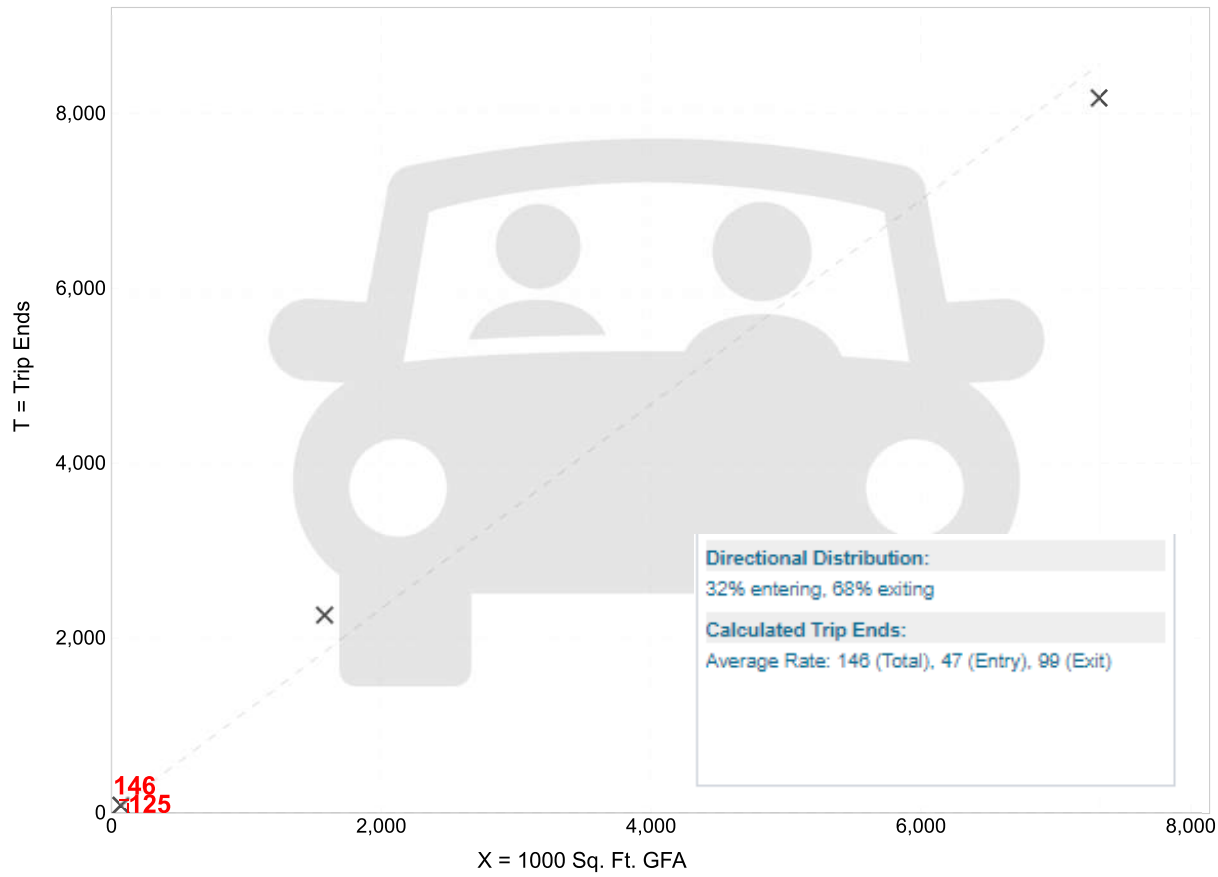
| | |
|---|---|
| **Vehicle Trip Ends vs:** | **1000 Sq. Ft. GFA** |
| **On a:** | **Weekday,**<br>**Peak Hour of Adjacent Street Traffic,**<br>**One Hour Between 4 and 6 p.m.** |
| **Setting/Location:** | **General Urban/Suburban** |
| Number of Studies: | 3 |
| Avg. 1000 Sq. Ft. GFA: | 2990 |
| Directional Distribution: | 32% entering, 68% exiting |

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***



# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

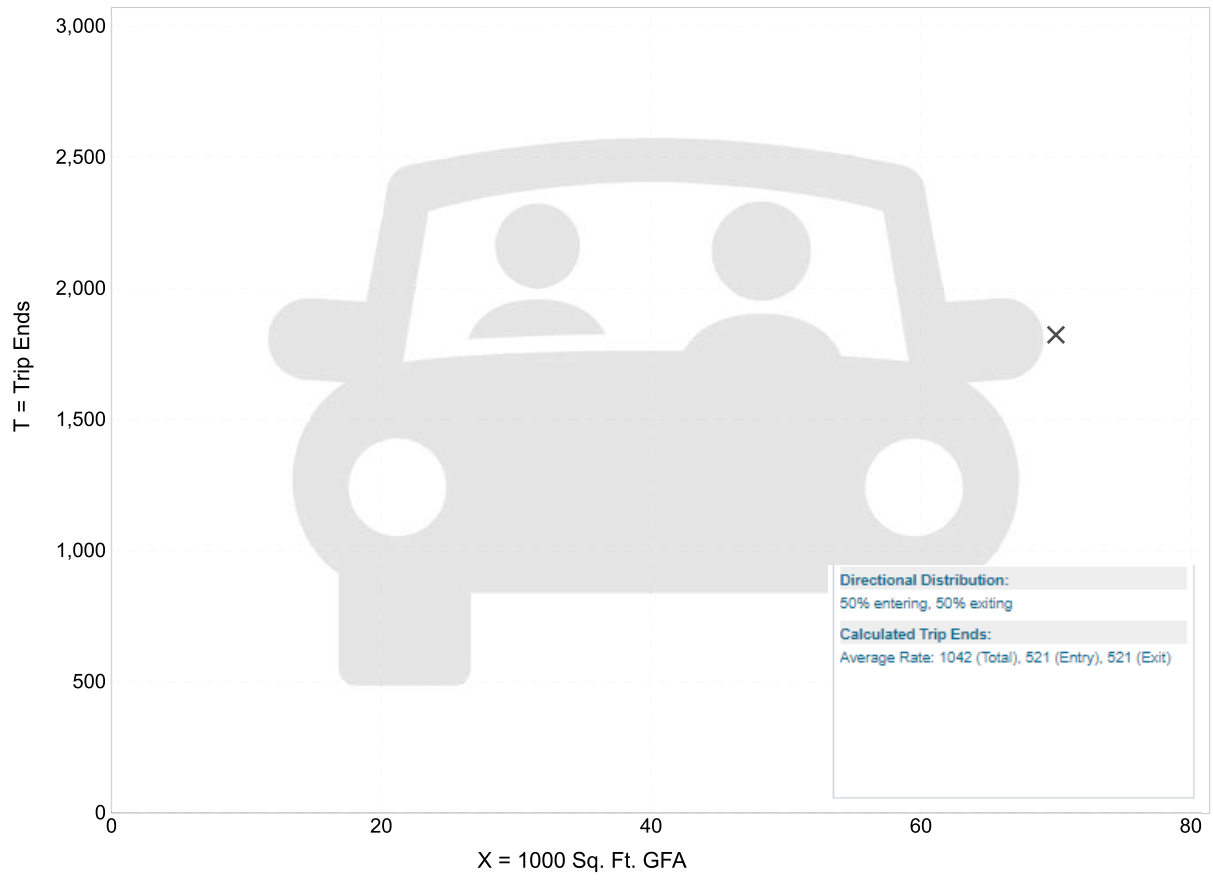
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

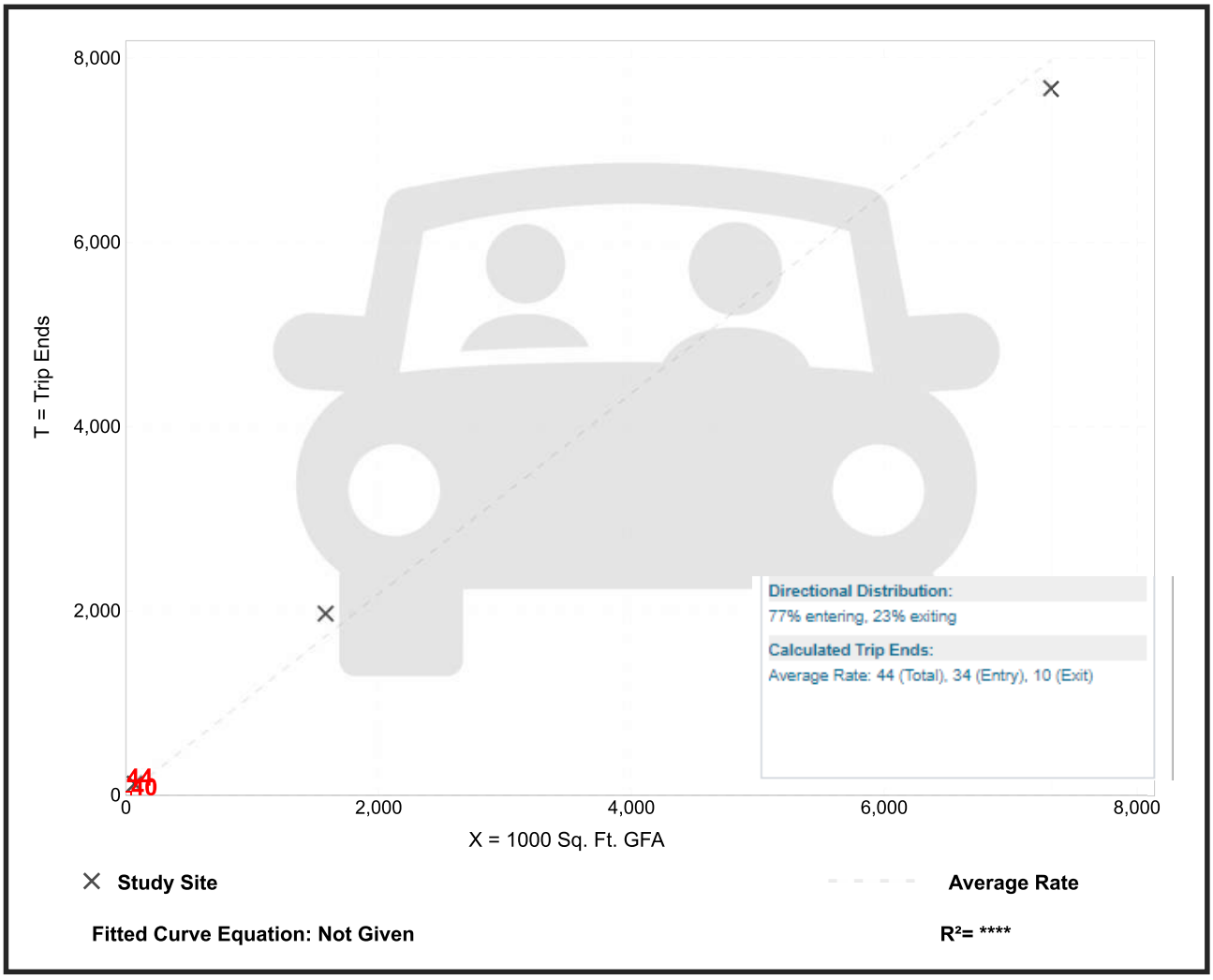
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

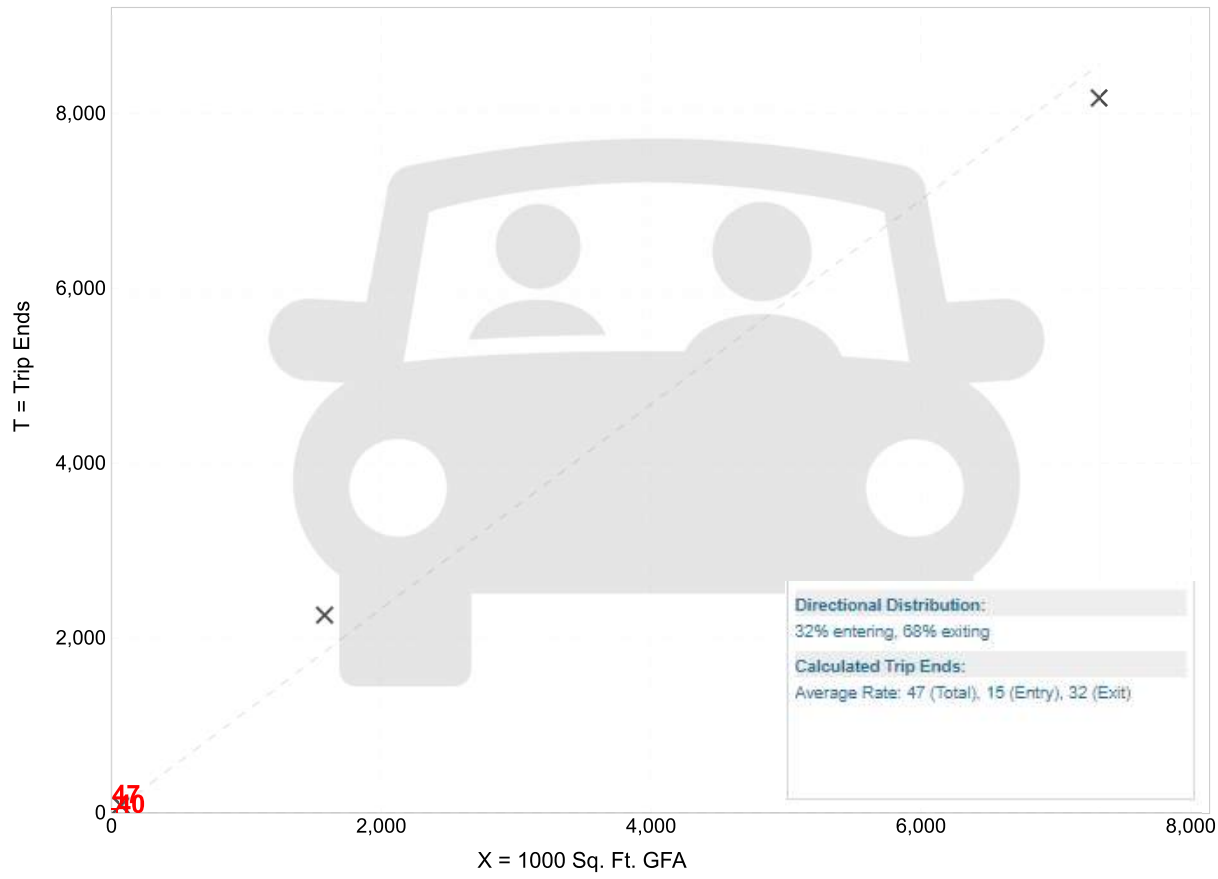
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

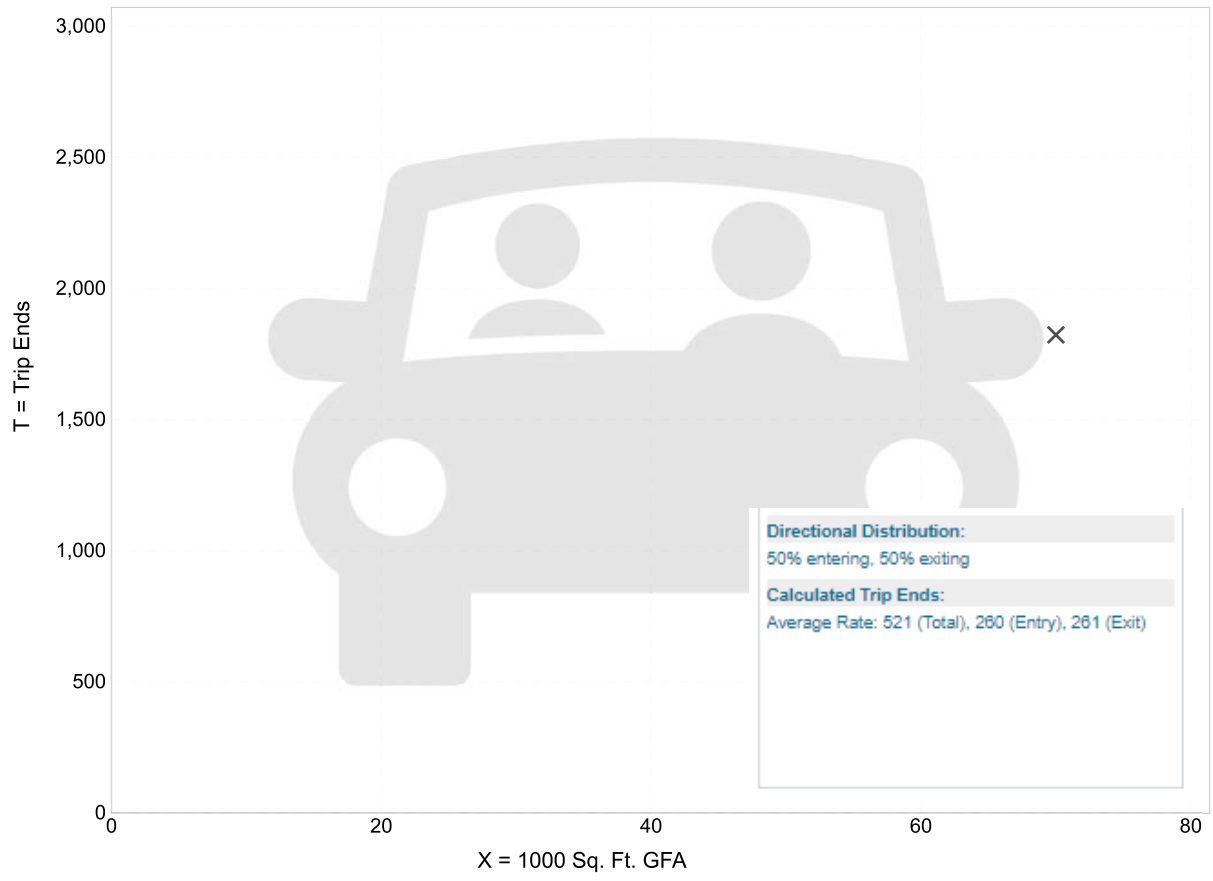
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

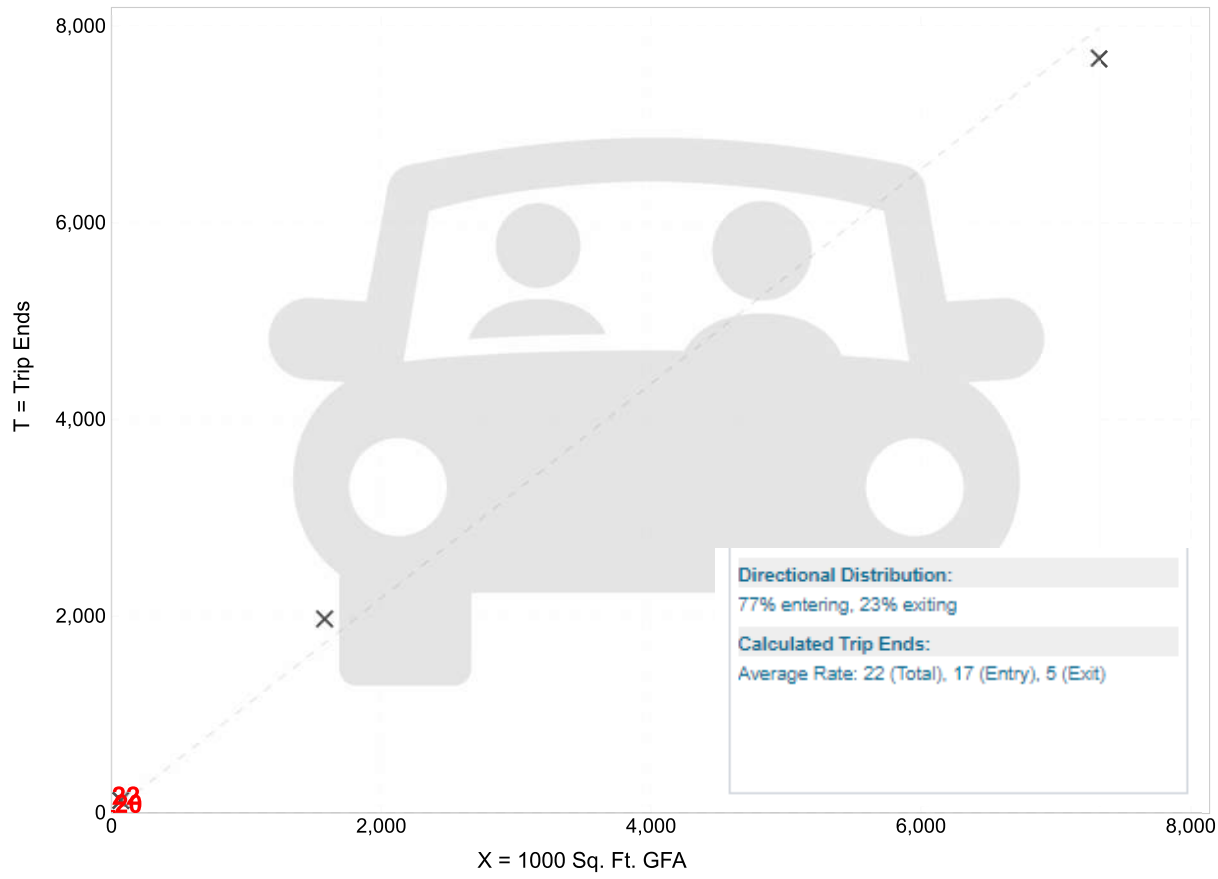
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given** **$R^2$= ****

*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

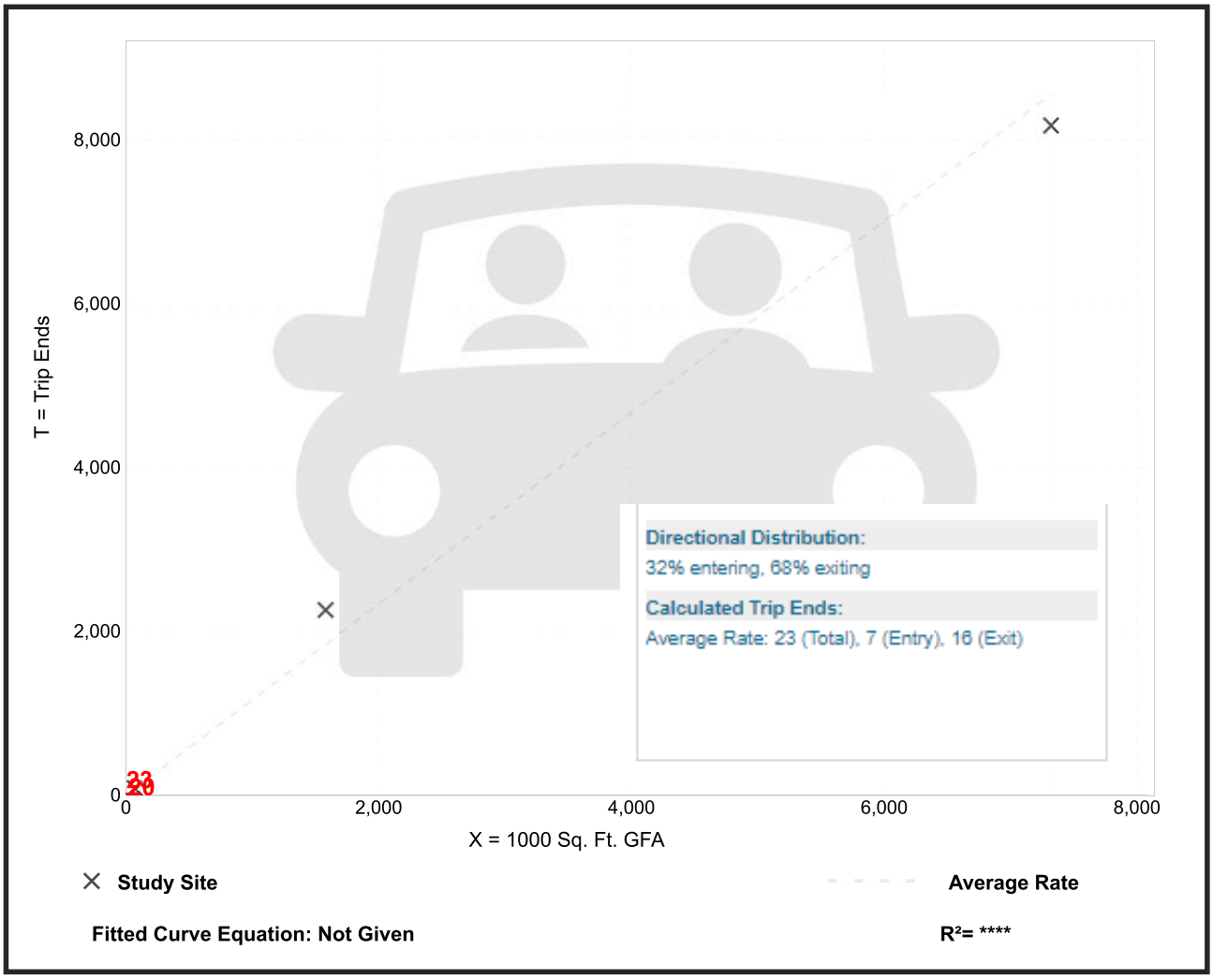
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given** **$R^2$= ******

# Off-Campus Student Apartment
(225)

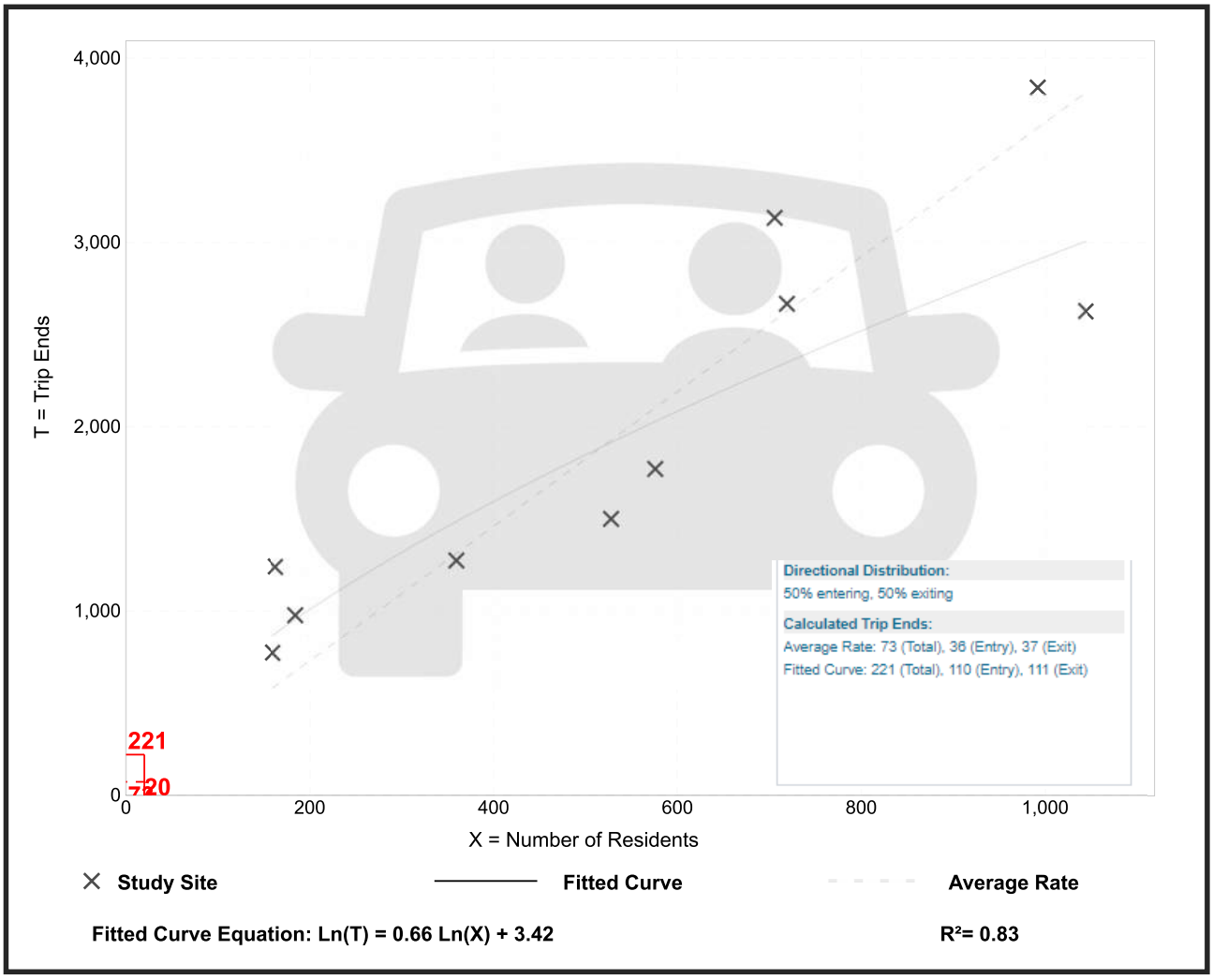
**Vehicle Trip Ends vs:** **Residents**
**On a:** **Weekday**

**Setting/Location:** **Adjacent to Campus**
Number of Studies: 10
Avg. Num. of Residents: 543
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per Resident

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 3.65 | 2.52 - 7.62 | 1.08 |

## Data Plot and Equation




**Fitted Curve Equation: Ln(T) = 0.66 Ln(X) + 3.42** **$R^2$= 0.83**

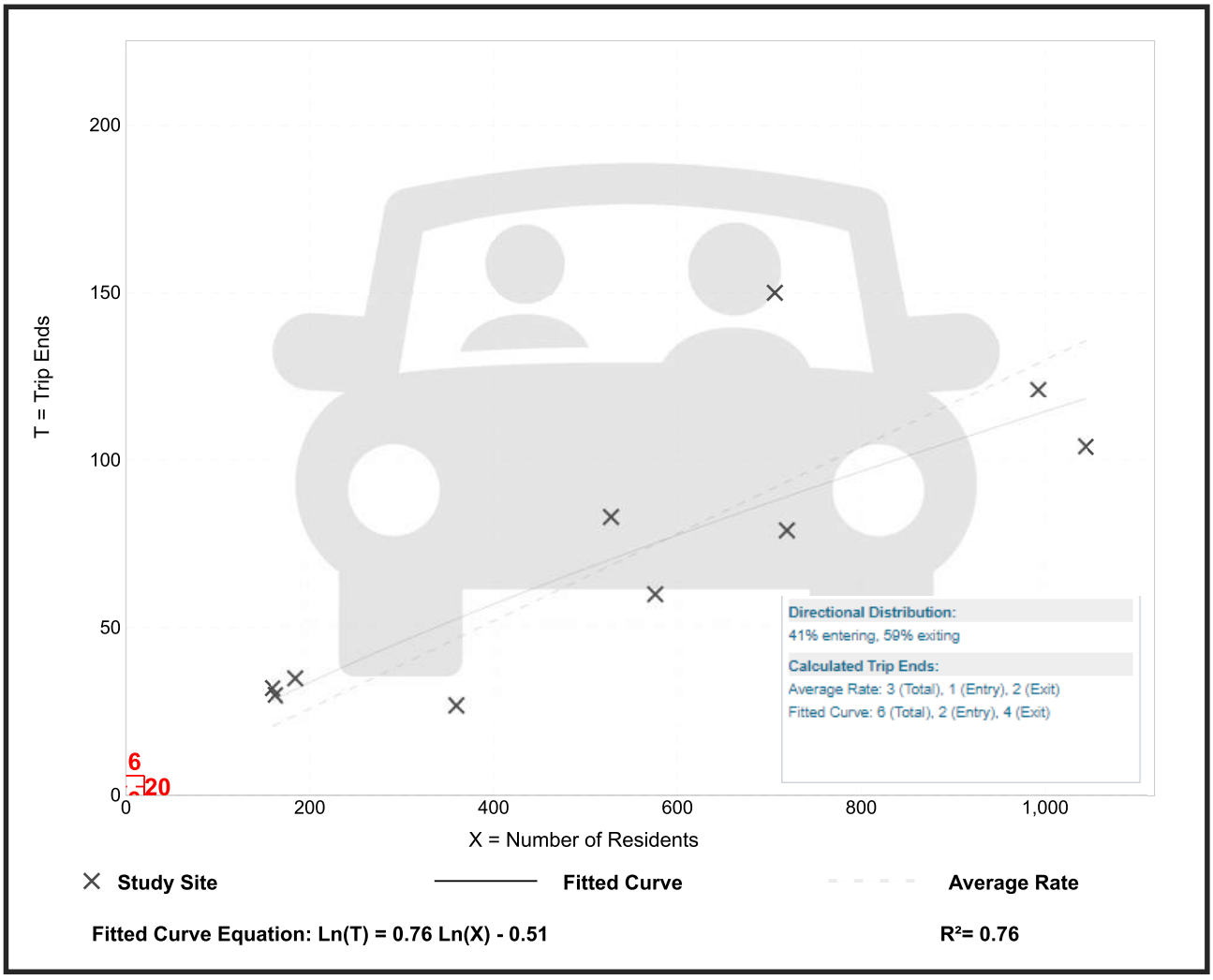
# Off-Campus Student Apartment
(225)

| | |
|---|---|
| **Vehicle Trip Ends vs:** | **Residents** |
| **On a:** | **Weekday,** |
| | **Peak Hour of Adjacent Street Traffic,** |
| | **One Hour Between 7 and 9 a.m.** |
| **Setting/Location:** | **Adjacent to Campus** |
| Number of Studies: | 10 |
| Avg. Num. of Residents: | 543 |
| Directional Distribution: | 41% entering, 59% exiting |

## Vehicle Trip Generation per Resident

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 0.13 | 0.08 - 0.21 | 0.04 |

## Data Plot and Equation



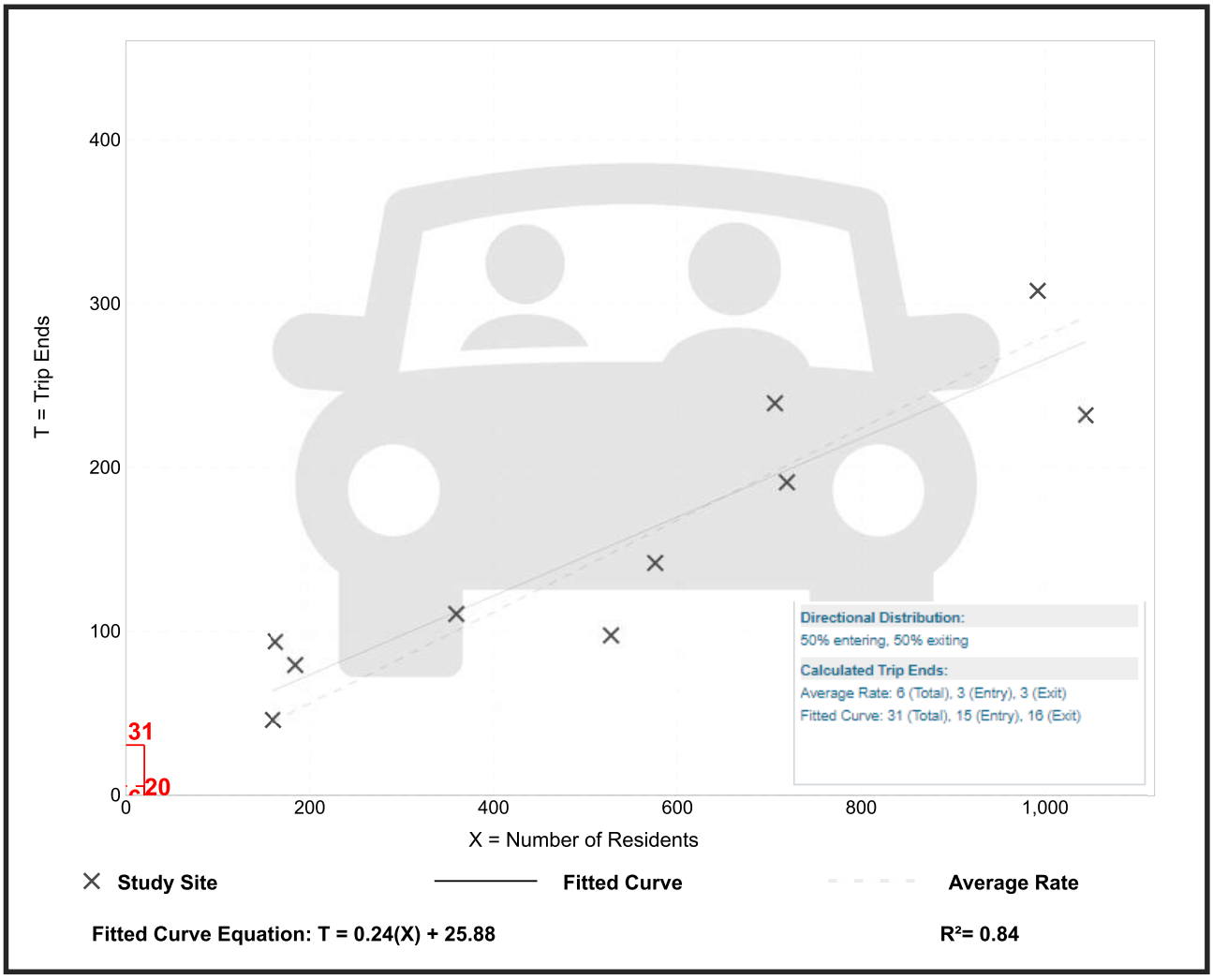
# Off-Campus Student Apartment
(225)

| | |
|---|---|
| **Vehicle Trip Ends vs:** | **Residents** |
| **On a:** | **Weekday,**<br>**Peak Hour of Adjacent Street Traffic,**<br>**One Hour Between 4 and 6 p.m.** |
| **Setting/Location:** | **Adjacent to Campus** |
| Number of Studies: | 10 |
| Avg. Num. of Residents: | 543 |
| Directional Distribution: | 50% entering, 50% exiting |

## Vehicle Trip Generation per Resident

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 0.28 | 0.19 - 0.58 | 0.08 |

## Data Plot and Equation



# Off-Campus Student Apartment
(225)

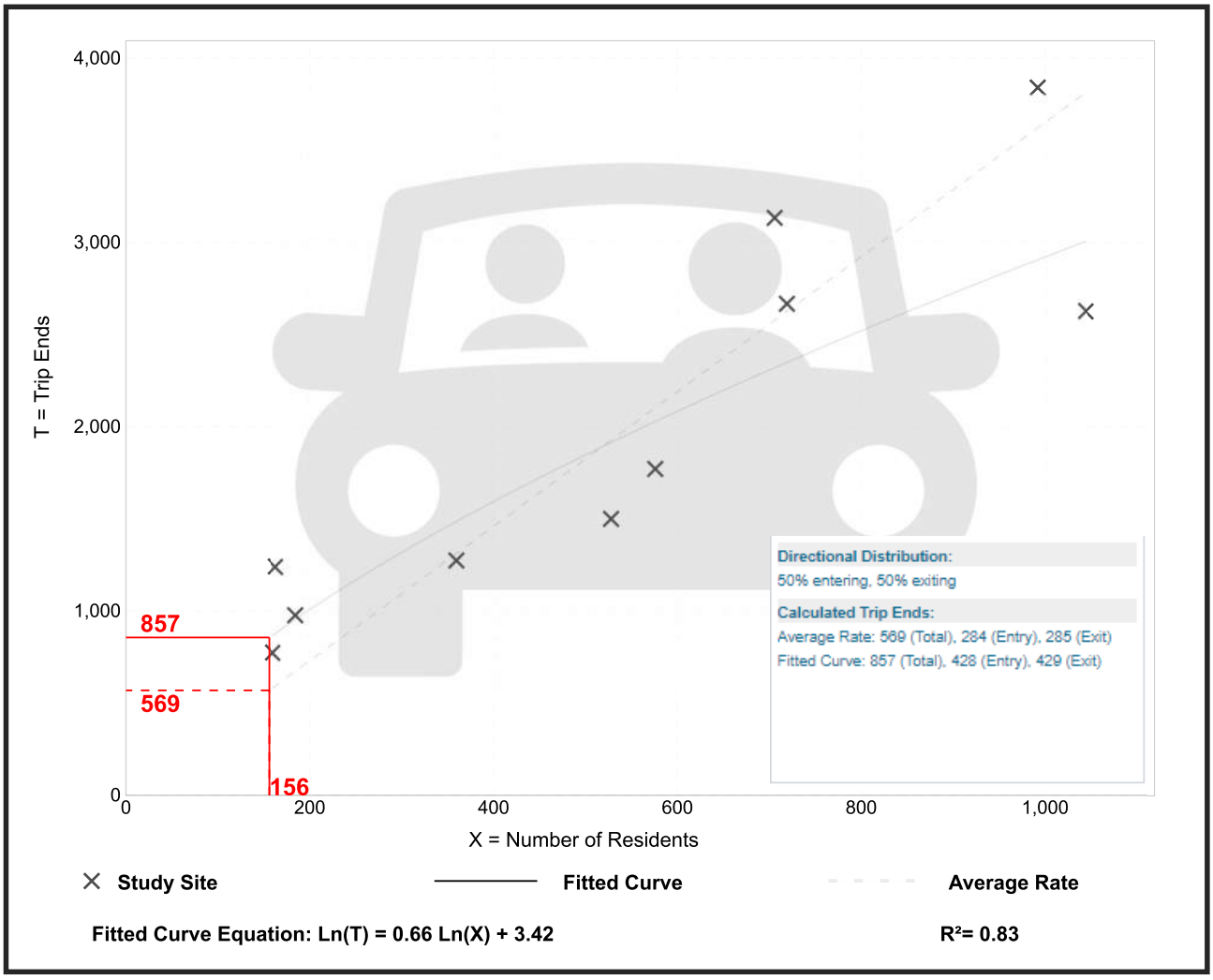
**Vehicle Trip Ends vs:** **Residents**
**On a:** **Weekday**

**Setting/Location:** **Adjacent to Campus**
Number of Studies: 10
Avg. Num. of Residents: 543
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per Resident

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 3.65 | 2.52 - 7.62 | 1.08 |

## Data Plot and Equation




**Fitted Curve Equation: Ln(T) = 0.66 Ln(X) + 3.42** **$R^2$= 0.83**

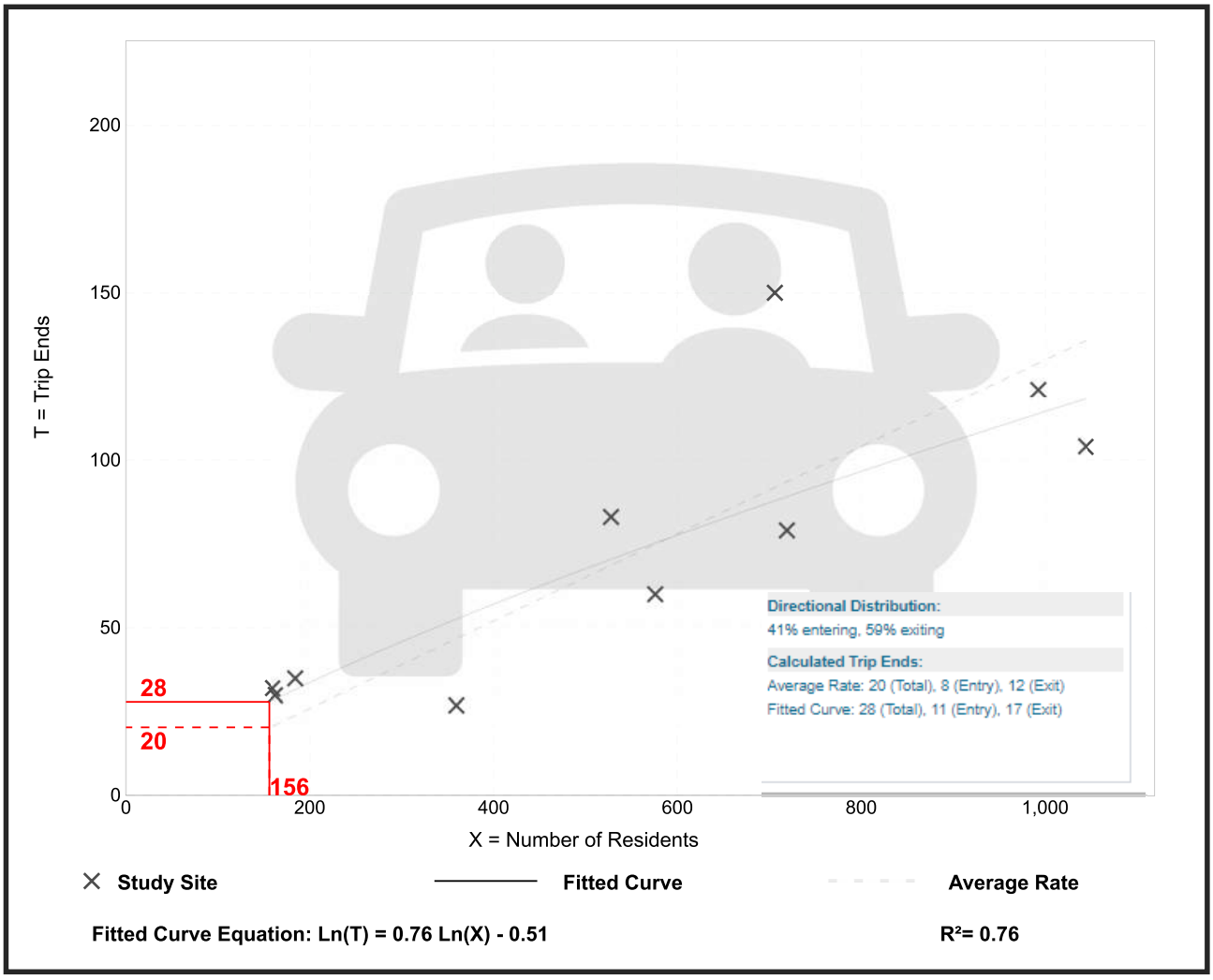
# Off-Campus Student Apartment
(225)

| | |
|---|---|
| **Vehicle Trip Ends vs:** | **Residents** |
| **On a:** | **Weekday,**<br>**Peak Hour of Adjacent Street Traffic,**<br>**One Hour Between 7 and 9 a.m.** |
| **Setting/Location:** | **Adjacent to Campus** |
| Number of Studies: | 10 |
| Avg. Num. of Residents: | 543 |
| Directional Distribution: | 41% entering, 59% exiting |

## Vehicle Trip Generation per Resident

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 0.13 | 0.08 - 0.21 | 0.04 |

## Data Plot and Equation




**Fitted Curve Equation: Ln(T) = 0.76 Ln(X) - 0.51** **$R^2$= 0.76**

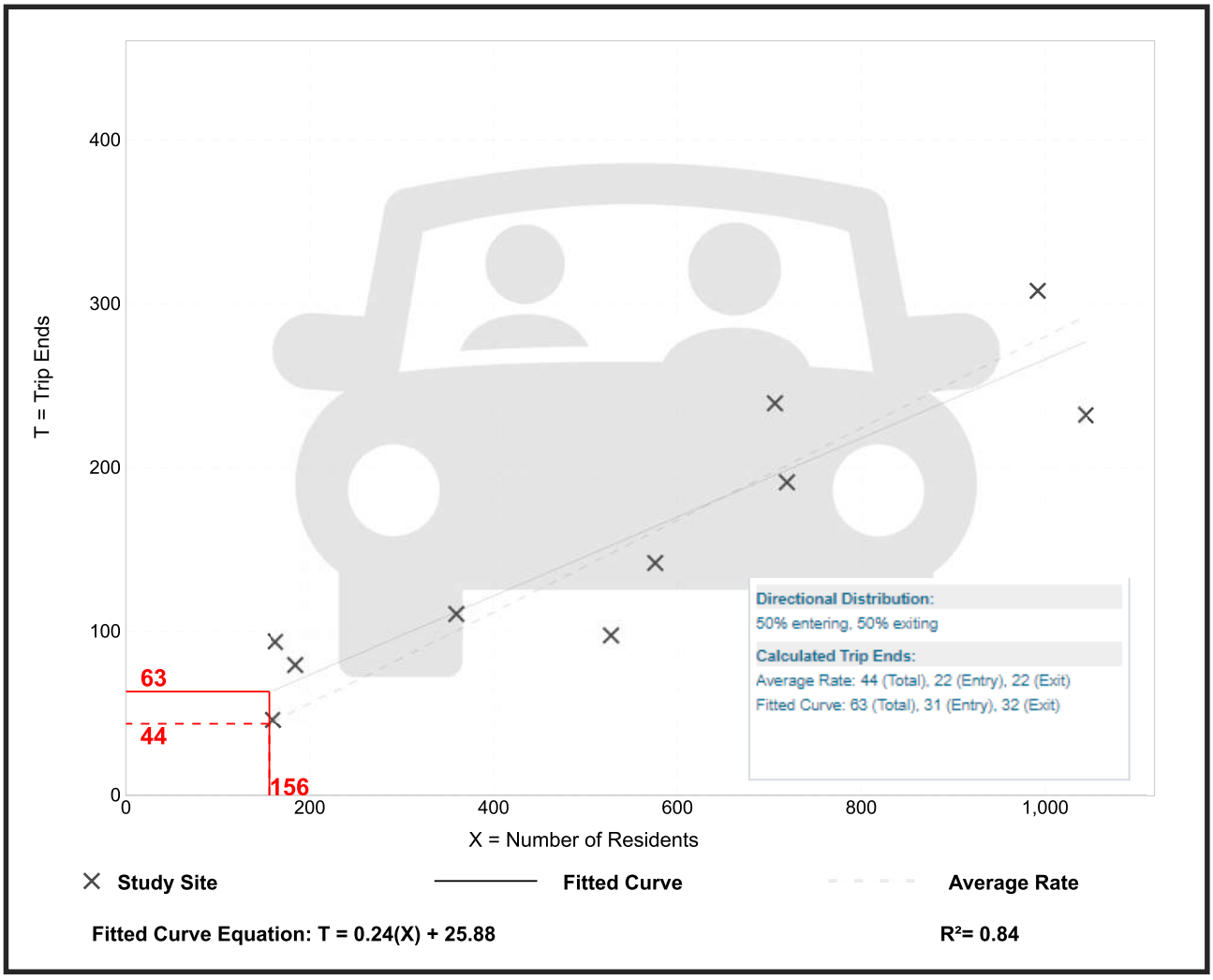
# Off-Campus Student Apartment
(225)

| | |
|---|---|
| **Vehicle Trip Ends vs:** | **Residents** |
| **On a:** | **Weekday,** |
| | **Peak Hour of Adjacent Street Traffic,** |
| | **One Hour Between 4 and 6 p.m.** |
| **Setting/Location:** | **Adjacent to Campus** |
| Number of Studies: | 10 |
| Avg. Num. of Residents: | 543 |
| Directional Distribution: | 50% entering, 50% exiting |

## Vehicle Trip Generation per Resident

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 0.28 | 0.19 - 0.58 | 0.08 |

## Data Plot and Equation




**Fitted Curve Equation: T = 0.24(X) + 25.88**

**$R^2$= 0.84**

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

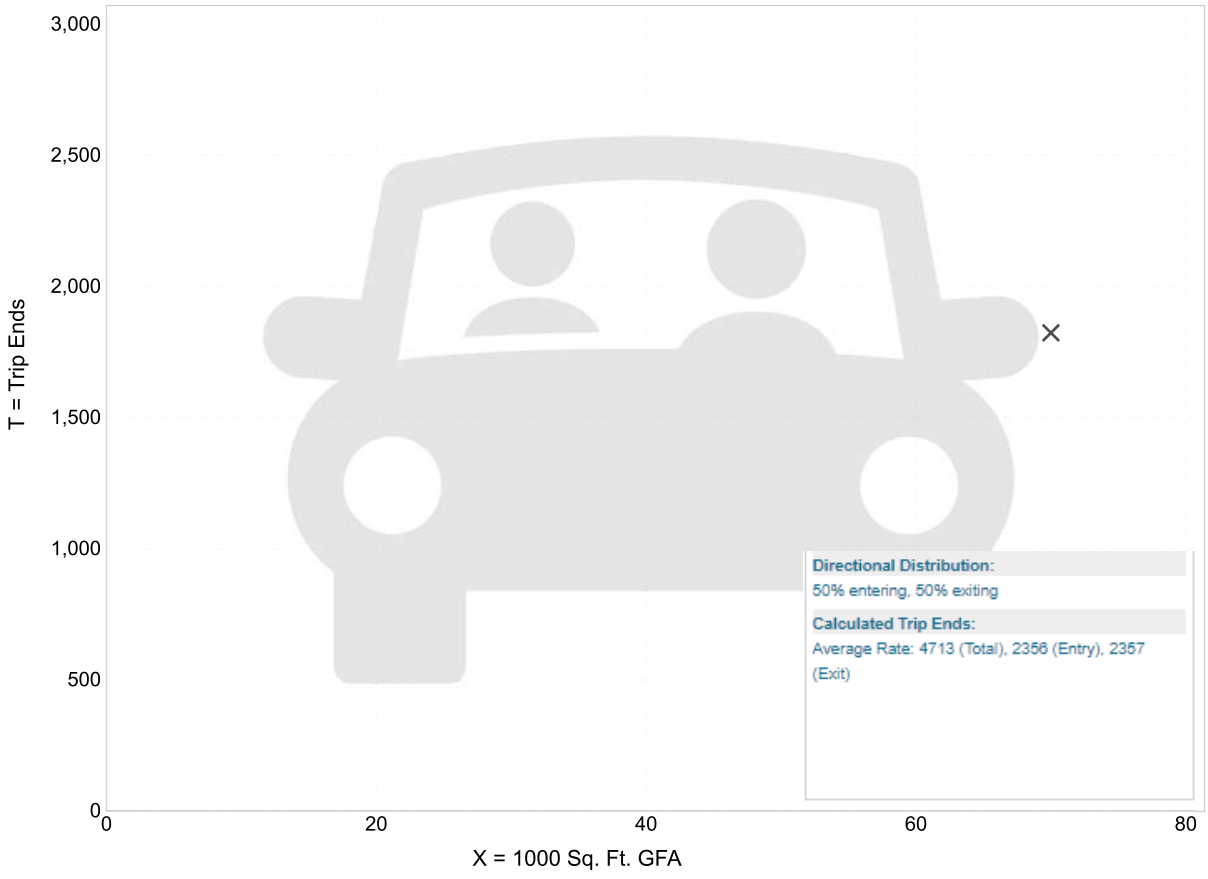
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

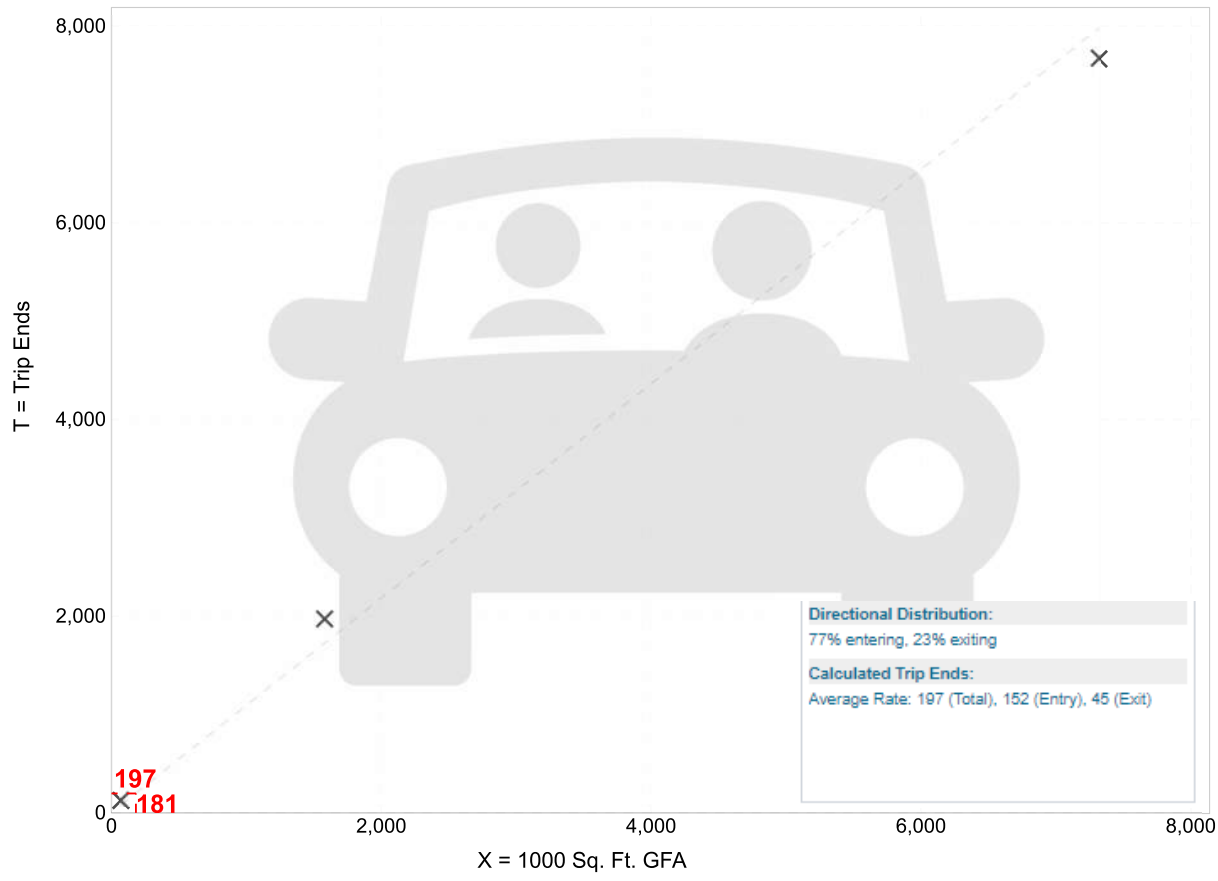
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

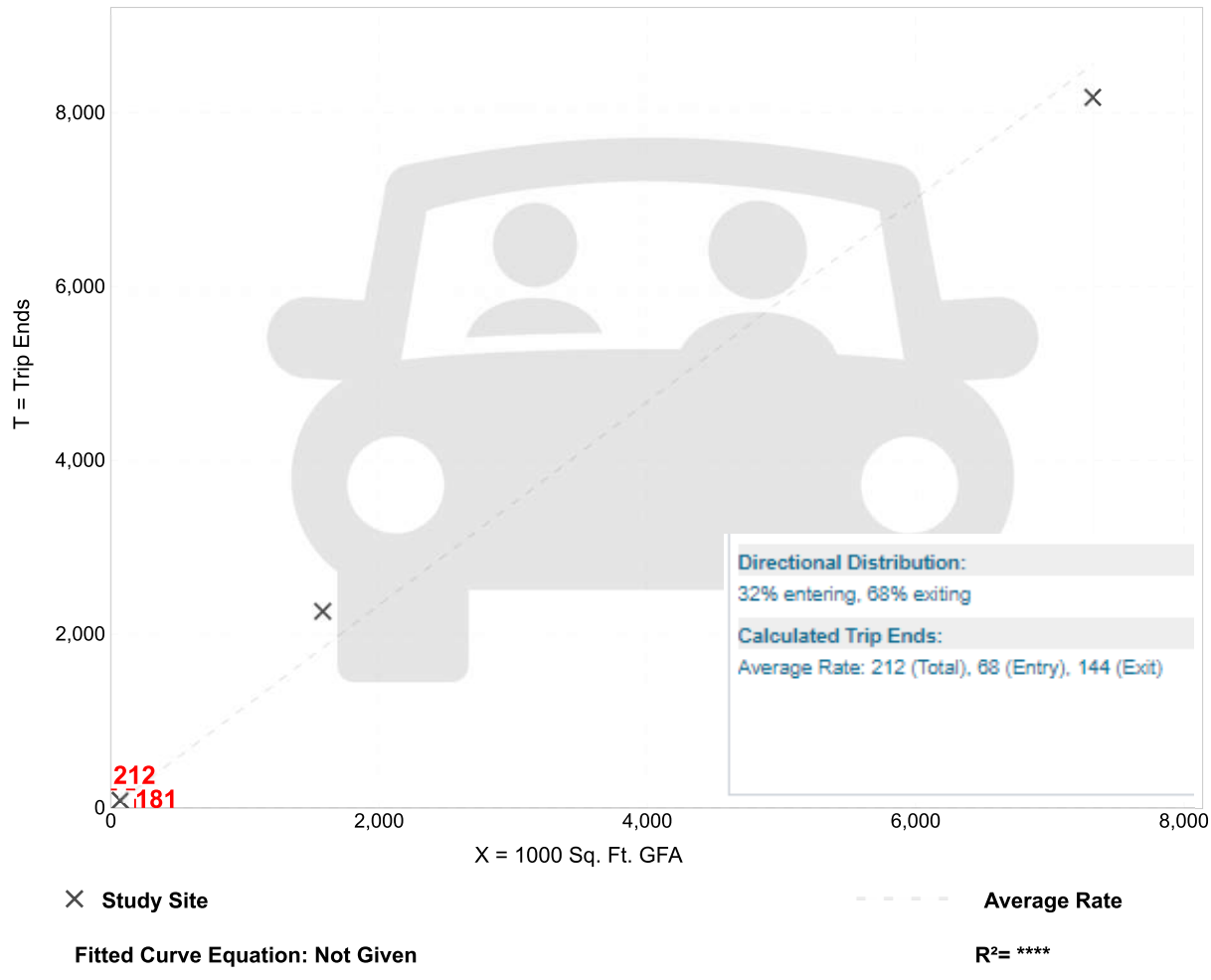
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

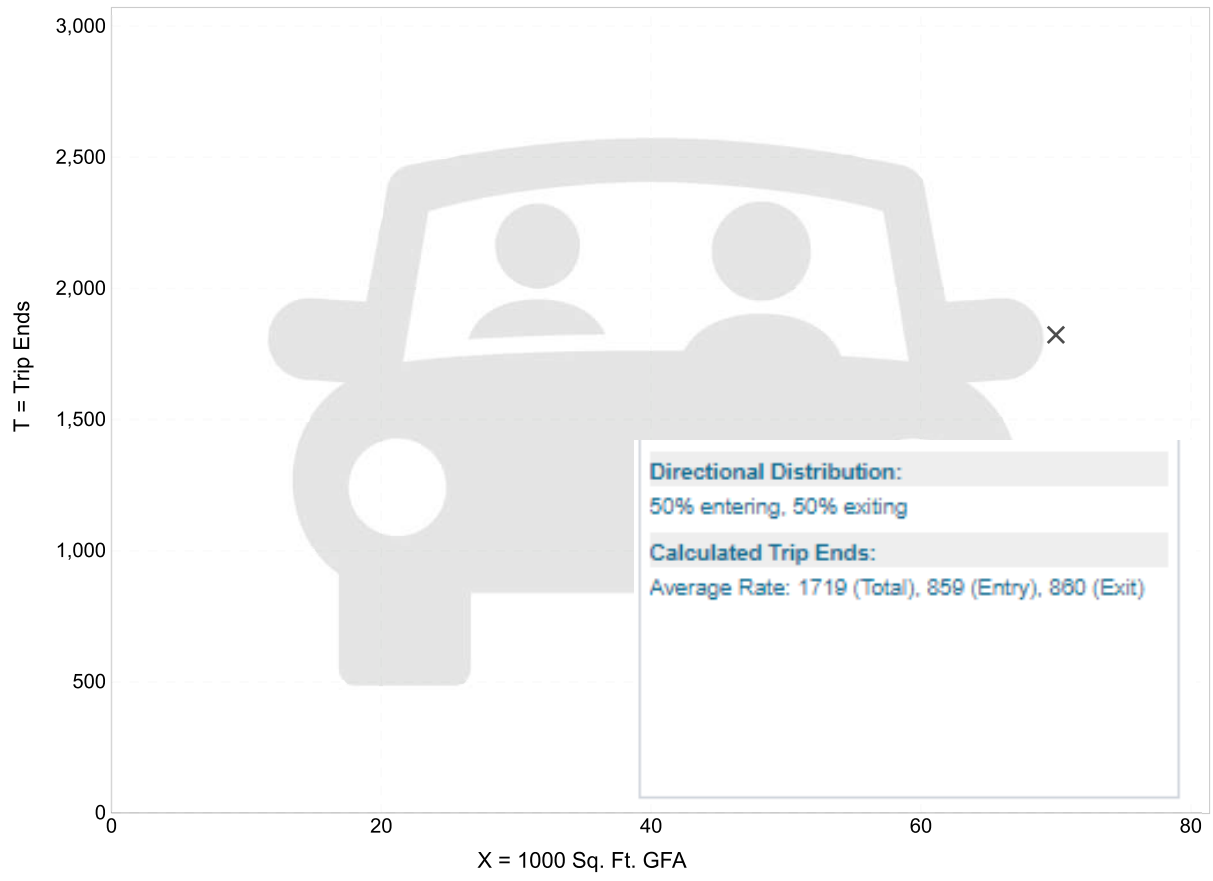
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

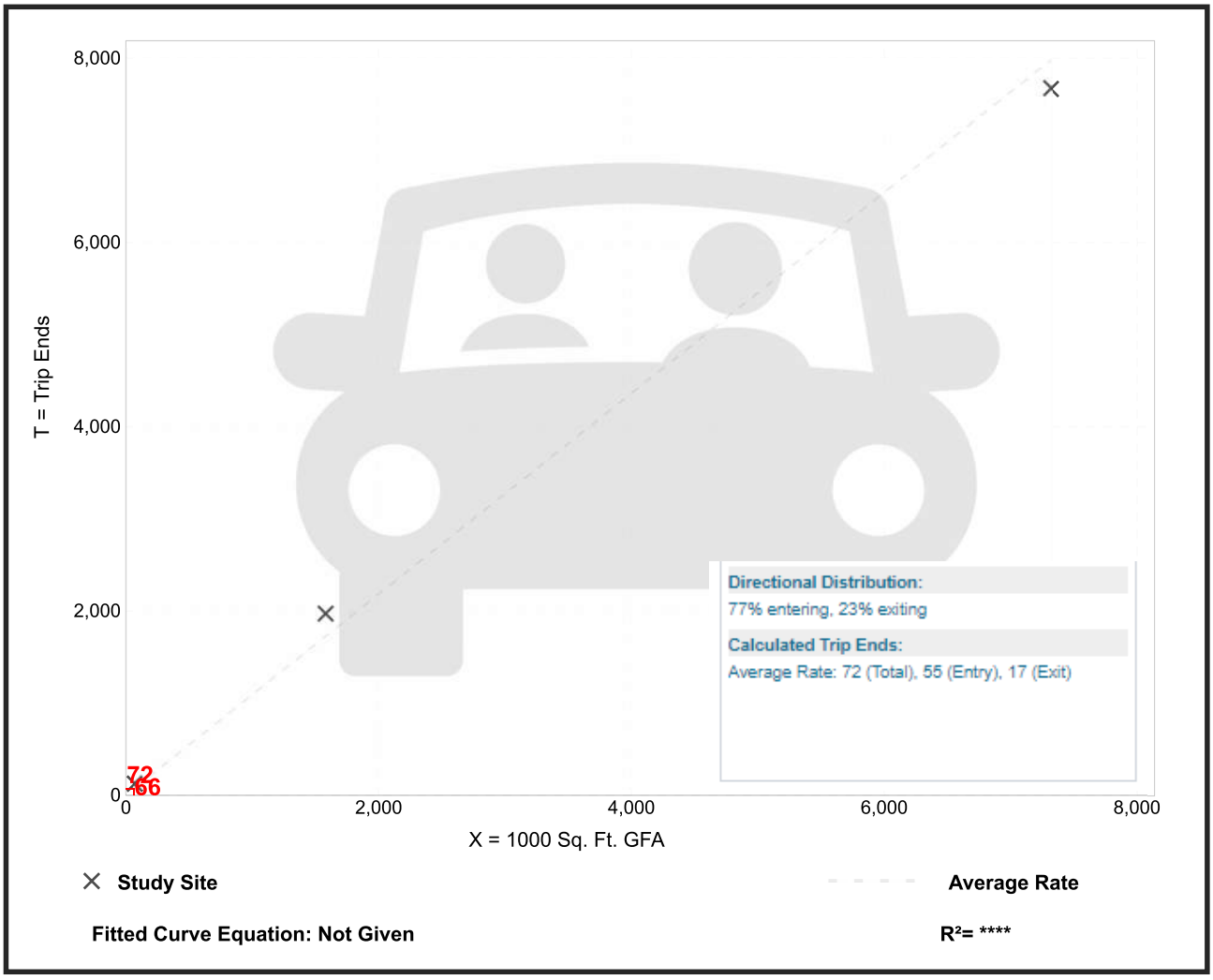
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given** **$R^2$= ****

*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

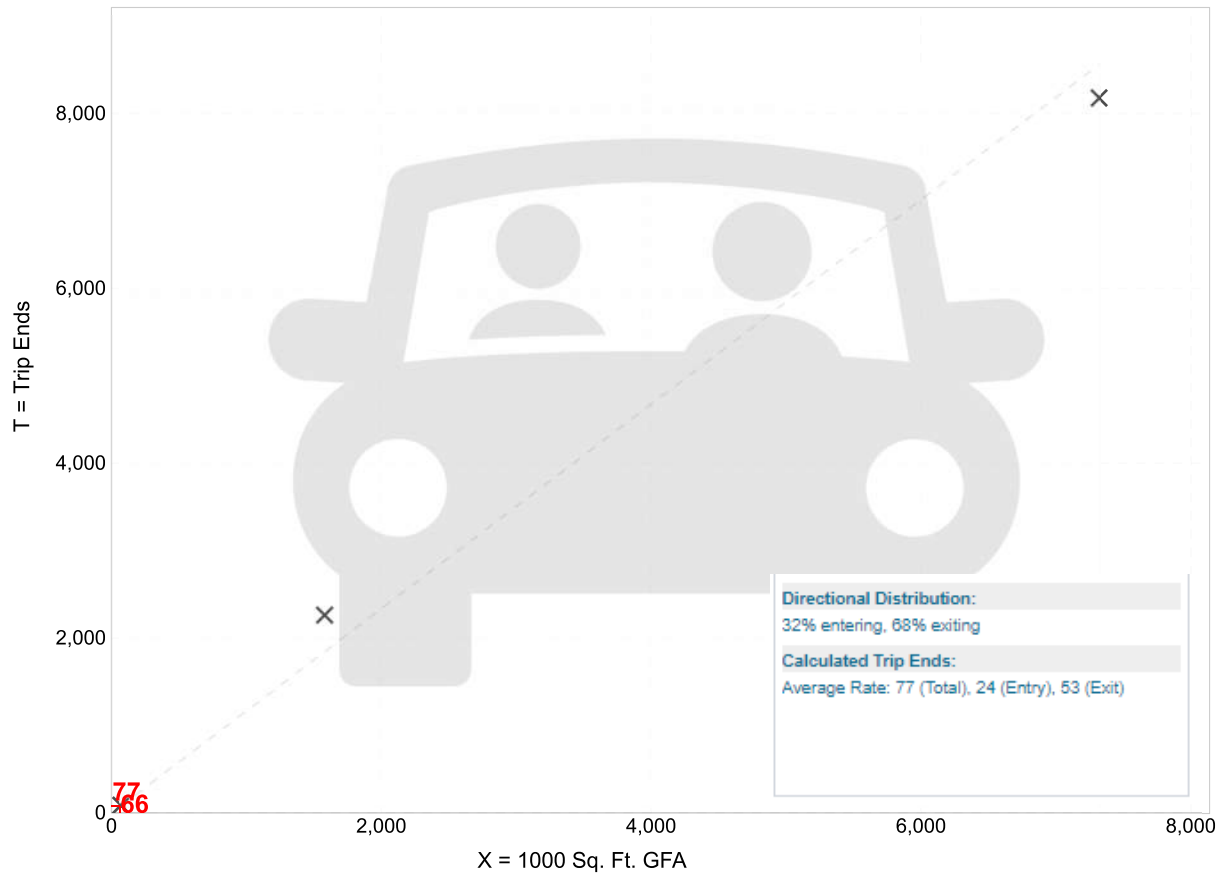
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

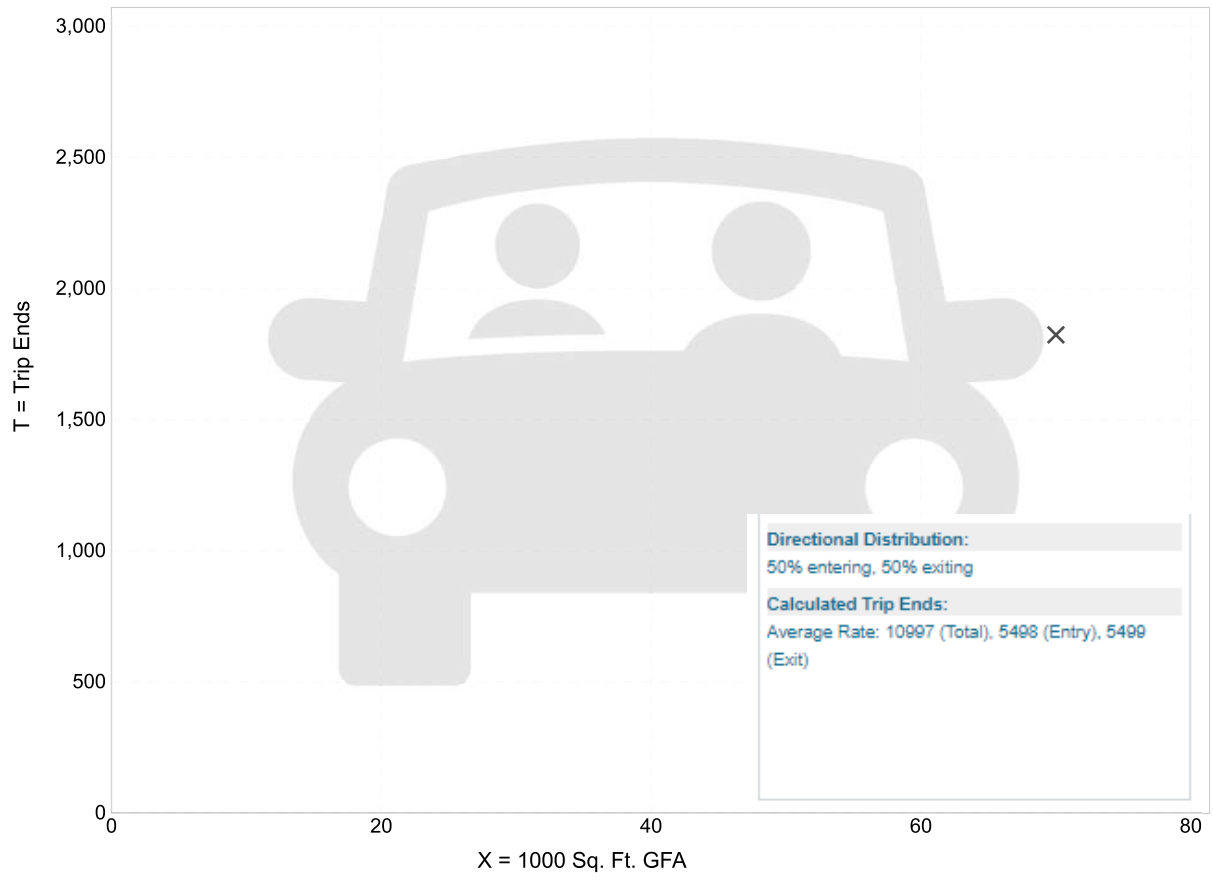
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

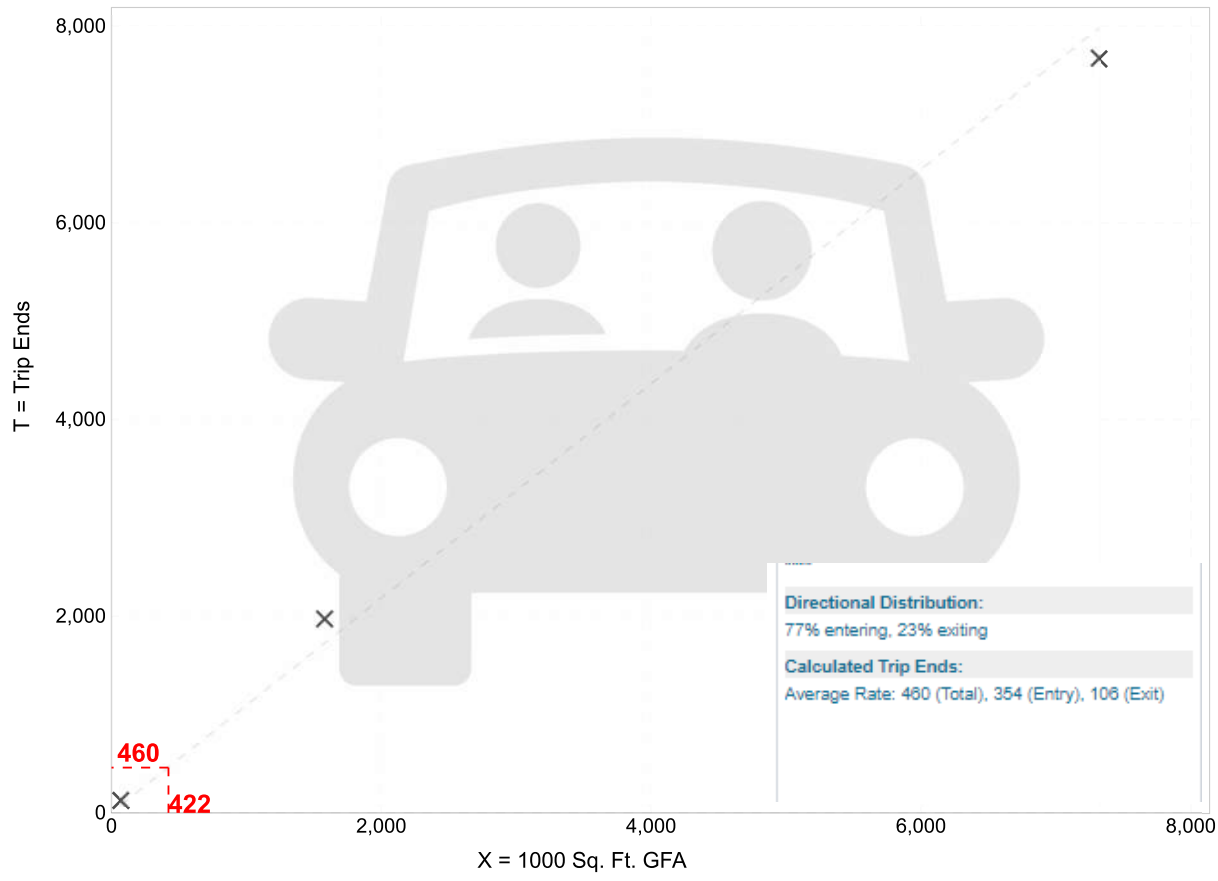
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




× **Study Site** - - - - **Average Rate**

**Fitted Curve Equation: Not Given** **$R^2$= ******

# University/College
(550)

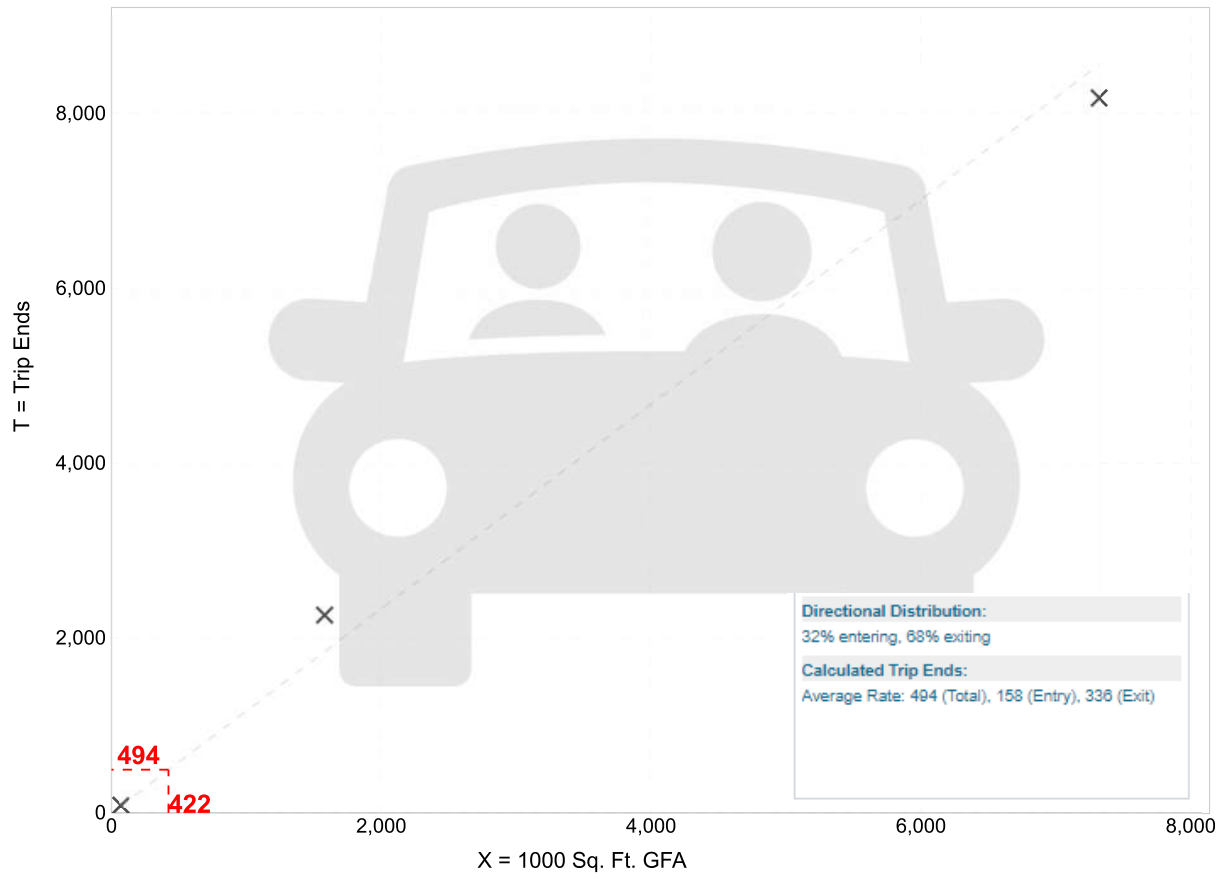
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

*Trip Gen Manual,* 10th Edition ● Institute of Transportation Engineers

# University/College
(550)

**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday**

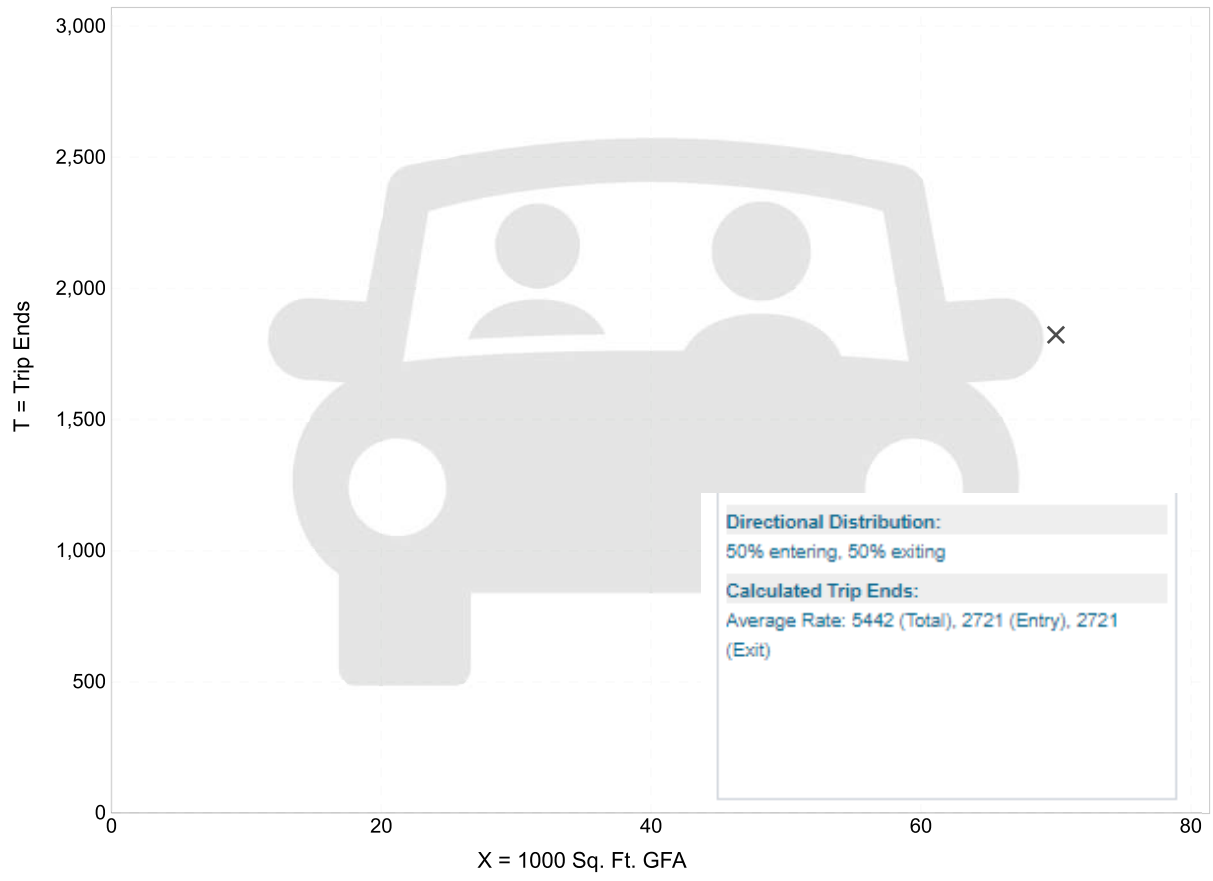
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 1
Avg. 1000 Sq. Ft. GFA: 70
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 26.04 | 26.04 - 26.04 | * |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ****

# University/College
(550)

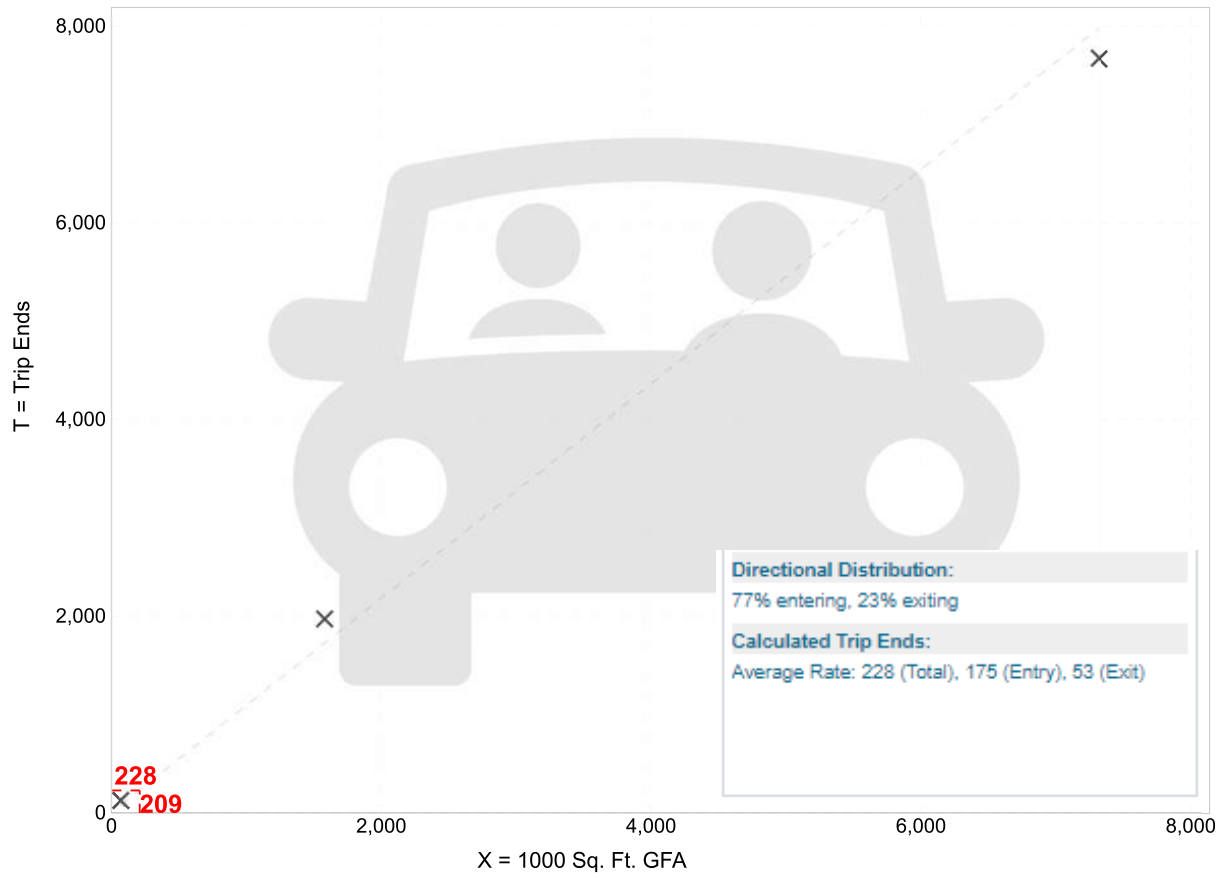
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.09 | 1.05 - 1.80 | 0.12 |

## Data Plot and Equation

***Caution – Small Sample Size***




× **Study Site** - - - - **Average Rate**

**Fitted Curve Equation: Not Given** **$R^2$= ******

# University/College
(550)

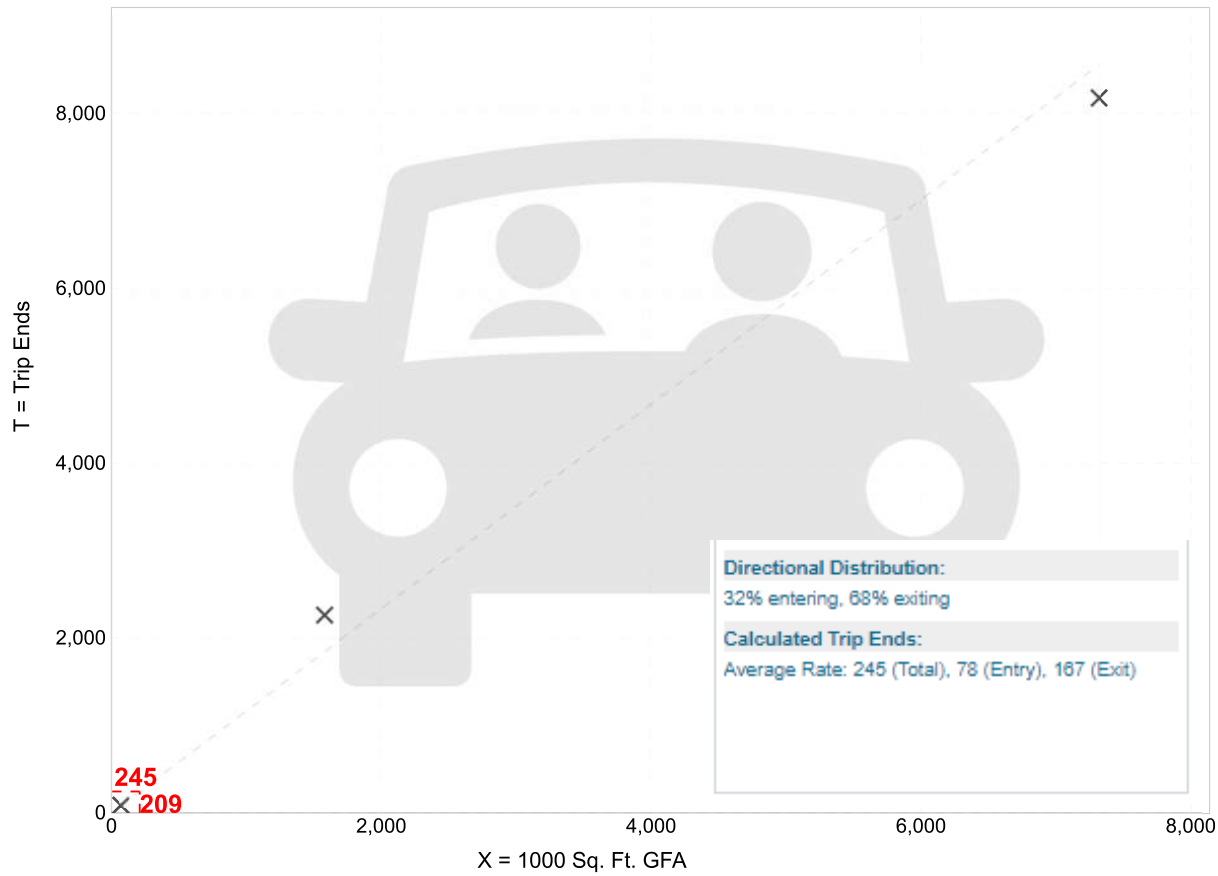
**Vehicle Trip Ends vs:** **1000 Sq. Ft. GFA**
**On a:** **Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**
**Setting/Location:** **General Urban/Suburban**
Number of Studies: 3
Avg. 1000 Sq. Ft. GFA: 2990
Directional Distribution: 32% entering, 68% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.17 | 1.12 - 1.43 | 0.15 |

## Data Plot and Equation

***Caution – Small Sample Size***




**Fitted Curve Equation: Not Given**

**$R^2$= ******

# APPENDIX D
## Carnegie Mellon 2018 Parking Master Plan Highlights



gai consultants
transforming ideas into reality®

# Carnegie Mellon University

## Parking Study | 2018


- Ayers Saint Gross
- Brailsford & Dunlavey
- Fehr & Peers


*November 2018*

# Campus Commute Patterns

*Each icon represents a total of 100 individuals or parking spaces*
*Demographic Data sourced from www.cmu.edu/ira | Survey Data collected Spring 2018 by Fehr & Peers*

**STUDENTS**
13,000

**FACULTY & STAFF**
5,800

**VISITORS**
1,000

**PARKING SPACES**
3,000

*How do you get to campus during the week?*

- PARK ON CAMPUS (PERMIT HOLDERS, CMU OPERATED PAID LOTS, OR METERS)
- PARK OFF CAMPUS – *PER SURVEY DATA*

*Arrive via alternative method:*

- PUBLIC TRANS
- WALK
- BIKE
- CMU SHUTTLE
- RIDE HAILING
- OTHER

# Calculating Parking Demand

## Current Supply 3,081

*Includes:*

- *On-campus parking*
- *Leased spaces*
- *Metered spaces on Frew Street* (144)

2022 parking supply, less 144 metered spaces = 2,908

## Demand 2,852

*Includes:*

- *On-campus observed demand*
- *Documented off-campus parking (from Survey)*
- *Waitlisted permit applications*

## Parking Efficiency Rate : 90%

*Demand = 90% of Recommended Supply*

## Recommended Supply 3,169

## Current Deficit (88)

1. *Parking occupancy data collected on Monday, April 10th, 2017 and includes student parking and campus managed on-street parking*

2. *Documented off-campus parking calculated based on April 2018 employee survey response data*

# APPENDIX E
## Turning Movement Counts from Previous Studies



gai consultants
transforming ideas into reality®

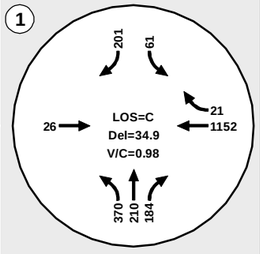
Figure 2: September 2010 AM Peak Intersection Operations

Oakland/CMU Pedestrian Safety Mobility Study

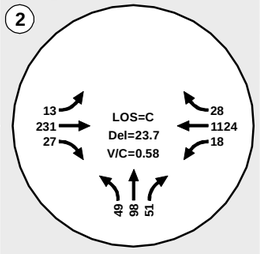
January 2011

1 2 3 4 5 6 7 8 9 10

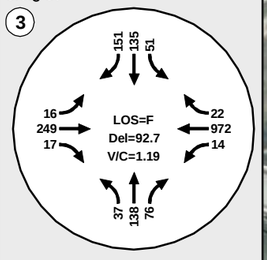
**Fifth Ave & Bellefield Ave** (1)



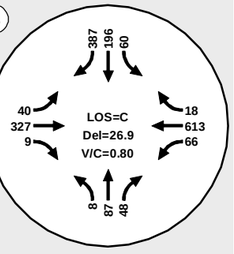

**Fifth Ave & Dithridge St** (2)



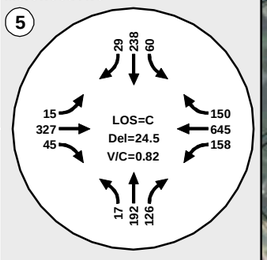

**Fifth Ave & Craig St** (3)



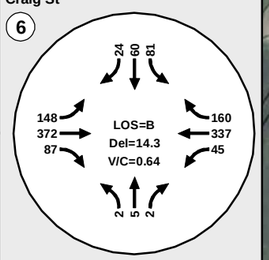

**Fifth Ave & Neville St** (4)



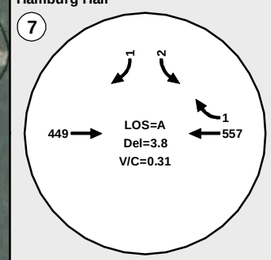

**Fifth Ave & Morewood Ave** (5)



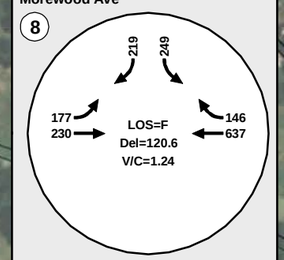

**Forbes Ave & Craig St** (6)



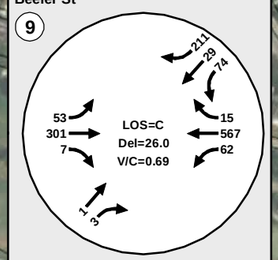

**Forbes Ave & Hamburg Hall** (7)



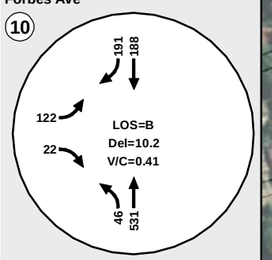

**Forbes Ave & Morewood Ave** (8)




**Forbes Ave & Beeler St** (9)




**Margaret Morrison St & Forbes Ave** (10)




**Legend**

0 100 200 400 Feet

1 inch = 400 feet

Study Intersections

Study Roads

PCTI Pennsylvania Community Transportation Initiative — Oakland Transportation Management Association — Carnegie Mellon

Kittelson & Associates, Inc. Transportation Engineering/Planning

gai consultants

# Figure 3: September 2010 PM Peak Intersection Operations

Oakland/CMU Pedestrian Safety Mobility Study

January 2011

1 2 3 4 5 6 7 8 9 10

**Fifth Ave & Bellefield Ave** (1)

LOS=C
Del=26.8
V/C=0.81

106 175 34 36 897 262 185 397

**Fifth Ave & Dithridge St** (2)

LOS=B
Del=18.1
V/C=0.56

15 529 24 24 813 14 118 83 154

**Fifth Ave & Craig St** (3)

LOS=E
Del=67.6
V/C=0.93

110 121 107 18 647 18 55 682 27 59 145 135

**Fifth Ave & Neville St** (4)

LOS=C
Del=27.1
V/C=0.81

181 99 92 135 744 10 39 577 60 6 140 155

**Fifth Ave & Morewood Ave** (5)

LOS=D
Del=44.7
V/C=0.99

40 257 77 23 933 78 111 723 79 37 248 289

**Forbes Ave & Craig St** (6)

LOS=F
Del=91.7
V/C=1.03

41 10 164 165 685 13 84 179 4 34 70 81

**Forbes Ave & Hamburg Hall** (7)

LOS=B
Del=14.7
V/C=0.63

36 64 1 943 252

**Forbes Ave & Morewood Ave** (8)

LOS=C
Del=21.9
V/C=0.72

79 419 292 630 161 265

**Forbes Ave & Beeler St** (9)

LOS=B
Del=13.0
V/C=0.45

66 38 185 829 54 340 1 16 33 59

**Margaret Morrison St & Forbes Ave** (10)

LOS=B
Del=13.9
V/C=0.65

219 715 127 26 17 280

**Legend**

0 100 200 400 Feet

1 inch = 400 feet

Study Intersections

Study Roads

PCTI Pennsylvania Community Transportation Initiative — Oakland Transportation Management Association — Carnegie Mellon

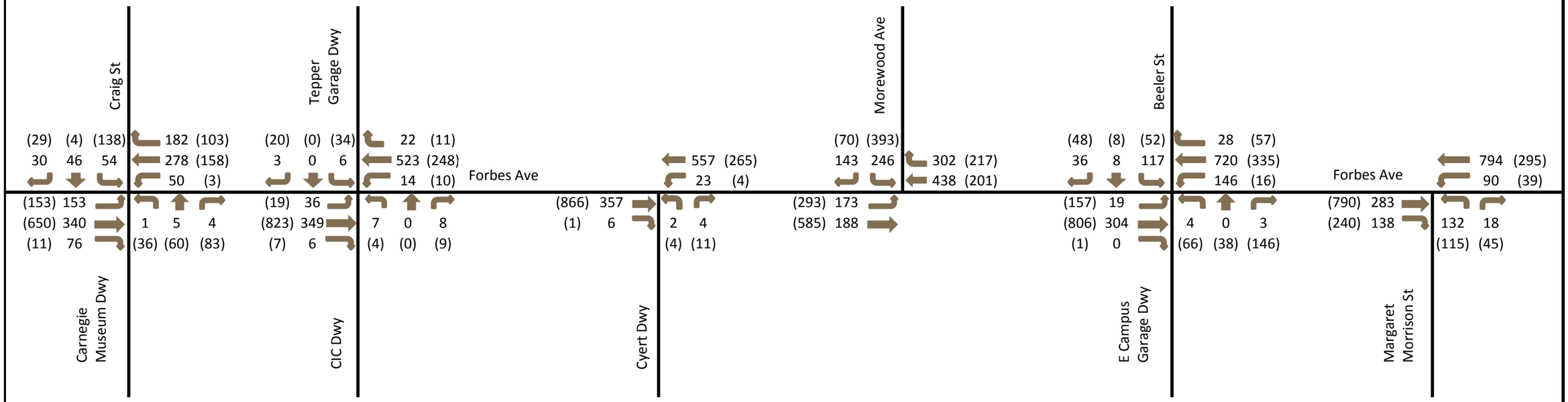
Kittelson & Associates, Inc. Transportation Engineering/Planning

gai consultants

**Legend**

| | |
|---|---|
| 123 | - AM Peak Hour (8:00 AM - 9:00 AM) |
| (123) | - PM Peak Hour (4:45 PM - 5:45 PM) |

| | |
|---|---|
| 0.25% | Growth Rate |
| 2015 | Existing Year |
| 2021 | Design Year |
| 6 | Growth Period (Years) |
| 1.0150 | Growth Factor |




gai consultants
Pittsburgh Office
385 East Waterfront Drive
Homestead, PA 15120-5005
412-476-2000

| | |
|---|---|
| CLIENT: | C101194.10<br>Carnegie Mellon University |
| PROJECT: | Forbes Avenue Reconfiguration Study<br>City of Pittsburgh, Allegheny County |
| TITLE: | Design Year (2021) Peak Hour Volumes |

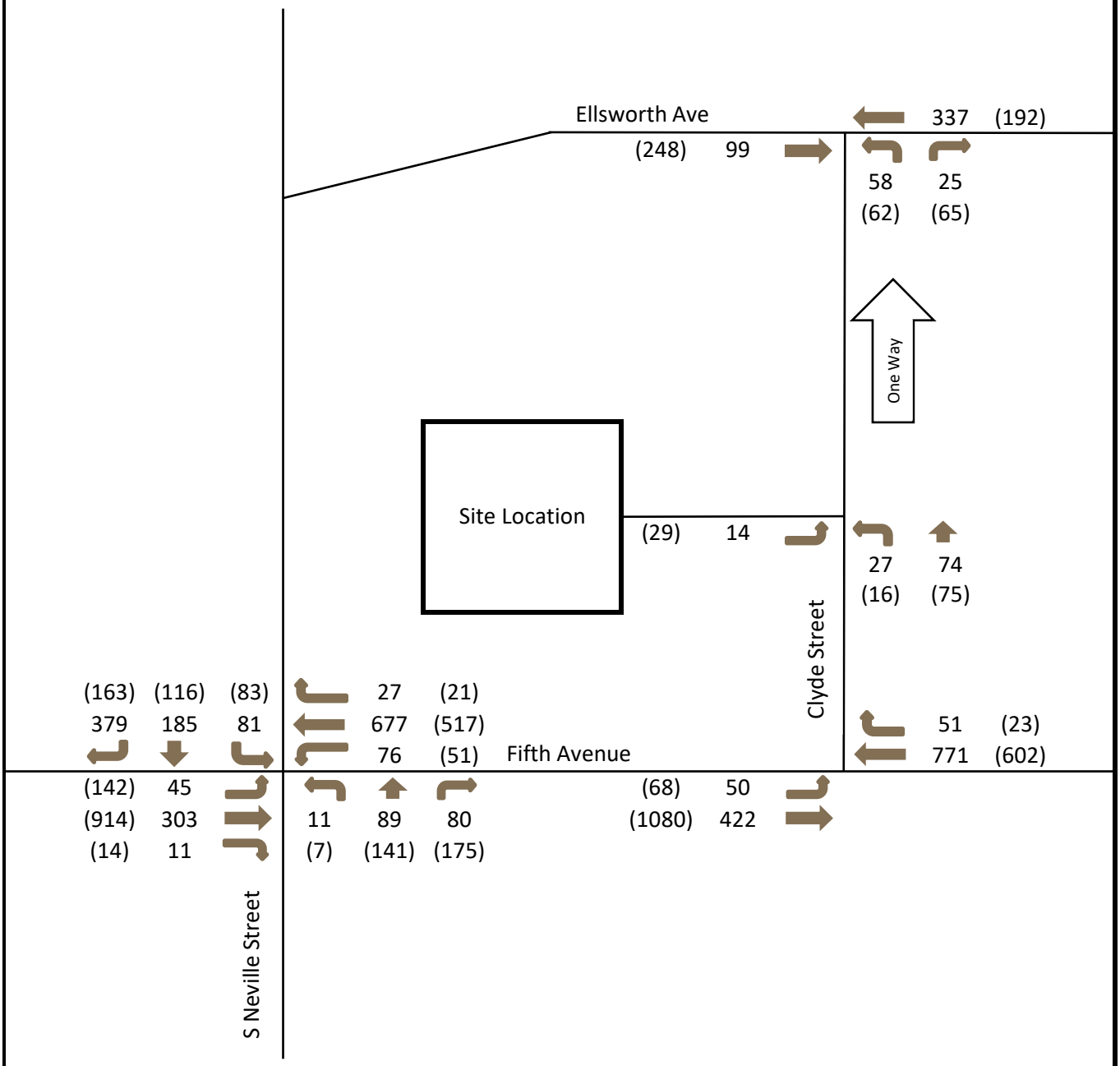
SCALE: NTS

DWN: TMW
CHKD: MSG
FIGURE
14

Legend

123 - AM Peak Hour (7:30 AM - 8:30 AM)

(123) - PM Peak Hour (4:45 PM - 5:45 PM)




gai consultants

Pittsburgh Office
385 East Waterfront Drive
Homestead, PA 15120-5005
412-476-2000

CLIENT: C151305.00
Carnegie Mellon University

PROJECT: Dearden Center / North of Fifth Development
City of Pittsburgh, Allegheny County

TITLE: Forecasted Opening Year (2018) Full Buildout with Development Peak Hour Volumes

SCALE: NTS

DWN: TMW
CHKD. RAK

FIGURE
16

# APPENDIX F
## Level of Service Definitions



gai consultants
transforming ideas into reality®

## Level of Service

Intersection levels of service (LOS) were determined through implementation of the methodology presented in the *Highway Capacity Manual* 2000 Edition, published by the Transportation Research Board.

## Signalized Intersections

Signalized intersection level of service is described as follows:

"Level of service for signalized intersections is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics, traffic and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions. Specifically, level-of-service (LOS) criteria are stated in terms of the average control delay per vehicle, typically for a 15-minute analysis period. Delay is a complex measure and depends upon a number of variables, including the quality of progression, the cycle length, the green ratio, and the volume to capacity (v/c) ratio for the lane group.

**LOS A** describes operations with very low control delay, up to 10 seconds per vehicle. This LOS occurs when progression is extremely favorable and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths m ay tend to contribute to low delay values.

**LOS B** describes operations with control delay greater than 10 and up to 20 seconds per vehicle. This generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of delay.

**LOS C** describes operations with control delay greater than 20 and up to 35 seconds per vehicle. These higher delays may result from only fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. Cycle failure occurs when a given green phase does not serve queued vehicles and overflows occur. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

**LOS D** describes operations with control delay greater than 35 and up to 55 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

**LOS E** describes operations with control delay greater than 55 and up to 80 seconds per vehicle. These high delay values generally indicate poor progression, long cycle lengths and high v/c ratios. Individual cycle failures are frequent.

**LOS F** describes operations with control delay in excess of 80 seconds per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of lane groups. It may also occur at high v/c ratios with many individual cycle failures. Poor progression and long cycle lengths may also contribute significantly to high delay levels."

## Level of Service Criteria for Signalized Intersections

(Adapted from Figure 16-2, HCS 2000)

| Level of Service | Control Delay per Vehicle (Sec) |
|---|---|
| A | ≤ 10 |
| B | > 10 and ≤ 20 |
| C | > 20 and ≤ 35 |
| D | > 35 and ≤ 55 |
| E | > 55 and ≤ 85 |
| F | > 80 |

## Unsignalized Intersections

Level of service for unsignalized intersections is determined by the computed or measured average control delay and is defined for each minor movement. The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics, traffic and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during conditions with ideal geometrics and in the absence of traffic control, incidents, and congestion.

The LOS criteria for unsignalized intersections are somewhat different from the criteria use for signalized intersections primarily because different transportation facilities create different driver perceptions. The expectation is that a signalized intersection is designed to carry higher traffic volumes and experience greater delay than an unsignalized intersection.

**Level of Service Criteria for Unsignalized Intersections**

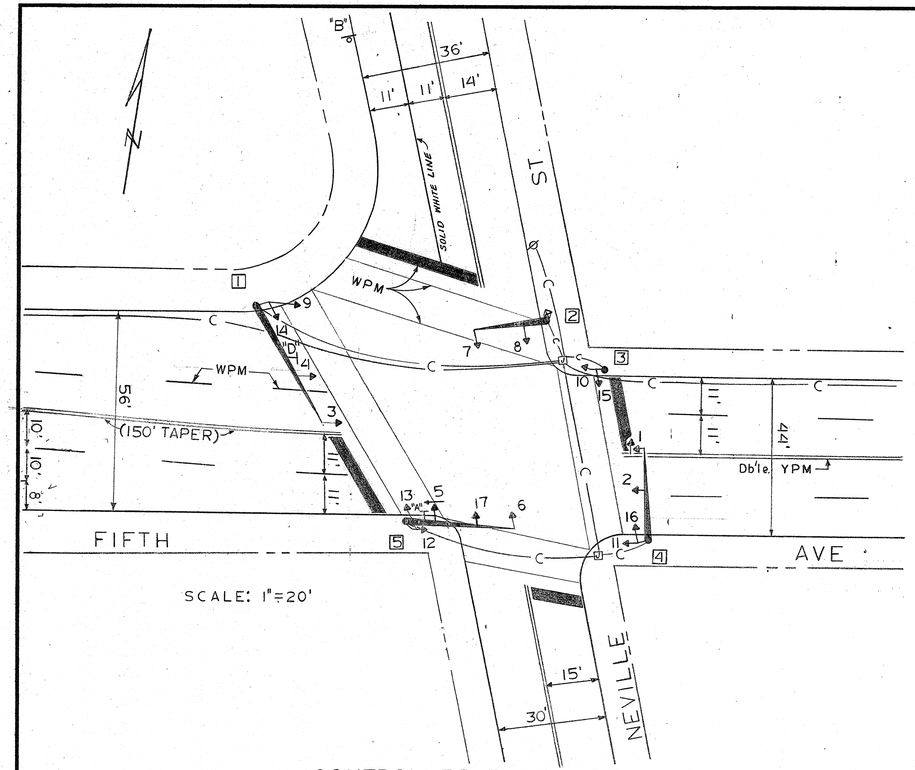
(Adapted from Figure 17-2 and 17-22, HCS 2000)

| Level of Service | Control Delay per Vehicle (Sec) |
|---|---|
| A | ≤ 10 |
| B | > 10 and ≤ 15 |
| C | > 15 and ≤ 25 |
| D | > 25 and ≤ 35 |
| E | > 35 and ≤ 50 |
| F | > 50 |

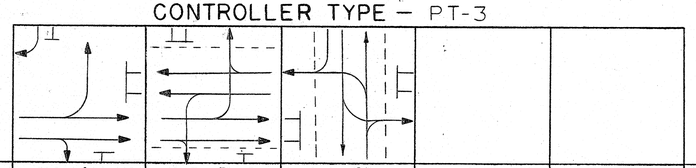
# APPENDIX G
## Existing Traffic Signal Plans



gai consultants
transforming ideas into reality®




## CONTROLLER TYPE — PT-3



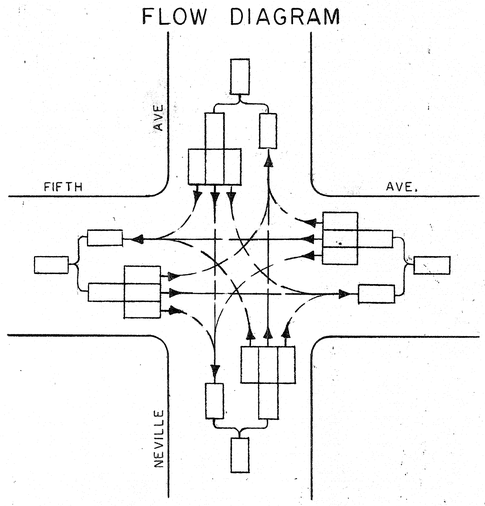
| SIGNALS | PHASE A | | PHASE B | | | | PHASE C | | | | PHASE | | | | FLASH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | INTERVAL | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | | |
| 1 | G | G | G | G | Y | R | R | R | R | R | | | | | Y |
| 2 | G | G | G | G | Y | R | R | R | R | R | | | | | Y |
| 3-4 | R | R | G | G | Y | R | R | R | R | R | | | | | Y |
| 5 | R | -Y→ | R | R | R | R | G | G | Y | R | | | | | R |
| 6-7-8-17 | R | R | R | R | R | R | G | G | Y | R | | | | | R |
| 9-10-11-12 | DW | DW | FL WK | FL DW | DW | DW | $P_W$ | $P_W$ | DW | DW | | | | | OUT |
| 13-14-15-16 | DW | DW | $P_W$ | $P_W$ | DW | DW | FL WK | FL DW | DW | DW | | | | | OUT |
| DIAL 1 TIME | 41.2 | 3 | 12.6 | 12 | 3.6 | 1.8 | 7.2 | 10.8 | 3 | 1.8 | | | | | 60 |
| DIAL 1 DIAL SETT. | 0 | 7 | 12 | 33 | 53 | 59 | 62 | 74 | 92 | 97 | 0 | | | | |
| DIAL 1 % | 7 | 5 | 21 | 20 | 6 | 3 | 12 | 18 | 5 | 3 | | | | | |
| DIAL 2 TIME | 4.8 | 3.2 | 30.4 | 12 | 4 | 1.6 | 7.2 | 11.2 | 4 | 1.6 | | | | | 80 |
| DIAL 2 DIAL SETT. | 0 | 6 | 10 | 48 | 63 | 68 | 70 | 79 | 93 | 98 | 0 | | | | |
| DIAL 2 % | 6 | 4 | 38 | 15 | 5 | 2 | 9 | 14 | 5 | 2 | | | | | |
| DIAL 3 TIME | 12.8 | 3.2 | 22.4 | 12 | 4 | 1.6 | 7.2 | 11.2 | 4 | 1.6 | | | | | 80 |
| DIAL 3 DIAL SETT. | 0 | 16 | 20 | 48 | 63 | 68 | 70 | 79 | 93 | 98 | 0 | | | | |
| DIAL 3 % | 16 | 4 | 28 | 15 | 5 | 2 | 9 | 14 | 5 | 2 | | | | | |

| FIELD DATA | DRAWN | SUPERV'SD. |
|---|---|---|
| BY | | |
| VOL. | | |
| CHECKED | INSPECT'D | CKD.-CONST. |
| | | |
| | | |
| CALC. BOOK | PG. | |

REVISIONS

| CHARACTER | DATE |
|---|---|
| | |
| | |
| | |

## FLOW DIAGRAM



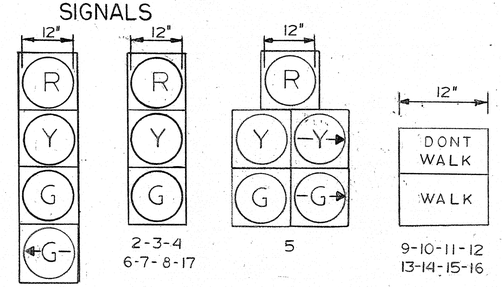

## CABLE CHART

| RUN | NO. & SIZE OF CONDUCTORS | CC TO | FROM | TO | FROM | TO | FROM | TO |
|---|---|---|---|---|---|---|---|---|
| 1 | 12C#14 | SH1 | SH2 | SH2 | SH11 | SH11 | SH16 | |
| 2 | 12C#14 | CC | SH3 | SH3 | SH4 | SH4 | SH9 | |
| 3 | | SH9 | SH14 | | | | | |
| 4 | 12C#14 | CC | SH5 | SH5 | SH17 | SH17 | SH6 | |
| 5 | | SH6 | SH12 | SH12 | SH13 | | | |
| 6 | 9C#14 | CC | SH7 | SH7 | SH8 | | | |
| 7 | 9C#14 | CC | SH10 | SH10 | SH15 | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |

## SIGNS

"A" — R10-10R
"B" — R7-R
"D" — R10-11

## SIGNALS




## LEGEND

- CONTROLLER
- SIGNAL
- MAST ARM
- —C— CONDUIT
- POLE NUMBER
- LOOP DETECTOR
- WOOD POLE
- STEEL POLE
- [S] SPLICE BOX
- [J] JUNCTION BOX
- PEDESTRIAN PUSH BUTTON
- YPM YELLOW PAV'T. MKNG.
- WPM WHITE PAV'T. MKNG.

## POLE CHART

| POLE NO. | POLE TYPE | POLE HEIGHT | POLE WALL THK. | POLE O.D. | ANCHOR BOLTS | SIGNAL BRACKET ON POLE DIM "K" | SIGNAL BRACKET ON POLE DIM "L" | MAST ARM ARM DESIGNATION | MAST ARM DIM. "L" | MAST ARM DIM. "M" | MAST ARM DIM. "N" | MAST ARM DIM. "O" | LOCATION STATION | LOCATION OFFSET |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | I-L | 32' | 7GA | 12" | 1½" X 60" | 10' | 33" | A | 38' | 37.5 | 22' | 17' | ‡‡ | |
| 2 | I | 21' | 7GA | 9" | 1¼" X 48" | 10' | 33" | A | 20' | 19.5 | 9' | — | * | |
| 3 | X | 15' | 7GA | 7" | 1¼" X 48" | 10' | 33" | — | — | — | — | — | * | |
| 4 | I-L | 32' | 7GA | 10" | 1½" X 60" | 10' | 33" | A | 22' | 21.5 | 10' | — | ‡‡ | |
| 5 | I | 21' | 7GA | 11" | 1½" X 60" | 10' | 33" | A | 30' | 29.5 | 18' | 7' | * | |
| 6 | I | 21' | 7GA | 9" | 1¼" X 48" | — | — | A | 16' | 15' | — | — | *(140' E. POLE #4) | |
| 7 | I | 21' | 7GA | 9" | 1¼" X 48" | — | — | A | 16 | 15 | — | — | *(FIFTH-DEVONSHIRE) | |

* — CONSTRUCT FDN. AT EXISTING INLAY
‡‡ — INSTALL ON EXISTING FDN.

## MATERIALS LIST

(FOR INFORMATION ONLY)

LUMP SUM ITEM - CS-13

1 EA. CONTROLLER TYPE PT-3 3 DIAL INTERCONNECTED

LUMP SUM ITEM - CS-25
(MAST ARM SIGNAL INST.)

1 EA. SIGNAL UNIT 12" 4 SECTION R-Y-G-G ARROW MAST ARM MTG.

7 EA. SIGNAL UNIT 12" 3 SECTION R-Y-G MAST ARM MTG.

1 EA. SIGNAL UNIT 12" 5 SECTION R-Y-G-G ARROW-Y ARROW MAST ARM MTG.

8 EA. SIGNAL UNIT 12" 2 SECTION WK-DW SIDE OF POST MTG.

4 EA. TYPE I GALV. STEEL MAST ARM POLE - 21'

2 EA. TYPE I-L GALV. STEEL MAST ARM POLE - 32' W/ 8' LUMINAIRE ARM

1 EA. TYPE X GALV. STEEL POLE 15'

5 EA. POLE FOUNDATION

AS REQUIRED:

12 C # 14 AWG. CABLE
2½" STEEL CONDUIT
MISC. HARDWARE
6" PLASTIC PVMT. MARKING (WHITE)
4" PLASTIC PVMT. MARKING (YELLOW/WHITE)

SIGNS:

1 EA. R10-10R 30" X 36"
1 EA. R3-7R 30" X 30"
1 EA. CHANNEL BAR
1 EA. R10-11 30" X 36"

| APPROVED | | DATE |
|---|---|---|
| | ENGR. | |
| | ENGR. | |
| W.J. Rodgers | DESIGNER. | 7/24/77 |
| | | |
| A. Muscmarra | CITY ENGR. D. P. W. | 7-26-77 |
| | DIRECTOR | |

# TRAFFIC SIGNAL PLAN

## CITY OF PITTSBURGH
## DEPARTMENT OF PUBLIC WORKS
## BUREAU OF ENGINEERING

— INTERSECTION OF —

FIFTH AVE. — NEVILLE ST.

SCALES AS NOTED
DATE

SHEET NO. 4 OF 16

** # 197-B
ACCESSION NO.
CASE NO.

** THIS DWG. SUPERSEDES B.T.P. PRINT # 197

TS-308

K. DIETZGEN CO. P-3200-57

REFERENCE FOR C100485.00

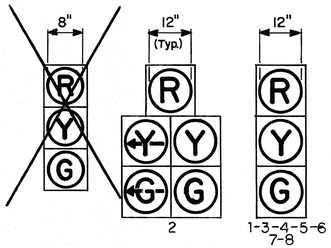
Sent by the City of Pittsburgh on June 11, 2010

PERMIT NO. _____ SHEET 1 OF 1

DATE ISSUED _____

## LEGEND

- SIGNAL POLE W/ MAST ARM
- SIGNAL STRAIN POLE
- PEDESTAL
- WOOD POLE
- VEHICULAR SIGNAL HEAD
- PEDESTRIAN SIGNAL HEAD
- SIGN
- PEDESTRIAN PUSH BUTTON
- PEDESTRIAN PUSH BUTTON/SIGN
- VEHICLE DETECTOR
- JUNCTION BOX
- SPLICE BOX
- CONTROLLER ASSEMBLY
- C/2½"_"_ – CONDUIT/SIZE (Local Signal)
- W/4" – WHITE (Solid Line)/WIDTH
- BW/4" – BROKEN WHITE (Line)/WIDTH
- DY/4" – DOUBLE YELLOW (Solid Lines)/WIDTH
- C/2½"IC – CONDUIT SIZE (System) INTERCONNECT
- CATCH BASIN/INLET
- LUMINAIRE







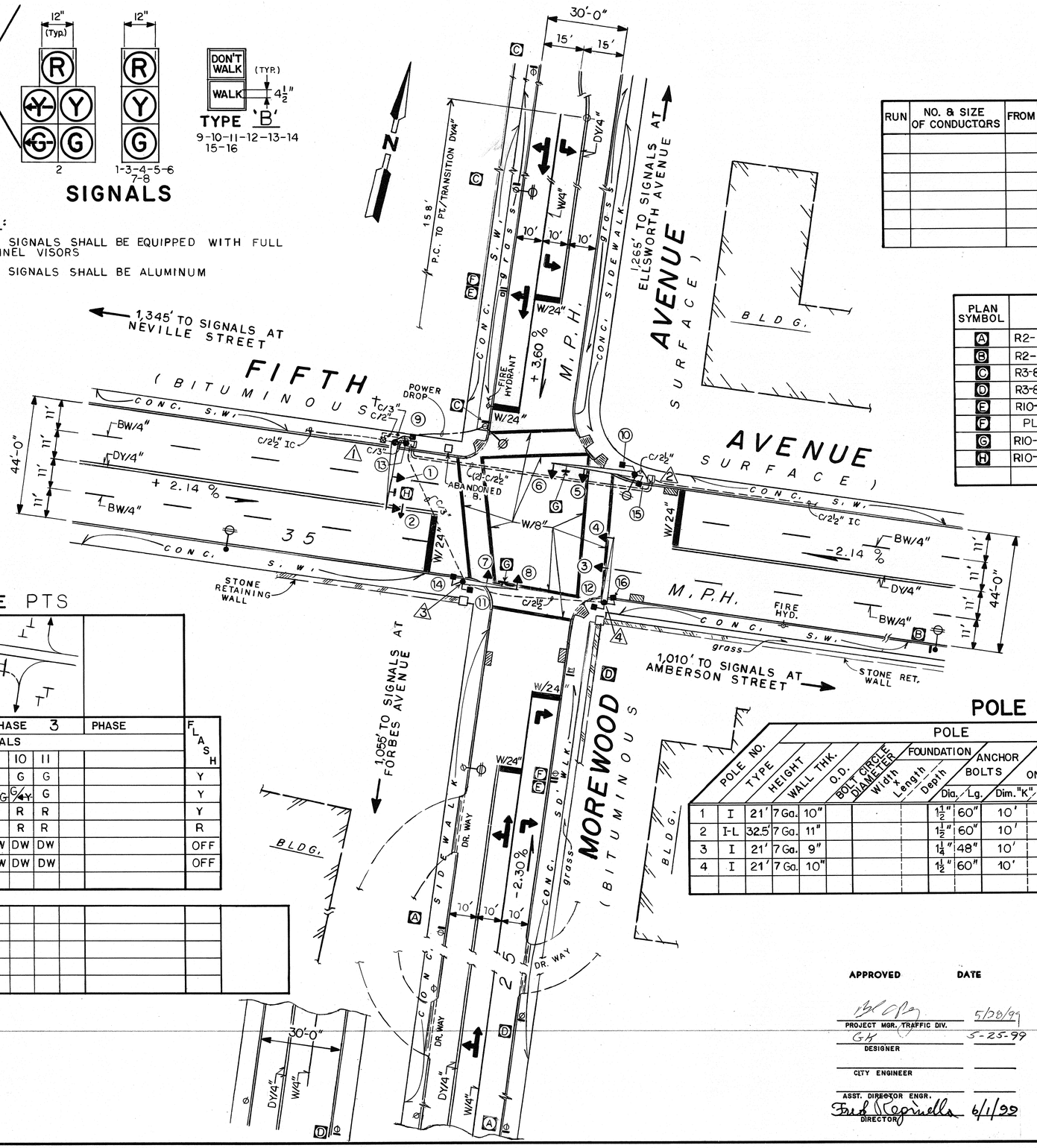
TYPE 'B'
9-10-11-12-13-14
15-16

## SIGNALS

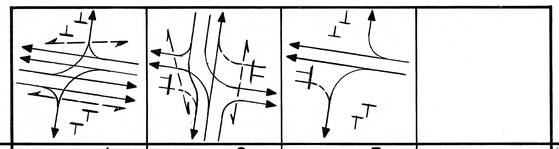
NOTE:

1.) ALL SIGNALS SHALL BE EQUIPPED WITH FULL TUNNEL VISORS

2.) ALL SIGNALS SHALL BE ALUMINUM




## CONTROLLER TYPE PTS



| SIGNALS | PHASE 1 | | | | PHASE 2 | | | | PHASE 3 | | | PHASE | | FLASH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | INTERVALS | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | | |
| 1 | G | G | Y | R | R | R | R | R | G | G | G | | | Y |
| 2 | G | G | Y | R | R | R | R | R | G/G | G/Y | G | | | Y |
| 3-4 | G | G | Y | R | R | R | R | R | R | R | R | | | Y |
| 5-6-7-8 | R | R | R | R | G | G | Y | R | R | R | R | | | R |
| 9-10-11-12 | W | FD | DW | DW | DW | DW | DW | DW | DW | DW | DW | | | OFF |
| 13-14-15-16 | DW | DW | DW | DW | W | FD | DW | DW | DW | DW | DW | | | OFF |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

| FIELD DATA | DRAWN | SUPERV'SD. |
|---|---|---|
| BY | C. TAYLOR | |
| VOL | | |
| CHECKED | INSPECT'D. | CKD-CONST. |
| | | |
| | | |
| CALC. BOOK | PG. | |

REVISIONS

| CHARACTER | DATE |
|---|---|
| REMOVE POST MOUNTED CONTROLLER AND INSTALL BASE MOUNTED CONTROLLER INSTALL 2" AND 3" CONDUIT | † |

## CABLE CHART

| RUN | NO. & SIZE OF CONDUCTORS | FROM | TO | FROM | TO | FROM | TO | FROM | TO | FROM | TO | FROM | TO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

## SIGNS

| PLAN SYMBOL | DESCRIPTION | SIZE W x H | QUANTITY |
|---|---|---|---|
| A | R2-1, SPEED LIMIT 25 | 24"x30" | 2 |
| B | R2-1, SPEED LIMIT 35 | 24"x30" | 1 |
| C | R3-8LSR, LANE USE CONTROL | 30"x30" | 3 |
| D | R3-8LSRB, LANE USE CONTROL | 30"x30" | 3 |
| E | R10-6L, STOP HERE ON RED | 24"x30" | 2 |
| F | PLAQUE LEFT LANE | 24"x24" | 2 |
| G | R10-11, NO TURN ON RED | 30"x36" | 2 |
| H | R10-12, LEFT TURN YIELD ON GREEN ● | 30"x36" | 1 |
| | | | |

## POLE CHART

| POLE NO. | TYPE | POLE HEIGHT | POLE WALL THK. | FOUNDATION O.D. | FOUNDATION BOLT CIRCLE DIAMETER | FOUNDATION Width x Length x Depth | ANCHOR BOLTS Dia. | ANCHOR BOLTS Lg. | SIGNAL BRACKETS ON POLE Dim. "K" | SIGNAL BRACKETS ON POLE Dim. "J" | MAST ARM ARM DESIGNATION | MAST ARM DIM. "L" | MAST ARM DIM. "M" | MAST ARM DIM. "N" | MAST ARM DIM. "O" | LOCATION STATION | LOCATION OFFSET |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | I | 21' | 7 Ga. | 10" | | | 1½" | 60" | 10' | 33" | A | 24' | 23.5' | 12' | | | |
| 2 | I-L | 32.5' | 7 Ga. | 11" | | | 1½" | 60" | 10' | 33" | A | 30' | 29.5' | 18' | | | |
| 3 | I | 21' | 7 Ga. | 9" | | | 1¼" | 48" | 10' | 33" | A | 20' | 19.5' | 8' | | | |
| 4 | I | 21' | 7 Ga. | 10" | | | 1½" | 60" | 10' | 33" | A | 24' | 23.5' | 12' | | | |
| | | | | | | | | | | | | | | | | | |

TRAFFIC SIGNAL PLAN

| APPROVED | DATE |
|---|---|
| PROJECT MGR. TRAFFIC DIV. | 5/28/99 |
| DESIGNER | 5-25-99 |
| CITY ENGINEER | |
| ASST. DIRECTOR ENGR. | |
| DIRECTOR Fred Fagnilli | 6/1/99 |

**CITY OF PITTSBURGH**
**DEPARTMENT OF ENGINEERING AND CONSTRUCTION**

—INTERSECTION OF—

**FIFTH AVE.-MOREWOOD AVE.**

SCALE: 1" = 20 FT.

DATE

TS-306

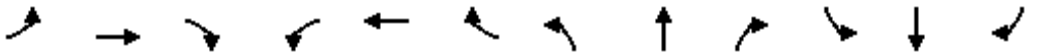
REFERENCE FOR C100485.00

Sent by the City of Pittsburgh on June 11, 2010

# APPENDIX H
## Capacity Calculations
## 2022 Existing Conditions

R200398.00 / May 2022

gai consultants
transforming ideas into reality®

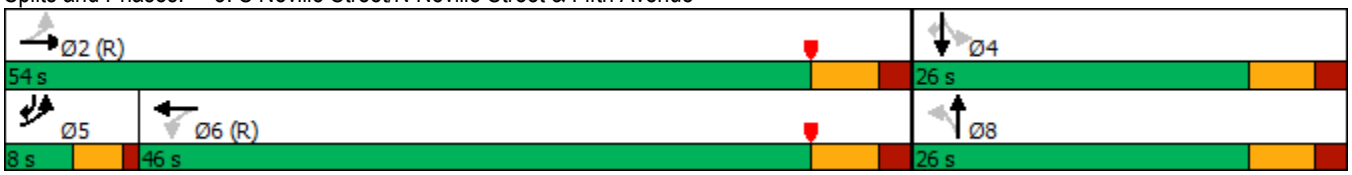


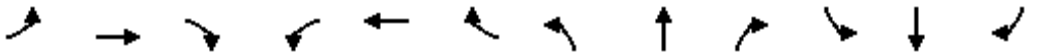
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 45 | 306 | 11 | 77 | 684 | 27 | 11 | 90 | 81 | 82 | 187 | 383 |
| Future Volume (vph) | 45 | 306 | 11 | 77 | 684 | 27 | 11 | 90 | 81 | 82 | 187 | 383 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 110 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | No | | | No | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 646 | | | 1349 | | | 479 | | | 639 | |
| Travel Time (s) | | 12.6 | | | 26.3 | | | 13.1 | | | 17.4 | |
| Confl. Peds. (#/hr) | 60 | | 71 | 71 | | 60 | 20 | | 50 | 50 | | 20 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 25% | 8% | 9% | 1% | 4% | 4% | 0% | 1% | 3% | 26% | 2% | 7% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 402 | 0 | 0 | 876 | 0 | 0 | 202 | 0 | 0 | 299 | 426 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Link Offset(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Crosswalk Width(ft) | | 10 | | | 10 | | | 10 | | | 10 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.11 | 1.11 | 1.11 | 1.13 | 1.13 | 1.13 | 1.18 | 1.18 | 1.18 | 1.13 | 1.13 | 1.13 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Minimum Split (s) | 8.0 | 54.0 | | 38.0 | 38.0 | | 26.0 | 26.0 | | 26.0 | 26.0 | 8.0 |
| Total Split (s) | 8.0 | 54.0 | | 46.0 | 46.0 | | 26.0 | 26.0 | | 26.0 | 26.0 | 8.0 |
| Total Split (%) | 10.0% | 67.5% | | 57.5% | 57.5% | | 32.5% | 32.5% | | 32.5% | 32.5% | 10.0% |
| Yellow Time (s) | 3.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 3.0 |
| All-Red Time (s) | 1.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 1.0 |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | | | -1.0 | -1.0 |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lead/Lag | Lead | | | Lag | Lag | | | | | | | Lead |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | | | | | | | Yes |
| v/c Ratio | | 0.27 | | | 0.64 | | | 0.54 | | | 0.94 | 0.92 |
| Control Delay | | 7.6 | | | 10.7 | | | 31.5 | | | 70.0 | 51.7 |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | 0.0 |
| Total Delay | | 7.6 | | | 10.7 | | | 31.5 | | | 70.0 | 51.7 |
| Queue Length 50th (ft) | | 42 | | | 68 | | | 87 | | | 146 | 184 |
| Queue Length 95th (ft) | | 63 | | | 118 | | | 153 | | | #298 | #331 |
| Internal Link Dist (ft) | | 566 | | | 1269 | | | 399 | | | 559 | |
| Turn Bay Length (ft) | | | | | | | | | | | | 110 |
| Base Capacity (vph) | | 1482 | | | 1362 | | | 377 | | | 317 | 462 |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Reduced v/c Ratio | | 0.27 | | | 0.64 | | | 0.54 | | | 0.94 | 0.92 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 80 | |
| Control Type: Pretimed | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |

Splits and Phases: 3: S Neville Street/N Neville Street & Fifth Avenue

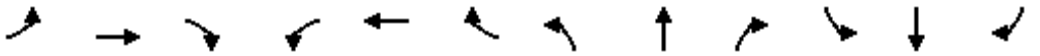




| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 45 | 306 | 11 | 77 | 684 | 27 | 11 | 90 | 81 | 82 | 187 | 383 |
| Future Volume (vph) | 45 | 306 | 11 | 77 | 684 | 27 | 11 | 90 | 81 | 82 | 187 | 383 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | 1.00 |
| Frpb, ped/bikes | | 1.00 | | | 1.00 | | | 0.96 | | | 1.00 | 0.96 |
| Flpb, ped/bikes | | 1.00 | | | 0.99 | | | 1.00 | | | 0.99 | 1.00 |
| Frt | | 1.00 | | | 0.99 | | | 0.94 | | | 1.00 | 0.85 |
| Flt Protected | | 0.99 | | | 1.00 | | | 1.00 | | | 0.99 | 1.00 |
| Satd. Flow (prot) | | 2964 | | | 3086 | | | 1476 | | | 1539 | 1322 |
| Flt Permitted | | 0.80 | | | 0.86 | | | 0.97 | | | 0.77 | 1.00 |
| Satd. Flow (perm) | | 2385 | | | 2658 | | | 1438 | | | 1210 | 1322 |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 50 | 340 | 12 | 86 | 760 | 30 | 12 | 100 | 90 | 91 | 208 | 426 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 402 | 0 | 0 | 876 | 0 | 0 | 202 | 0 | 0 | 299 | 426 |
| Confl. Peds. (#/hr) | 60 | | 71 | 71 | | 60 | 20 | | 50 | 50 | | 20 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Heavy Vehicles (%) | 25% | 8% | 9% | 1% | 4% | 4% | 0% | 1% | 3% | 26% | 2% | 7% |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Actuated Green, G (s) | | 48.0 | | | 40.0 | | | 20.0 | | | 20.0 | 24.0 |
| Effective Green, g (s) | | 49.0 | | | 41.0 | | | 21.0 | | | 21.0 | 26.0 |
| Actuated g/C Ratio | | 0.61 | | | 0.51 | | | 0.26 | | | 0.26 | 0.32 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 4.0 |
| Lane Grp Cap (vph) | | 1497 | | | 1362 | | | 377 | | | 317 | 429 |
| v/s Ratio Prot | | 0.02 | | | | | | | | | | c0.06 |
| v/s Ratio Perm | | 0.15 | | | c0.33 | | | 0.14 | | | 0.25 | 0.26 |
| v/c Ratio | | 0.27 | | | 0.64 | | | 0.54 | | | 0.94 | 0.99 |
| Uniform Delay, d1 | | 7.2 | | | 14.2 | | | 25.3 | | | 28.9 | 26.9 |
| Progression Factor | | 1.00 | | | 0.62 | | | 1.00 | | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 0.4 | | | 1.6 | | | 5.4 | | | 38.0 | 41.8 |
| Delay (s) | | 7.6 | | | 10.5 | | | 30.7 | | | 66.9 | 68.7 |
| Level of Service | | A | | | B | | | C | | | E | E |
| Approach Delay (s) | | 7.6 | | | 10.5 | | | 30.7 | | | 67.9 | |
| Approach LOS | | A | | | B | | | C | | | E | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 30.7 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.79 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 86.1% | ICU Level of Service | E |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

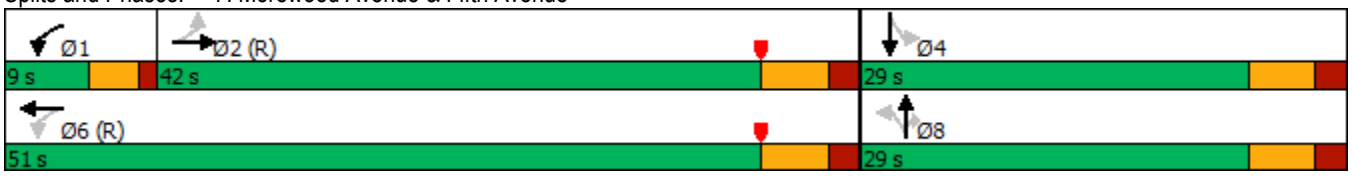


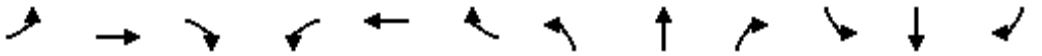
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 15 | 337 | 46 | 163 | 664 | 155 | 18 | 198 | 130 | 62 | 245 | 30 |
| Future Volume (vph) | 15 | 337 | 46 | 163 | 664 | 155 | 18 | 198 | 130 | 62 | 245 | 30 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 260 | | 0 | 75 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1349 | | | 803 | | | 419 | | | 464 | |
| Travel Time (s) | | 26.3 | | | 15.6 | | | 11.4 | | | 12.7 | |
| Confl. Peds. (#/hr) | 75 | | 35 | 35 | | 75 | 83 | | 161 | 161 | | 83 |
| Confl. Bikes (#/hr) | | | 1 | | | 7 | | | 4 | | | 3 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 442 | 0 | 0 | 1091 | 0 | 0 | 240 | 144 | 69 | 305 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 10 | |
| Link Offset(ft) | | 0 | | | 0 | | | 5 | | | 0 | |
| Crosswalk Width(ft) | | 16 | | | 16 | | | 16 | | | 16 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.13 | 1.13 | 1.13 | 1.11 | 1.11 | 1.11 | 1.16 | 1.16 | 1.16 | 1.20 | 1.20 | 1.20 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Minimum Split (s) | 26.0 | 26.0 | | 9.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (s) | 42.0 | 42.0 | | 9.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (%) | 52.5% | 52.5% | | 11.3% | 63.8% | | 36.3% | 36.3% | 36.3% | 36.3% | 36.3% | |
| Yellow Time (s) | 4.0 | 4.0 | | 3.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 1.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | -1.0 | -1.0 | -1.0 | |
| 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 | | | | | | | | |
| v/c Ratio | | 0.34 | | | 0.80 | | | 0.51 | 0.43 | 0.32 | 0.64 | |
| Control Delay | | 8.4 | | | 17.9 | | | 27.6 | 27.3 | 26.6 | 31.6 | |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 8.4 | | | 17.9 | | | 27.6 | 27.3 | 26.6 | 31.6 | |
| Queue Length 50th (ft) | | 35 | | | 164 | | | 98 | 57 | 26 | 131 | |
| Queue Length 95th (ft) | | m48 | | | 223 | | | 168 | 111 | 63 | 217 | |
| Internal Link Dist (ft) | | 1269 | | | 723 | | | 339 | | | 384 | |
| Turn Bay Length (ft) | | | | | | | | | | 75 | | |
| Base Capacity (vph) | | 1287 | | | 1363 | | | 474 | 336 | 219 | 475 | |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | 0 | 0 | 0 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | | 0.34 | | | 0.80 | | | 0.51 | 0.43 | 0.32 | 0.64 | |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 68 (85%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 80 | |
| Control Type: Pretimed | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 7: Morewood Avenue & Fifth Avenue

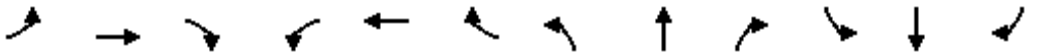




| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 15 | 337 | 46 | 163 | 664 | 155 | 18 | 198 | 130 | 62 | 245 | 30 |
| Future Volume (vph) | 15 | 337 | 46 | 163 | 664 | 155 | 18 | 198 | 130 | 62 | 245 | 30 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frpb, ped/bikes | | 0.99 | | | 0.97 | | | 1.00 | 0.79 | 1.00 | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | 1.00 | 0.87 | 1.00 | |
| Frt | | 0.98 | | | 0.98 | | | 1.00 | 0.85 | 1.00 | 0.98 | |
| Flt Protected | | 1.00 | | | 0.99 | | | 1.00 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 3070 | | | 3072 | | | 1649 | 1123 | 1344 | 1585 | |
| Flt Permitted | | 0.90 | | | 0.73 | | | 0.96 | 1.00 | 0.52 | 1.00 | |
| Satd. Flow (perm) | | 2757 | | | 2270 | | | 1583 | 1123 | 733 | 1585 | |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 17 | 374 | 51 | 181 | 738 | 172 | 20 | 220 | 144 | 69 | 272 | 33 |
| RTOR Reduction (vph) | 0 | 12 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 430 | 0 | 0 | 1072 | 0 | 0 | 240 | 144 | 69 | 305 | 0 |
| Confl. Peds. (#/hr) | 75 | | 35 | 35 | | 75 | 83 | | 161 | 161 | | 83 |
| Confl. Bikes (#/hr) | | | 1 | | | 7 | | | 4 | | | 3 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Actuated Green, G (s) | | 36.0 | | | 45.0 | | | 23.0 | 23.0 | 23.0 | 23.0 | |
| Effective Green, g (s) | | 37.0 | | | 46.0 | | | 24.0 | 24.0 | 24.0 | 24.0 | |
| Actuated g/C Ratio | | 0.46 | | | 0.58 | | | 0.30 | 0.30 | 0.30 | 0.30 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | 6.0 | 6.0 | 6.0 | |
| Lane Grp Cap (vph) | | 1275 | | | 1365 | | | 474 | 336 | 219 | 475 | |
| v/s Ratio Prot | | | | | c0.06 | | | | | | c0.19 | |
| v/s Ratio Perm | | 0.16 | | | c0.39 | | | 0.15 | 0.13 | 0.09 | | |
| v/c Ratio | | 0.34 | | | 0.79 | | | 0.51 | 0.43 | 0.32 | 0.64 | |
| Uniform Delay, d1 | | 13.7 | | | 13.2 | | | 23.1 | 22.5 | 21.6 | 24.3 | |
| Progression Factor | | 0.59 | | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 0.7 | | | 4.6 | | | 3.8 | 4.0 | 3.7 | 6.5 | |
| Delay (s) | | 8.7 | | | 17.8 | | | 26.9 | 26.4 | 25.4 | 30.8 | |
| Level of Service | | A | | | B | | | C | C | C | C | |
| Approach Delay (s) | | 8.7 | | | 17.8 | | | 26.8 | | | 29.8 | |
| Approach LOS | | A | | | B | | | C | | | C | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 19.5 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.78 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 94.9% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

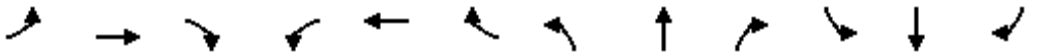


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 143 | 923 | 14 | 52 | 522 | 21 | 7 | 142 | 177 | 84 | 117 | 165 |
| Future Volume (vph) | 143 | 923 | 14 | 52 | 522 | 21 | 7 | 142 | 177 | 84 | 117 | 165 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 110 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | No | | | No | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 646 | | | 1349 | | | 479 | | | 639 | |
| Travel Time (s) | | 12.6 | | | 26.3 | | | 13.1 | | | 17.4 | |
| Confl. Peds. (#/hr) | 85 | | 120 | 120 | | 85 | 36 | | 66 | 66 | | 36 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 1.00 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 12% | 2% | 0% | 0% | 2% | 21% | 0% | 0% | 0% | 3% | 0% | 7% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 1201 | 0 | 0 | 661 | 0 | 0 | 343 | 0 | 0 | 223 | 183 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Link Offset(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Crosswalk Width(ft) | | 10 | | | 10 | | | 10 | | | 10 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.11 | 1.11 | 1.11 | 1.13 | 1.13 | 1.13 | 1.18 | 1.18 | 1.18 | 1.13 | 1.13 | 1.13 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Minimum Split (s) | 8.0 | 54.0 | | 38.0 | 38.0 | | 26.0 | 26.0 | | 26.0 | 26.0 | 8.0 |
| Total Split (s) | 9.0 | 54.0 | | 45.0 | 45.0 | | 26.0 | 26.0 | | 26.0 | 26.0 | 9.0 |
| Total Split (%) | 11.3% | 67.5% | | 56.3% | 56.3% | | 32.5% | 32.5% | | 32.5% | 32.5% | 11.3% |
| Yellow Time (s) | 3.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 3.0 |
| All-Red Time (s) | 1.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 1.0 |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | | | -1.0 | -1.0 |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lead/Lag | Lead | | | Lag | Lag | | | | | | | Lead |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | | | | | | | Yes |
| v/c Ratio | | 0.87 | | | 0.56 | | | 0.89 | | | 0.99 | 0.39 |
| Control Delay | | 20.8 | | | 11.5 | | | 56.4 | | | 90.0 | 19.8 |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | 0.0 |
| Total Delay | | 20.8 | | | 11.5 | | | 56.4 | | | 90.0 | 19.8 |
| Queue Length 50th (ft) | | 176 | | | 61 | | | 165 | | | 111 | 62 |
| Queue Length 95th (ft) | | #253 | | | m95 | | | #317 | | | #249 | 112 |
| Internal Link Dist (ft) | | 566 | | | 1269 | | | 399 | | | 559 | |
| Turn Bay Length (ft) | | | | | | | | | | | | 110 |
| Base Capacity (vph) | | 1385 | | | 1189 | | | 384 | | | 226 | 473 |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Reduced v/c Ratio | | 0.87 | | | 0.56 | | | 0.89 | | | 0.99 | 0.39 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 90 | |
| Control Type: Pretimed | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

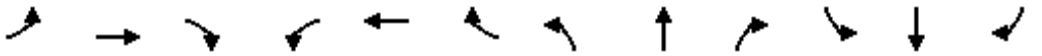
Splits and Phases: 3: S Neville Street/N Neville Street & Fifth Avenue



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 143 | 923 | 14 | 52 | 522 | 21 | 7 | 142 | 177 | 84 | 117 | 165 |
| Future Volume (vph) | 143 | 923 | 14 | 52 | 522 | 21 | 7 | 142 | 177 | 84 | 117 | 165 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | 1.00 |
| Frpb, ped/bikes | | 1.00 | | | 0.99 | | | 0.95 | | | 1.00 | 0.95 |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | | | 0.99 | 1.00 |
| Frt | | 1.00 | | | 0.99 | | | 0.93 | | | 1.00 | 0.85 |
| Flt Protected | | 0.99 | | | 1.00 | | | 1.00 | | | 0.98 | 1.00 |
| Satd. Flow (prot) | | 3164 | | | 3132 | | | 1475 | | | 1650 | 1308 |
| Flt Permitted | | 0.69 | | | 0.76 | | | 0.99 | | | 0.51 | 1.00 |
| Satd. Flow (perm) | | 2185 | | | 2379 | | | 1464 | | | 861 | 1308 |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 1.00 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 159 | 1026 | 16 | 58 | 580 | 23 | 8 | 158 | 177 | 93 | 130 | 183 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 1201 | 0 | 0 | 661 | 0 | 0 | 343 | 0 | 0 | 223 | 183 |
| Confl. Peds. (#/hr) | 85 | | 120 | 120 | | 85 | 36 | | 66 | 66 | | 36 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Heavy Vehicles (%) | 12% | 2% | 0% | 0% | 2% | 21% | 0% | 0% | 0% | 3% | 0% | 7% |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Actuated Green, G (s) | | 48.0 | | | 39.0 | | | 20.0 | | | 20.0 | 25.0 |
| Effective Green, g (s) | | 49.0 | | | 40.0 | | | 21.0 | | | 21.0 | 27.0 |
| Actuated g/C Ratio | | 0.61 | | | 0.50 | | | 0.26 | | | 0.26 | 0.34 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 4.0 |
| Lane Grp Cap (vph) | | 1411 | | | 1189 | | | 384 | | | 226 | 441 |
| v/s Ratio Prot | | c0.06 | | | | | | | | | | 0.03 |
| v/s Ratio Perm | | c0.46 | | | 0.28 | | | 0.23 | | | c0.26 | 0.11 |
| v/c Ratio | | 0.85 | | | 0.56 | | | 0.89 | | | 0.99 | 0.41 |
| Uniform Delay, d1 | | 12.5 | | | 13.8 | | | 28.4 | | | 29.4 | 20.4 |
| Progression Factor | | 1.00 | | | 0.74 | | | 1.00 | | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 6.6 | | | 1.0 | | | 25.6 | | | 56.6 | 2.9 |
| Delay (s) | | 19.2 | | | 11.3 | | | 54.0 | | | 85.9 | 23.3 |
| Level of Service | | B | | | B | | | D | | | F | C |
| Approach Delay (s) | | 19.2 | | | 11.3 | | | 54.0 | | | 57.7 | |
| Approach LOS | | B | | | B | | | D | | | E | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 27.7 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.94 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 104.4% | ICU Level of Service | G |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

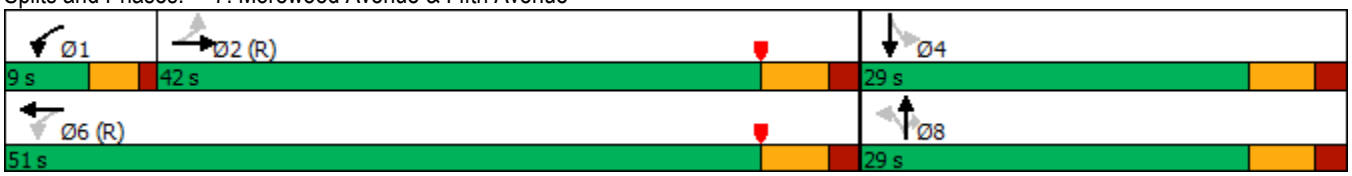


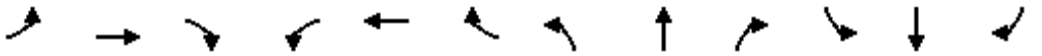
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 24 | 961 | 80 | 81 | 745 | 114 | 38 | 255 | 298 | 79 | 265 | 41 |
| Future Volume (vph) | 24 | 961 | 80 | 81 | 745 | 114 | 38 | 255 | 298 | 79 | 265 | 41 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 260 | | 0 | 75 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1349 | | | 803 | | | 419 | | | 464 | |
| Travel Time (s) | | 26.3 | | | 15.6 | | | 11.4 | | | 12.7 | |
| Confl. Peds. (#/hr) | 34 | | 72 | 72 | | 34 | 59 | | 115 | 115 | | 59 |
| Confl. Bikes (#/hr) | | | | | | 6 | | | 17 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 1184 | 0 | 0 | 1045 | 0 | 0 | 325 | 331 | 88 | 340 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 10 | |
| Link Offset(ft) | | 0 | | | 0 | | | 5 | | | 0 | |
| Crosswalk Width(ft) | | 16 | | | 16 | | | 16 | | | 16 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.13 | 1.13 | 1.13 | 1.11 | 1.11 | 1.11 | 1.16 | 1.16 | 1.16 | 1.20 | 1.20 | 1.20 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Minimum Split (s) | 26.0 | 26.0 | | 9.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (s) | 42.0 | 42.0 | | 9.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (%) | 52.5% | 52.5% | | 11.3% | 63.8% | | 36.3% | 36.3% | 36.3% | 36.3% | 36.3% | |
| Yellow Time (s) | 4.0 | 4.0 | | 3.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 1.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | -1.0 | -1.0 | -1.0 | |
| 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 | | | | | | | | |
| v/c Ratio | | 0.90 | | | 0.85 | | | 0.81 | 0.92 | 0.50 | 0.72 | |
| Control Delay | | 27.2 | | | 21.5 | | | 44.5 | 61.8 | 34.6 | 35.2 | |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 27.2 | | | 21.5 | | | 44.5 | 61.8 | 34.6 | 35.2 | |
| Queue Length 50th (ft) | | 211 | | | 154 | | | 150 | 159 | 36 | 151 | |
| Queue Length 95th (ft) | | m#293 | | | #224 | | | #288 | #317 | 85 | #266 | |
| Internal Link Dist (ft) | | 1269 | | | 723 | | | 339 | | | 384 | |
| Turn Bay Length (ft) | | | | | | | | | | 75 | | |
| Base Capacity (vph) | | 1313 | | | 1227 | | | 399 | 358 | 177 | 474 | |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | 0 | 0 | 0 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | | 0.90 | | | 0.85 | | | 0.81 | 0.92 | 0.50 | 0.72 | |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 71 (89%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 80 | |
| Control Type: Pretimed | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 7: Morewood Avenue & Fifth Avenue





| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 24 | 961 | 80 | 81 | 745 | 114 | 38 | 255 | 298 | 79 | 265 | 41 |
| Future Volume (vph) | 24 | 961 | 80 | 81 | 745 | 114 | 38 | 255 | 298 | 79 | 265 | 41 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frpb, ped/bikes | | 0.99 | | | 0.99 | | | 1.00 | 0.84 | 1.00 | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | 1.00 | 0.93 | 1.00 | |
| Frt | | 0.99 | | | 0.98 | | | 1.00 | 0.85 | 1.00 | 0.98 | |
| Flt Protected | | 1.00 | | | 1.00 | | | 0.99 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 3102 | | | 3167 | | | 1645 | 1194 | 1433 | 1579 | |
| Flt Permitted | | 0.91 | | | 0.63 | | | 0.80 | 1.00 | 0.39 | 1.00 | |
| Satd. Flow (perm) | | 2823 | | | 2009 | | | 1331 | 1194 | 591 | 1579 | |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 27 | 1068 | 89 | 90 | 828 | 127 | 42 | 283 | 331 | 88 | 294 | 46 |
| RTOR Reduction (vph) | 0 | 8 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 1176 | 0 | 0 | 1031 | 0 | 0 | 325 | 331 | 88 | 340 | 0 |
| Confl. Peds. (#/hr) | 34 | | 72 | 72 | | 34 | 59 | | 115 | 115 | | 59 |
| Confl. Bikes (#/hr) | | | | | | 6 | | | 17 | | | 10 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Actuated Green, G (s) | | 36.0 | | | 45.0 | | | 23.0 | 23.0 | 23.0 | 23.0 | |
| Effective Green, g (s) | | 37.0 | | | 46.0 | | | 24.0 | 24.0 | 24.0 | 24.0 | |
| Actuated g/C Ratio | | 0.46 | | | 0.58 | | | 0.30 | 0.30 | 0.30 | 0.30 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | 6.0 | 6.0 | 6.0 | |
| Lane Grp Cap (vph) | | 1305 | | | 1242 | | | 399 | 358 | 177 | 473 | |
| v/s Ratio Prot | | | | | c0.06 | | | | | | 0.22 | |
| v/s Ratio Perm | | c0.42 | | | 0.42 | | | 0.24 | c0.28 | 0.15 | | |
| v/c Ratio | | 0.90 | | | 0.83 | | | 0.81 | 0.92 | 0.50 | 0.72 | |
| Uniform Delay, d1 | | 19.8 | | | 13.8 | | | 25.9 | 27.1 | 23.0 | 25.0 | |
| Progression Factor | | 1.07 | | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 5.1 | | | 6.5 | | | 16.5 | 31.8 | 9.6 | 9.1 | |
| Delay (s) | | 26.4 | | | 20.4 | | | 42.5 | 58.9 | 32.7 | 34.1 | |
| Level of Service | | C | | | C | | | D | E | C | C | |
| Approach Delay (s) | | 26.4 | | | 20.4 | | | 50.8 | | | 33.8 | |
| Approach LOS | | C | | | C | | | D | | | C | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 30.3 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.92 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 111.3% | ICU Level of Service | H |
| Analysis Period (min) | 15 | | |

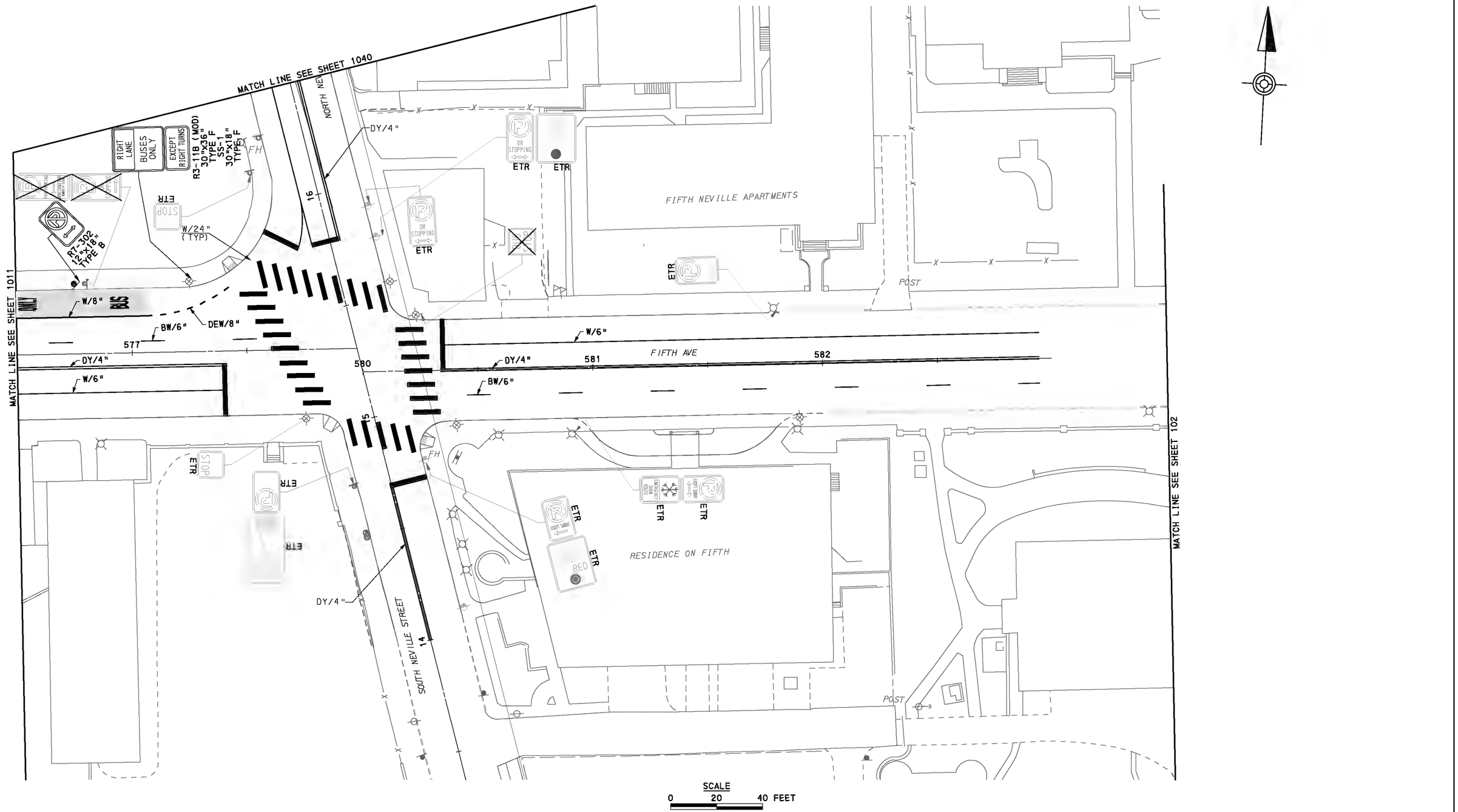
c Critical Lane Group

# APPENDIX I
## Proposed Intersection Plans with Bus Rapid Transit



gai consultants
transforming ideas into reality®

PLOTTED: 9/27/2020
5:49:33 PM




SCALE
0 20 40 FEET

FOR CONSTRUCTION PLAN SEE SHEET 588

AECOM
Gulf Tower
707 Grant Street
5th Floor
Pittsburgh, PA 15219

| NO. | DATE | DESCRIPTION |
|---|---|---|

REVISIONS

THE PREPARATION OF THIS DOCUMENT HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE FEDERAL TRANSIT ADMINISTRATION, U.S. DEPARTMENT OF TRANSPORTATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED, FOR THE PORT AUTHORITY OF ALLEGHENY COUNTY, PENNSYLVANIA.

100% DESIGN SUBMITTAL

(NOT FOR CONSTRUCTION)

SIGNATURE

APPROVED

| | |
|---|---|
| DESIGNED | AJR |
| DRAWN | FJC |
| CHECKED | BFS |
| IN CHARGE | JKM |
| DATE | 09/29/20 |
| SCALE | AS SHOWN |

PORT AUTHORITY OF ALLEGHENY COUNTY
PITTSBURGH PENNSYLVANIA

# BUS RAPID TRANSIT ROADWAY
## SIGNING & PAVEMENT MARKING PLANS
## FIFTH AVE - STA 576+50 TO STA 583+00

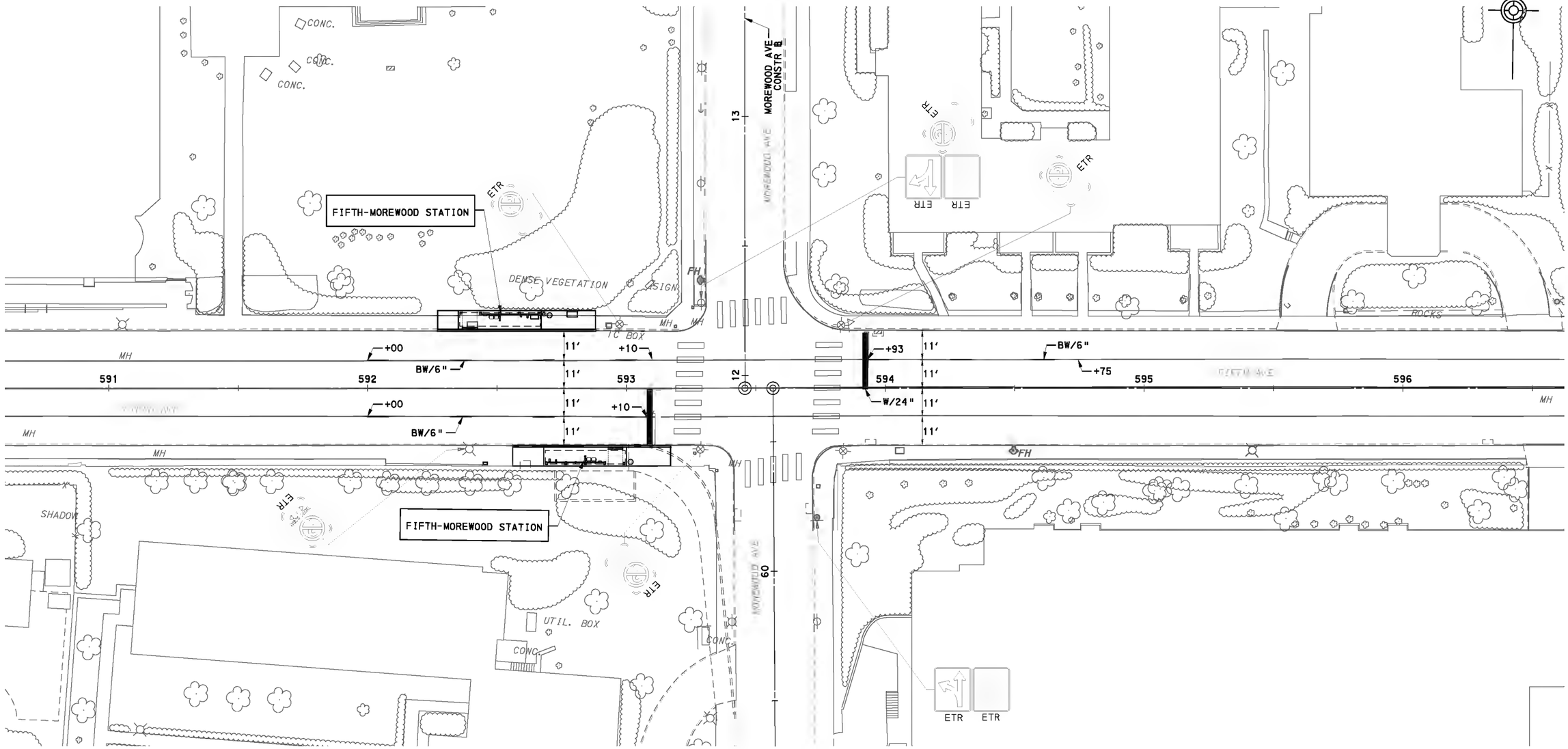
Port Authority
connecting people to life

CONTRACT NO. BRT-001

DWG. NO. SN84 SHT. 1012

OPERATOR: "mccool j"
FILE PATH: c:\pwworking\aecom_ds16_na\jeremy.mccool@aecom.com\d0207707\BRT_01_SPM_SHT41.dgn

PLOTTED: 9/27/2020 5:55:24 PM
OPERATOR:
FILE PATH: c:\pwworking\aecom_ds16_ndj\jeremy.mccool@aecom.com\d0207707\BRT_09_SPM_SHT03.dgn




SCALE
0 20 40 FEET

FOR CONSTRUCTION PLAN SEE SHEET 616

AECOM
Gulf Tower
707 Grant Street
5th Floor
Pittsburgh, PA 15219

Prepared by:
MARKOSKY
3689 Route 711
Ligonier, PA 15658
THE MARKOSKY ENGINEERING GROUP, INC.

| NO. | DATE | DESCRIPTION |
|---|---|---|
| | | |

REVISIONS

THE PREPARATION OF THIS DOCUMENT HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE FEDERAL TRANSIT ADMINISTRATION, U.S. DEPARTMENT OF TRANSPORTATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED, FOR THE PORT AUTHORITY OF ALLEGHENY COUNTY, PENNSYLVANIA.

100% DESIGN SUBMITTAL

(NOT FOR CONSTRUCTION)

SIGNATURE

APPROVED

| | |
|---|---|
| DESIGNED | LMS |
| DRAWN | LMS |
| CHECKED | BLW |
| IN CHARGE | MW |
| DATE | 09/29/20 |
| SCALE | AS SHOWN |

**PORT AUTHORITY OF ALLEGHENY COUNTY**
PITTSBURGH PENNSYLVANIA

BUS RAPID TRANSIT ROADWAY
SIGNING & PAVEMENT MARKING PLANS
FIFTH-MOREWOOD STATION

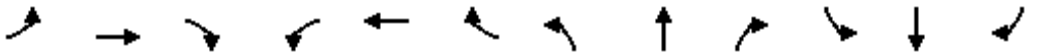
Port Authority
connecting people to life

CONTRACT NO. BRT-001
DWG. NO. SN113 SHT. 1041

# APPENDIX J
## Capacity Calculations
## 2032 Forecasted Master Plan Year without Development



gai consultants
transforming ideas into reality®

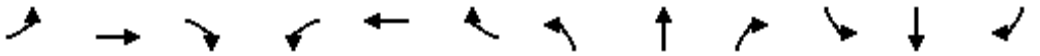


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 46 | 314 | 11 | 79 | 701 | 28 | 11 | 92 | 83 | 84 | 192 | 393 |
| Future Volume (vph) | 46 | 314 | 11 | 79 | 701 | 28 | 11 | 92 | 83 | 84 | 192 | 393 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 110 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | No | | | No | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 646 | | | 1349 | | | 479 | | | 639 | |
| Travel Time (s) | | 12.6 | | | 26.3 | | | 13.1 | | | 17.4 | |
| Confl. Peds. (#/hr) | 60 | | 71 | 71 | | 60 | 20 | | 50 | 50 | | 20 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 25% | 8% | 9% | 1% | 4% | 4% | 0% | 1% | 3% | 26% | 2% | 7% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 412 | 0 | 0 | 898 | 0 | 0 | 206 | 0 | 0 | 306 | 437 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Link Offset(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Crosswalk Width(ft) | | 10 | | | 10 | | | 10 | | | 10 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.11 | 1.11 | 1.11 | 1.13 | 1.13 | 1.13 | 1.18 | 1.18 | 1.18 | 1.13 | 1.13 | 1.13 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Detector Phase | 5 | 2 | | 6 | 6 | | 8 | 8 | | 4 | 4 | 5 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | 4.0 |
| Minimum Split (s) | 8.0 | 27.0 | | 27.0 | 27.0 | | 22.0 | 22.0 | | 22.0 | 22.0 | 8.0 |
| Total Split (s) | 14.0 | 51.0 | | 37.0 | 37.0 | | 29.0 | 29.0 | | 29.0 | 29.0 | 14.0 |
| Total Split (%) | 17.5% | 63.8% | | 46.3% | 46.3% | | 36.3% | 36.3% | | 36.3% | 36.3% | 17.5% |
| Yellow Time (s) | 3.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 3.0 |
| All-Red Time (s) | 1.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 1.0 |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | | | -1.0 | -1.0 |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lead/Lag | Lead | | | Lag | Lag | | | | | | | Lead |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | | | | | | | Yes |
| Recall Mode | None | C-Min | | C-Min | C-Min | | None | None | | None | None | None |
| v/c Ratio | | 0.28 | | | 0.76 | | | 0.51 | | | 0.88 | 0.79 |
| Control Delay | | 8.6 | | | 17.3 | | | 28.7 | | | 55.5 | 29.1 |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | 0.0 |
| Total Delay | | 8.6 | | | 17.3 | | | 28.7 | | | 55.5 | 29.1 |
| Queue Length 50th (ft) | | 48 | | | 88 | | | 83 | | | 141 | 165 |
| Queue Length 95th (ft) | | 72 | | | #313 | | | 148 | | | #279 | 253 |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 566 | | | 1269 | | | 399 | | | 559 | |
| Turn Bay Length (ft) | | | | | | | | | | | | 110 |
| Base Capacity (vph) | | 1461 | | | 1179 | | | 431 | | | 369 | 590 |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Reduced v/c Ratio | | 0.28 | | | 0.76 | | | 0.48 | | | 0.83 | 0.74 |

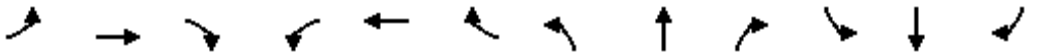
| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 12 (15%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 60 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |

Splits and Phases: 3: S Neville Street/N Neville Street & Fifth Avenue



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 46 | 314 | 11 | 79 | 701 | 28 | 11 | 92 | 83 | 84 | 192 | 393 |
| Future Volume (vph) | 46 | 314 | 11 | 79 | 701 | 28 | 11 | 92 | 83 | 84 | 192 | 393 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | 1.00 |
| Frpb, ped/bikes | | 1.00 | | | 1.00 | | | 0.96 | | | 1.00 | 0.97 |
| Flpb, ped/bikes | | 1.00 | | | 0.99 | | | 1.00 | | | 0.99 | 1.00 |
| Frt | | 1.00 | | | 0.99 | | | 0.94 | | | 1.00 | 0.85 |
| Flt Protected | | 0.99 | | | 1.00 | | | 1.00 | | | 0.99 | 1.00 |
| Satd. Flow (prot) | | 2965 | | | 3086 | | | 1476 | | | 1539 | 1329 |
| Flt Permitted | | 0.80 | | | 0.85 | | | 0.97 | | | 0.79 | 1.00 |
| Satd. Flow (perm) | | 2375 | | | 2645 | | | 1439 | | | 1232 | 1329 |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 51 | 349 | 12 | 88 | 779 | 31 | 12 | 102 | 92 | 93 | 213 | 437 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 412 | 0 | 0 | 898 | 0 | 0 | 206 | 0 | 0 | 306 | 437 |
| Confl. Peds. (#/hr) | 60 | | 71 | 71 | | 60 | 20 | | 50 | 50 | | 20 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Heavy Vehicles (%) | 25% | 8% | 9% | 1% | 4% | 4% | 0% | 1% | 3% | 26% | 2% | 7% |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Actuated Green, G (s) | | 46.5 | | | 34.7 | | | 21.5 | | | 21.5 | 29.3 |
| Effective Green, g (s) | | 47.5 | | | 35.7 | | | 22.5 | | | 22.5 | 31.3 |
| Actuated g/C Ratio | | 0.59 | | | 0.45 | | | 0.28 | | | 0.28 | 0.39 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 4.0 |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | | 1475 | | | 1180 | | | 404 | | | 346 | 519 |
| v/s Ratio Prot | | 0.03 | | | | | | | | | | c0.09 |
| v/s Ratio Perm | | 0.14 | | | c0.34 | | | 0.14 | | | c0.25 | 0.24 |
| v/c Ratio | | 0.28 | | | 0.76 | | | 0.51 | | | 0.88 | 0.84 |
| Uniform Delay, d1 | | 7.9 | | | 18.6 | | | 24.1 | | | 27.5 | 22.1 |
| Progression Factor | | 1.00 | | | 0.65 | | | 1.00 | | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 0.1 | | | 3.5 | | | 1.0 | | | 22.5 | 11.8 |
| Delay (s) | | 8.0 | | | 15.6 | | | 25.1 | | | 50.0 | 33.9 |
| Level of Service | | A | | | B | | | C | | | D | C |
| Approach Delay (s) | | 8.0 | | | 15.6 | | | 25.1 | | | 40.5 | |
| Approach LOS | | A | | | B | | | C | | | D | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 23.3 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.82 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 87.0% | ICU Level of Service | E |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

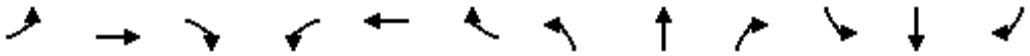


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 15 | 345 | 47 | 167 | 681 | 159 | 18 | 203 | 133 | 64 | 251 | 31 |
| Future Volume (vph) | 15 | 345 | 47 | 167 | 681 | 159 | 18 | 203 | 133 | 64 | 251 | 31 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 260 | | 0 | 75 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1349 | | | 803 | | | 419 | | | 464 | |
| Travel Time (s) | | 26.3 | | | 15.6 | | | 11.4 | | | 12.7 | |
| Confl. Peds. (#/hr) | 75 | | 35 | 35 | | 75 | 83 | | 161 | 161 | | 83 |
| Confl. Bikes (#/hr) | | | 1 | | | 7 | | | 4 | | | 3 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 452 | 0 | 0 | 1120 | 0 | 0 | 246 | 148 | 71 | 313 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 10 | |
| Link Offset(ft) | | 0 | | | 0 | | | 5 | | | 0 | |
| Crosswalk Width(ft) | | 16 | | | 16 | | | 16 | | | 16 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.13 | 1.13 | 1.13 | 1.11 | 1.11 | 1.11 | 1.16 | 1.16 | 1.16 | 1.20 | 1.20 | 1.20 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Detector Phase | 2 | 2 | | 1 | 6 | | 8 | 8 | 8 | 4 | 4 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 15.0 | 15.0 | | 5.0 | 14.0 | | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Minimum Split (s) | 25.0 | 25.0 | | 9.0 | 25.0 | | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | |
| Total Split (s) | 45.0 | 45.0 | | 9.0 | 54.0 | | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | |
| Total Split (%) | 56.3% | 56.3% | | 11.3% | 67.5% | | 32.5% | 32.5% | 32.5% | 32.5% | 32.5% | |
| Yellow Time (s) | 4.0 | 4.0 | | 3.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 1.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | -1.0 | -1.0 | -1.0 | |
| 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 | None | None | None | |
| v/c Ratio | | 0.26 | | | 0.74 | | | 0.69 | 0.54 | 0.44 | 0.80 | |
| Control Delay | | 6.1 | | | 14.0 | | | 38.2 | 33.8 | 34.4 | 45.3 | |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 6.1 | | | 14.0 | | | 38.2 | 33.8 | 34.4 | 45.3 | |
| Queue Length 50th (ft) | | 28 | | | 190 | | | 107 | 62 | 29 | 141 | |
| Queue Length 95th (ft) | | m43 | | | 268 | | | 188 | 121 | 70 | #263 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 1269 | | | 723 | | | 339 | | | 384 | |
| Turn Bay Length (ft) | | | | | | | | | | 75 | | |
| Base Capacity (vph) | | 1753 | | | 1518 | | | 383 | 297 | 174 | 419 | |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | | 0.26 | | | 0.74 | | | 0.64 | 0.50 | 0.41 | 0.75 | |

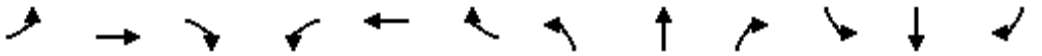
| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 60 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 7: Morewood Avenue & Fifth Avenue



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 15 | 345 | 47 | 167 | 681 | 159 | 18 | 203 | 133 | 64 | 251 | 31 |
| Future Volume (vph) | 15 | 345 | 47 | 167 | 681 | 159 | 18 | 203 | 133 | 64 | 251 | 31 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frpb, ped/bikes | | 0.99 | | | 0.97 | | | 1.00 | 0.79 | 1.00 | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 0.99 | | | 1.00 | 1.00 | 0.87 | 1.00 | |
| Frt | | 0.98 | | | 0.98 | | | 1.00 | 0.85 | 1.00 | 0.98 | |
| Flt Protected | | 1.00 | | | 0.99 | | | 1.00 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 3072 | | | 3065 | | | 1650 | 1123 | 1352 | 1585 | |
| Flt Permitted | | 0.90 | | | 0.77 | | | 0.88 | 1.00 | 0.47 | 1.00 | |
| Satd. Flow (perm) | | 2770 | | | 2374 | | | 1451 | 1123 | 662 | 1585 | |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 17 | 383 | 52 | 186 | 757 | 177 | 20 | 226 | 148 | 71 | 279 | 34 |
| RTOR Reduction (vph) | 0 | 9 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 443 | 0 | 0 | 1102 | 0 | 0 | 246 | 148 | 71 | 313 | 0 |
| Confl. Peds. (#/hr) | 75 | | 35 | 35 | | 75 | 83 | | 161 | 161 | | 83 |
| Confl. Bikes (#/hr) | | | 1 | | | 7 | | | 4 | | | 3 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Actuated Green, G (s) | | 49.4 | | | 49.4 | | | 18.6 | 18.6 | 18.6 | 18.6 | |
| Effective Green, g (s) | | 50.4 | | | 50.4 | | | 19.6 | 19.6 | 19.6 | 19.6 | |
| Actuated g/C Ratio | | 0.63 | | | 0.63 | | | 0.25 | 0.25 | 0.25 | 0.25 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | 3.0 | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 1745 | | | 1495 | | | 355 | 275 | 162 | 388 | |
| v/s Ratio Prot | | | | | | | | | | | c0.20 | |
| v/s Ratio Perm | | 0.16 | | | c0.46 | | | 0.17 | 0.13 | 0.11 | | |
| v/c Ratio | | 0.25 | | | 0.74 | | | 0.69 | 0.54 | 0.44 | 0.81 | |
| Uniform Delay, d1 | | 6.5 | | | 10.2 | | | 27.5 | 26.3 | 25.5 | 28.4 | |
| Progression Factor | | 0.88 | | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 0.3 | | | 1.9 | | | 5.8 | 2.0 | 1.9 | 11.6 | |
| Delay (s) | | 6.1 | | | 12.1 | | | 33.2 | 28.3 | 27.4 | 40.0 | |
| Level of Service | | A | | | B | | | C | C | C | D | |
| Approach Delay (s) | | 6.1 | | | 12.1 | | | 31.4 | | | 37.7 | |
| Approach LOS | | A | | | B | | | C | | | D | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 18.4 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.80 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 96.0% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

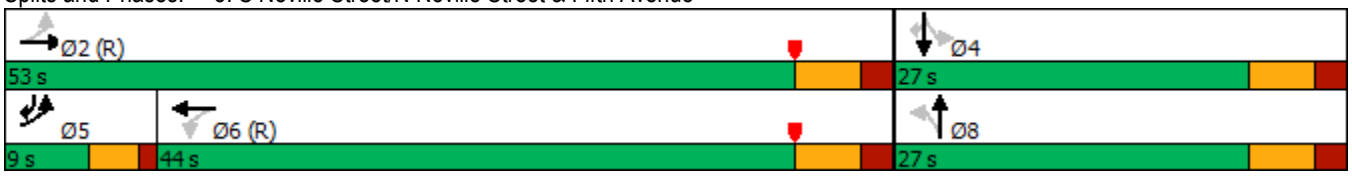


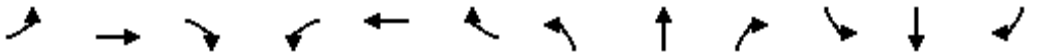
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 143 | 923 | 14 | 52 | 522 | 21 | 7 | 142 | 177 | 84 | 117 | 165 |
| Future Volume (vph) | 143 | 923 | 14 | 52 | 522 | 21 | 7 | 142 | 177 | 84 | 117 | 165 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 110 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | No | | | No | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 646 | | | 1349 | | | 479 | | | 639 | |
| Travel Time (s) | | 12.6 | | | 26.3 | | | 13.1 | | | 17.4 | |
| Confl. Peds. (#/hr) | 85 | | 120 | 120 | | 85 | 36 | | 66 | 66 | | 36 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 1.00 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 12% | 2% | 0% | 0% | 2% | 21% | 0% | 0% | 0% | 3% | 0% | 7% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 1201 | 0 | 0 | 661 | 0 | 0 | 343 | 0 | 0 | 223 | 183 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Link Offset(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Crosswalk Width(ft) | | 10 | | | 10 | | | 10 | | | 10 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.11 | 1.11 | 1.11 | 1.13 | 1.13 | 1.13 | 1.18 | 1.18 | 1.18 | 1.13 | 1.13 | 1.13 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Detector Phase | 5 | 2 | | 6 | 6 | | 8 | 8 | | 4 | 4 | 5 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | 4.0 |
| Minimum Split (s) | 8.0 | 27.0 | | 27.0 | 27.0 | | 25.0 | 25.0 | | 25.0 | 25.0 | 8.0 |
| Total Split (s) | 9.0 | 53.0 | | 44.0 | 44.0 | | 27.0 | 27.0 | | 27.0 | 27.0 | 9.0 |
| Total Split (%) | 11.3% | 66.3% | | 55.0% | 55.0% | | 33.8% | 33.8% | | 33.8% | 33.8% | 11.3% |
| Yellow Time (s) | 3.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 3.0 |
| All-Red Time (s) | 1.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 1.0 |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | | | -1.0 | -1.0 |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lead/Lag | Lead | | | Lag | Lag | | | | | | | Lead |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | | | | | | | Yes |
| Recall Mode | None | C-Min | | C-Min | C-Min | | None | None | | None | None | None |
| v/c Ratio | | 0.88 | | | 0.56 | | | 0.88 | | | 0.94 | 0.38 |
| Control Delay | | 22.1 | | | 7.7 | | | 52.9 | | | 78.3 | 19.2 |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | 0.0 |
| Total Delay | | 22.1 | | | 7.7 | | | 52.9 | | | 78.3 | 19.2 |
| Queue Length 50th (ft) | | 183 | | | 78 | | | 162 | | | 108 | 60 |
| Queue Length 95th (ft) | | #276 | | | m88 | | | #307 | | | #241 | 109 |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 566 | | | 1269 | | | 399 | | | 559 | |
| Turn Bay Length (ft) | | | | | | | | | | | | 110 |
| Base Capacity (vph) | | 1370 | | | 1176 | | | 402 | | | 242 | 480 |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Reduced v/c Ratio | | 0.88 | | | 0.56 | | | 0.85 | | | 0.92 | 0.38 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 21 (26%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 70 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 3: S Neville Street/N Neville Street & Fifth Avenue





| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 143 | 923 | 14 | 52 | 522 | 21 | 7 | 142 | 177 | 84 | 117 | 165 |
| Future Volume (vph) | 143 | 923 | 14 | 52 | 522 | 21 | 7 | 142 | 177 | 84 | 117 | 165 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | 1.00 |
| Frpb, ped/bikes | | 1.00 | | | 0.99 | | | 0.95 | | | 1.00 | 0.95 |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | | | 0.99 | 1.00 |
| Frt | | 1.00 | | | 0.99 | | | 0.93 | | | 1.00 | 0.85 |
| Flt Protected | | 0.99 | | | 1.00 | | | 1.00 | | | 0.98 | 1.00 |
| Satd. Flow (prot) | | 3164 | | | 3132 | | | 1475 | | | 1650 | 1308 |
| Flt Permitted | | 0.68 | | | 0.76 | | | 0.99 | | | 0.52 | 1.00 |
| Satd. Flow (perm) | | 2179 | | | 2378 | | | 1464 | | | 881 | 1308 |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 1.00 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 159 | 1026 | 16 | 58 | 580 | 23 | 8 | 158 | 177 | 93 | 130 | 183 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 1201 | 0 | 0 | 661 | 0 | 0 | 343 | 0 | 0 | 223 | 183 |
| Confl. Peds. (#/hr) | 85 | | 120 | 120 | | 85 | 36 | | 66 | 66 | | 36 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Heavy Vehicles (%) | 12% | 2% | 0% | 0% | 2% | 21% | 0% | 0% | 0% | 3% | 0% | 7% |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Actuated Green, G (s) | | 47.6 | | | 38.6 | | | 20.4 | | | 20.4 | 25.4 |
| Effective Green, g (s) | | 48.6 | | | 39.6 | | | 21.4 | | | 21.4 | 27.4 |
| Actuated g/C Ratio | | 0.61 | | | 0.50 | | | 0.27 | | | 0.27 | 0.34 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 4.0 |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | | 1397 | | | 1177 | | | 391 | | | 235 | 447 |
| v/s Ratio Prot | | c0.06 | | | | | | | | | | 0.03 |
| v/s Ratio Perm | | c0.46 | | | 0.28 | | | 0.23 | | | c0.25 | 0.11 |
| v/c Ratio | | 0.86 | | | 0.56 | | | 0.88 | | | 0.95 | 0.41 |
| Uniform Delay, d1 | | 12.9 | | | 14.1 | | | 28.0 | | | 28.8 | 20.1 |
| Progression Factor | | 1.00 | | | 0.45 | | | 1.00 | | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 5.5 | | | 1.1 | | | 19.3 | | | 44.1 | 0.6 |
| Delay (s) | | 18.4 | | | 7.5 | | | 47.3 | | | 72.9 | 20.7 |
| Level of Service | | B | | | A | | | D | | | E | C |
| Approach Delay (s) | | 18.4 | | | 7.5 | | | 47.3 | | | 49.4 | |
| Approach LOS | | B | | | A | | | D | | | D | |

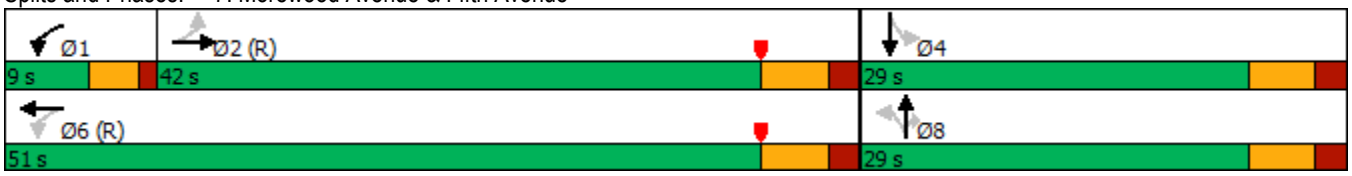
| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 24.3 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.94 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 103.1% | ICU Level of Service | G |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

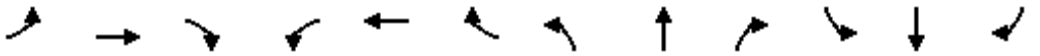
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 24 | 961 | 80 | 81 | 745 | 114 | 38 | 255 | 298 | 79 | 265 | 41 |
| Future Volume (vph) | 24 | 961 | 80 | 81 | 745 | 114 | 38 | 255 | 298 | 79 | 265 | 41 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 260 | | 0 | 75 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1349 | | | 803 | | | 419 | | | 464 | |
| Travel Time (s) | | 26.3 | | | 15.6 | | | 11.4 | | | 12.7 | |
| Confl. Peds. (#/hr) | 34 | | 72 | 72 | | 34 | 59 | | 115 | 115 | | 59 |
| Confl. Bikes (#/hr) | | | | | | 6 | | | 17 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 1184 | 0 | 0 | 1045 | 0 | 0 | 325 | 331 | 88 | 340 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 10 | |
| Link Offset(ft) | | 0 | | | 0 | | | 5 | | | 0 | |
| Crosswalk Width(ft) | | 16 | | | 16 | | | 16 | | | 16 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.13 | 1.13 | 1.13 | 1.11 | 1.11 | 1.11 | 1.16 | 1.16 | 1.16 | 1.20 | 1.20 | 1.20 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Detector Phase | 2 | 2 | | 1 | 6 | | 8 | 8 | 8 | 4 | 4 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 15.0 | 15.0 | | 5.0 | 15.0 | | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Minimum Split (s) | 26.0 | 26.0 | | 9.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (s) | 42.0 | 42.0 | | 9.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (%) | 52.5% | 52.5% | | 11.3% | 63.8% | | 36.3% | 36.3% | 36.3% | 36.3% | 36.3% | |
| Yellow Time (s) | 4.0 | 4.0 | | 3.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 1.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | -1.0 | -1.0 | -1.0 | |
| 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 | None | None | None | |
| v/c Ratio | | 0.72 | | | 0.82 | | | 0.84 | 0.94 | 0.51 | 0.73 | |
| Control Delay | | 16.7 | | | 20.4 | | | 46.9 | 64.4 | 35.4 | 35.8 | |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 16.7 | | | 20.4 | | | 46.9 | 64.4 | 35.4 | 35.8 | |
| Queue Length 50th (ft) | | 270 | | | 198 | | | 150 | 159 | 36 | 151 | |
| Queue Length 95th (ft) | | m319 | | | #302 | | | #290 | #317 | 85 | #266 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 1269 | | | 723 | | | 339 | | | 384 | |
| Turn Bay Length (ft) | | | | | | | | | | 75 | | |
| Base Capacity (vph) | | 1644 | | | 1267 | | | 394 | 358 | 175 | 474 | |
| 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 | | 0.72 | | | 0.82 | | | 0.82 | 0.92 | 0.50 | 0.72 | |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 72 (90%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 80 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 7: Morewood Avenue & Fifth Avenue





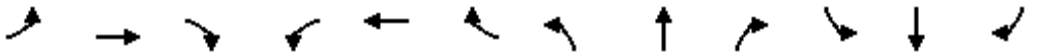
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 24 | 961 | 80 | 81 | 745 | 114 | 38 | 255 | 298 | 79 | 265 | 41 |
| Future Volume (vph) | 24 | 961 | 80 | 81 | 745 | 114 | 38 | 255 | 298 | 79 | 265 | 41 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frpb, ped/bikes | | 0.99 | | | 0.99 | | | 1.00 | 0.84 | 1.00 | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | 1.00 | 0.93 | 1.00 | |
| Frt | | 0.99 | | | 0.98 | | | 1.00 | 0.85 | 1.00 | 0.98 | |
| Flt Protected | | 1.00 | | | 1.00 | | | 0.99 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 3102 | | | 3162 | | | 1645 | 1194 | 1433 | 1579 | |
| Flt Permitted | | 0.91 | | | 0.68 | | | 0.79 | 1.00 | 0.39 | 1.00 | |
| Satd. Flow (perm) | | 2830 | | | 2161 | | | 1316 | 1194 | 585 | 1579 | |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 27 | 1068 | 89 | 90 | 828 | 127 | 42 | 283 | 331 | 88 | 294 | 46 |
| RTOR Reduction (vph) | 0 | 6 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 1178 | 0 | 0 | 1032 | 0 | 0 | 325 | 331 | 88 | 340 | 0 |
| Confl. Peds. (#/hr) | 34 | | 72 | 72 | | 34 | 59 | | 115 | 115 | | 59 |
| Confl. Bikes (#/hr) | | | | | | 6 | | | 17 | | | 10 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Actuated Green, G (s) | | 45.3 | | | 45.3 | | | 22.7 | 22.7 | 22.7 | 22.7 | |
| Effective Green, g (s) | | 46.3 | | | 46.3 | | | 23.7 | 23.7 | 23.7 | 23.7 | |
| Actuated g/C Ratio | | 0.58 | | | 0.58 | | | 0.30 | 0.30 | 0.30 | 0.30 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | 3.0 | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 1637 | | | 1250 | | | 389 | 353 | 173 | 467 | |
| v/s Ratio Prot | | | | | | | | | | | 0.22 | |
| v/s Ratio Perm | | 0.42 | | | c0.48 | | | 0.25 | c0.28 | 0.15 | | |
| v/c Ratio | | 0.72 | | | 0.83 | | | 0.84 | 0.94 | 0.51 | 0.73 | |
| Uniform Delay, d1 | | 12.2 | | | 13.6 | | | 26.3 | 27.4 | 23.3 | 25.3 | |
| Progression Factor | | 1.23 | | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 1.3 | | | 4.6 | | | 14.3 | 31.9 | 2.3 | 5.6 | |
| Delay (s) | | 16.3 | | | 18.2 | | | 40.7 | 59.3 | 25.7 | 30.9 | |
| Level of Service | | B | | | B | | | D | E | C | C | |
| Approach Delay (s) | | 16.3 | | | 18.2 | | | 50.1 | | | 29.8 | |
| Approach LOS | | B | | | B | | | D | | | C | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 25.3 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.91 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 111.3% | ICU Level of Service | H |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

# APPENDIX K
# 2032 Forecasted Master Plan Year with Development Without Transportation Demand Management Mitigation



gai consultants
transforming ideas into reality®

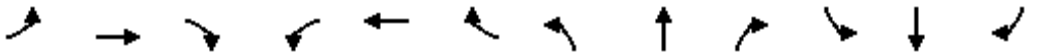


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 54 | 302 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 86 | 203 | 420 |
| Future Volume (vph) | 54 | 302 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 86 | 203 | 420 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 110 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | No | | | No | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 646 | | | 1349 | | | 479 | | | 639 | |
| Travel Time (s) | | 12.6 | | | 26.3 | | | 13.1 | | | 17.4 | |
| Confl. Peds. (#/hr) | 60 | | 71 | 71 | | 60 | 20 | | 50 | 50 | | 20 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 25% | 8% | 9% | 1% | 4% | 4% | 0% | 1% | 3% | 26% | 2% | 7% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 425 | 0 | 0 | 966 | 0 | 0 | 275 | 0 | 0 | 322 | 467 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Link Offset(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Crosswalk Width(ft) | | 10 | | | 10 | | | 10 | | | 10 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.11 | 1.11 | 1.11 | 1.13 | 1.13 | 1.13 | 1.18 | 1.18 | 1.18 | 1.13 | 1.13 | 1.13 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Detector Phase | 5 | 2 | | 6 | 6 | | 8 | 8 | | 4 | 4 | 5 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | 4.0 |
| Minimum Split (s) | 8.0 | 27.0 | | 27.0 | 27.0 | | 22.0 | 22.0 | | 22.0 | 22.0 | 8.0 |
| Total Split (s) | 11.0 | 51.0 | | 40.0 | 40.0 | | 29.0 | 29.0 | | 29.0 | 29.0 | 11.0 |
| Total Split (%) | 13.8% | 63.8% | | 50.0% | 50.0% | | 36.3% | 36.3% | | 36.3% | 36.3% | 13.8% |
| Yellow Time (s) | 3.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 3.0 |
| All-Red Time (s) | 1.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 1.0 |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | | | -1.0 | -1.0 |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lead/Lag | Lead | | | Lag | Lag | | | | | | | Lead |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | | | | | | | Yes |
| Recall Mode | None | C-Min | | C-Min | C-Min | | None | None | | None | None | None |
| v/c Ratio | | 0.33 | | | 0.90 | | | 0.67 | | | 0.94 | 0.84 |
| Control Delay | | 9.2 | | | 25.7 | | | 34.0 | | | 66.7 | 34.1 |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | 0.0 |
| Total Delay | | 9.2 | | | 25.7 | | | 34.0 | | | 66.7 | 34.1 |
| Queue Length 50th (ft) | | 51 | | | 139 | | | 119 | | | 155 | 182 |
| Queue Length 95th (ft) | | 75 | | | m#354 | | | 204 | | | #312 | #298 |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 566 | | | 1269 | | | 399 | | | 559 | |
| Turn Bay Length (ft) | | | | | | | | | | | | 110 |
| Base Capacity (vph) | | 1297 | | | 1069 | | | 415 | | | 345 | 559 |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Reduced v/c Ratio | | 0.33 | | | 0.90 | | | 0.66 | | | 0.93 | 0.84 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 10 (13%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 75 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 3: S Neville Street/N Neville Street & Fifth Avenue



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 54 | 302 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 86 | 203 | 420 |
| Future Volume (vph) | 54 | 302 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 86 | 203 | 420 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | 1.00 |
| Frpb, ped/bikes | | 0.99 | | | 1.00 | | | 0.96 | | | 1.00 | 0.97 |
| Flpb, ped/bikes | | 1.00 | | | 0.99 | | | 1.00 | | | 0.99 | 1.00 |
| Frt | | 0.99 | | | 1.00 | | | 0.93 | | | 1.00 | 0.85 |
| Flt Protected | | 0.99 | | | 0.99 | | | 1.00 | | | 0.99 | 1.00 |
| Satd. Flow (prot) | | 2919 | | | 3070 | | | 1450 | | | 1545 | 1327 |
| Flt Permitted | | 0.73 | | | 0.78 | | | 0.95 | | | 0.73 | 1.00 |
| Satd. Flow (perm) | | 2143 | | | 2426 | | | 1383 | | | 1149 | 1327 |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 60 | 336 | 29 | 156 | 779 | 31 | 24 | 111 | 140 | 96 | 226 | 467 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 425 | 0 | 0 | 966 | 0 | 0 | 275 | 0 | 0 | 322 | 467 |
| Confl. Peds. (#/hr) | 60 | | 71 | 71 | | 60 | 20 | | 50 | 50 | | 20 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Heavy Vehicles (%) | 25% | 8% | 9% | 1% | 4% | 4% | 0% | 1% | 3% | 26% | 2% | 7% |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Actuated Green, G (s) | | 45.3 | | | 34.3 | | | 22.7 | | | 22.7 | 29.7 |
| Effective Green, g (s) | | 46.3 | | | 35.3 | | | 23.7 | | | 23.7 | 31.7 |
| Actuated g/C Ratio | | 0.58 | | | 0.44 | | | 0.30 | | | 0.30 | 0.40 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 4.0 |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | | 1317 | | | 1070 | | | 409 | | | 340 | 525 |
| v/s Ratio Prot | | 0.03 | | | | | | | | | | c0.09 |
| v/s Ratio Perm | | 0.15 | | | c0.40 | | | 0.20 | | | c0.28 | 0.26 |
| v/c Ratio | | 0.32 | | | 0.90 | | | 0.67 | | | 0.95 | 0.89 |
| Uniform Delay, d1 | | 8.7 | | | 20.8 | | | 24.7 | | | 27.5 | 22.5 |
| Progression Factor | | 1.00 | | | 0.71 | | | 1.00 | | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 0.1 | | | 9.1 | | | 4.3 | | | 34.8 | 16.7 |
| Delay (s) | | 8.9 | | | 23.9 | | | 29.1 | | | 62.3 | 39.2 |
| Level of Service | | A | | | C | | | C | | | E | D |
| Approach Delay (s) | | 8.9 | | | 23.9 | | | 29.1 | | | 48.6 | |
| Approach LOS | | A | | | C | | | C | | | D | |

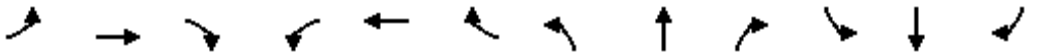
| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 29.8 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.93 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 93.3% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 15 | 388 | 60 | 209 | 690 | 159 | 18 | 235 | 172 | 64 | 267 | 34 |
| Future Volume (vph) | 15 | 388 | 60 | 209 | 690 | 159 | 18 | 235 | 172 | 64 | 267 | 34 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 260 | | 0 | 75 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1349 | | | 803 | | | 419 | | | 464 | |
| Travel Time (s) | | 26.3 | | | 15.6 | | | 11.4 | | | 12.7 | |
| Confl. Peds. (#/hr) | 75 | | 35 | 35 | | 75 | 83 | | 161 | 161 | | 83 |
| Confl. Bikes (#/hr) | | | 1 | | | 7 | | | 4 | | | 3 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 515 | 0 | 0 | 1176 | 0 | 0 | 281 | 191 | 71 | 335 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 10 | |
| Link Offset(ft) | | 0 | | | 0 | | | 5 | | | 0 | |
| Crosswalk Width(ft) | | 16 | | | 16 | | | 16 | | | 16 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.13 | 1.13 | 1.13 | 1.11 | 1.11 | 1.11 | 1.16 | 1.16 | 1.16 | 1.20 | 1.20 | 1.20 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Detector Phase | 2 | 2 | | 1 | 6 | | 8 | 8 | 8 | 4 | 4 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 15.0 | 15.0 | | 5.0 | 15.0 | | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Minimum Split (s) | 25.0 | 25.0 | | 9.0 | 25.0 | | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | |
| Total Split (s) | 46.0 | 46.0 | | 9.0 | 55.0 | | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | |
| Total Split (%) | 57.5% | 57.5% | | 11.3% | 68.8% | | 31.3% | 31.3% | 31.3% | 31.3% | 31.3% | |
| Yellow Time (s) | 4.0 | 4.0 | | 3.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 1.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | -1.0 | -1.0 | -1.0 | |
| 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-Max | | None | None | None | None | None | |
| v/c Ratio | | 0.29 | | | 0.82 | | | 0.86 | 0.70 | 0.51 | 0.87 | |
| Control Delay | | 3.7 | | | 17.1 | | | 54.9 | 43.3 | 40.5 | 54.1 | |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 3.7 | | | 17.1 | | | 54.9 | 43.3 | 40.5 | 54.1 | |
| Queue Length 50th (ft) | | 26 | | | 206 | | | 133 | 86 | 30 | 160 | |
| Queue Length 95th (ft) | | m38 | | | 311 | | | #264 | #179 | #78 | #301 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 1269 | | | 723 | | | 339 | | | 384 | |
| Turn Bay Length (ft) | | | | | | | | | | 75 | | |
| Base Capacity (vph) | | 1757 | | | 1440 | | | 338 | 280 | 143 | 395 | |
| 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 | | | 0.82 | | | 0.83 | 0.68 | 0.50 | 0.85 | |

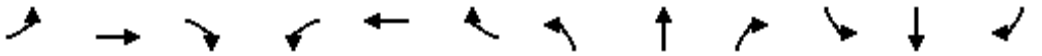
| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 70 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 7: Morewood Avenue & Fifth Avenue



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 15 | 388 | 60 | 209 | 690 | 159 | 18 | 235 | 172 | 64 | 267 | 34 |
| Future Volume (vph) | 15 | 388 | 60 | 209 | 690 | 159 | 18 | 235 | 172 | 64 | 267 | 34 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frpb, ped/bikes | | 0.99 | | | 0.97 | | | 1.00 | 0.79 | 1.00 | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 0.99 | | | 1.00 | 1.00 | 0.88 | 1.00 | |
| Frt | | 0.98 | | | 0.98 | | | 1.00 | 0.85 | 1.00 | 0.98 | |
| Flt Protected | | 1.00 | | | 0.99 | | | 1.00 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 3057 | | | 3066 | | | 1652 | 1123 | 1370 | 1583 | |
| Flt Permitted | | 0.90 | | | 0.73 | | | 0.82 | 1.00 | 0.40 | 1.00 | |
| Satd. Flow (perm) | | 2763 | | | 2252 | | | 1355 | 1123 | 576 | 1583 | |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 17 | 431 | 67 | 232 | 767 | 177 | 20 | 261 | 191 | 71 | 297 | 38 |
| RTOR Reduction (vph) | 0 | 11 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 504 | 0 | 0 | 1160 | 0 | 0 | 281 | 191 | 71 | 335 | 0 |
| Confl. Peds. (#/hr) | 75 | | 35 | 35 | | 75 | 83 | | 161 | 161 | | 83 |
| Confl. Bikes (#/hr) | | | 1 | | | 7 | | | 4 | | | 3 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Actuated Green, G (s) | | 49.6 | | | 49.6 | | | 18.4 | 18.4 | 18.4 | 18.4 | |
| Effective Green, g (s) | | 50.6 | | | 50.6 | | | 19.4 | 19.4 | 19.4 | 19.4 | |
| Actuated g/C Ratio | | 0.63 | | | 0.63 | | | 0.24 | 0.24 | 0.24 | 0.24 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | 3.0 | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 1747 | | | 1424 | | | 328 | 272 | 139 | 383 | |
| v/s Ratio Prot | | | | | | | | | | | c0.21 | |
| v/s Ratio Perm | | 0.18 | | | c0.52 | | | 0.21 | 0.17 | 0.12 | | |
| v/c Ratio | | 0.29 | | | 0.81 | | | 0.86 | 0.70 | 0.51 | 0.87 | |
| Uniform Delay, d1 | | 6.6 | | | 11.1 | | | 29.0 | 27.7 | 26.2 | 29.1 | |
| Progression Factor | | 0.52 | | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 0.4 | | | 3.7 | | | 19.2 | 8.0 | 3.1 | 19.3 | |
| Delay (s) | | 3.8 | | | 14.9 | | | 48.2 | 35.6 | 29.3 | 48.5 | |
| Level of Service | | A | | | B | | | D | D | C | D | |
| Approach Delay (s) | | 3.8 | | | 14.9 | | | 43.1 | | | 45.1 | |
| Approach LOS | | A | | | B | | | D | | | D | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 22.6 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.88 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 98.6% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

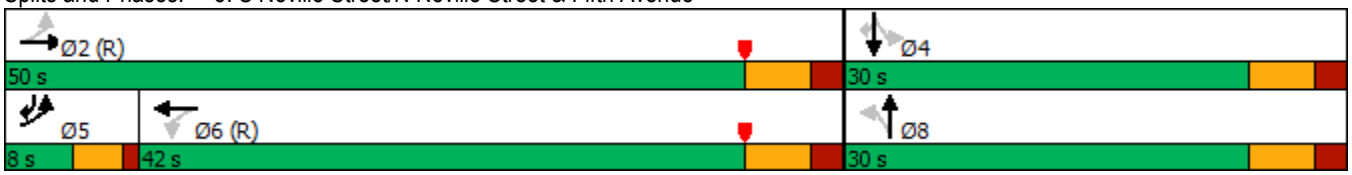


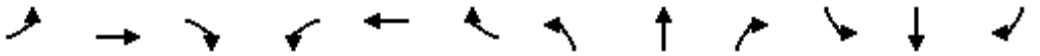
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 162 | 951 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 85 | 170 | 169 |
| Future Volume (vph) | 162 | 951 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 85 | 170 | 169 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 110 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | No | | | No | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 646 | | | 1349 | | | 479 | | | 639 | |
| Travel Time (s) | | 12.6 | | | 26.3 | | | 13.1 | | | 17.4 | |
| Confl. Peds. (#/hr) | 85 | | 120 | 120 | | 85 | 36 | | 66 | 66 | | 36 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 1.00 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 12% | 2% | 0% | 0% | 2% | 21% | 0% | 0% | 0% | 3% | 0% | 7% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 1259 | 0 | 0 | 696 | 0 | 0 | 473 | 0 | 0 | 283 | 188 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Link Offset(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Crosswalk Width(ft) | | 10 | | | 10 | | | 10 | | | 10 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.11 | 1.11 | 1.11 | 1.13 | 1.13 | 1.13 | 1.18 | 1.18 | 1.18 | 1.13 | 1.13 | 1.13 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Detector Phase | 5 | 2 | | 6 | 6 | | 8 | 8 | | 4 | 4 | 5 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | 4.0 |
| Minimum Split (s) | 8.0 | 27.0 | | 27.0 | 27.0 | | 25.0 | 25.0 | | 25.0 | 25.0 | 8.0 |
| Total Split (s) | 8.0 | 50.0 | | 42.0 | 42.0 | | 30.0 | 30.0 | | 30.0 | 30.0 | 8.0 |
| Total Split (%) | 10.0% | 62.5% | | 52.5% | 52.5% | | 37.5% | 37.5% | | 37.5% | 37.5% | 10.0% |
| Yellow Time (s) | 3.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 3.0 |
| All-Red Time (s) | 1.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 1.0 |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | | | -1.0 | -1.0 |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lead/Lag | Lead | | | Lag | Lag | | | | | | | Lead |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | | | | | | | Yes |
| Recall Mode | None | C-Min | | C-Min | C-Min | | None | None | | None | None | None |
| v/c Ratio | | 1.05 | | | 0.73 | | | 1.04 | | | 1.02 | 0.36 |
| Control Delay | | 59.4 | | | 7.0 | | | 82.1 | | | 89.7 | 17.3 |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | 0.0 |
| Total Delay | | 59.4 | | | 7.0 | | | 82.1 | | | 89.7 | 17.3 |
| Queue Length 50th (ft) | | ~245 | | | 67 | | | ~259 | | | ~145 | 59 |
| Queue Length 95th (ft) | | #427 | | | m66 | | | #437 | | | #299 | 106 |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 566 | | | 1269 | | | 399 | | | 559 | |
| Turn Bay Length (ft) | | | | | | | | | | | | 110 |
| Base Capacity (vph) | | 1199 | | | 956 | | | 456 | | | 278 | 521 |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Reduced v/c Ratio | | 1.05 | | | 0.73 | | | 1.04 | | | 1.02 | 0.36 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 26 (33%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 100 | |
| Control Type: Actuated-Coordinated | |
| ~ Volume exceeds capacity, queue is theoretically infinite. | |
| Queue shown is maximum after two cycles. | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

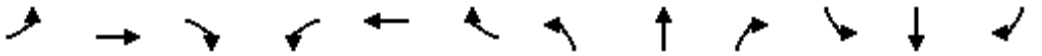
Splits and Phases: 3: S Neville Street/N Neville Street & Fifth Avenue





| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 162 | 951 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 85 | 170 | 169 |
| Future Volume (vph) | 162 | 951 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 85 | 170 | 169 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | 1.00 |
| Frpb, ped/bikes | | 1.00 | | | 0.99 | | | 0.95 | | | 1.00 | 0.95 |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | | | 0.99 | 1.00 |
| Frt | | 1.00 | | | 0.99 | | | 0.93 | | | 1.00 | 0.85 |
| Flt Protected | | 0.99 | | | 0.99 | | | 1.00 | | | 0.98 | 1.00 |
| Satd. Flow (prot) | | 3155 | | | 3128 | | | 1470 | | | 1672 | 1304 |
| Flt Permitted | | 0.65 | | | 0.66 | | | 0.99 | | | 0.52 | 1.00 |
| Satd. Flow (perm) | | 2065 | | | 2067 | | | 1461 | | | 890 | 1304 |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 1.00 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 180 | 1057 | 22 | 83 | 589 | 24 | 8 | 213 | 252 | 94 | 189 | 188 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 1259 | 0 | 0 | 696 | 0 | 0 | 473 | 0 | 0 | 283 | 188 |
| Confl. Peds. (#/hr) | 85 | | 120 | 120 | | 85 | 36 | | 66 | 66 | | 36 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Heavy Vehicles (%) | 12% | 2% | 0% | 0% | 2% | 21% | 0% | 0% | 0% | 3% | 0% | 7% |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Actuated Green, G (s) | | 44.0 | | | 36.0 | | | 24.0 | | | 24.0 | 28.0 |
| Effective Green, g (s) | | 45.0 | | | 37.0 | | | 25.0 | | | 25.0 | 30.0 |
| Actuated g/C Ratio | | 0.56 | | | 0.46 | | | 0.31 | | | 0.31 | 0.38 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 4.0 |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | | 1229 | | | 955 | | | 456 | | | 278 | 489 |
| v/s Ratio Prot | | c0.06 | | | | | | | | | | 0.02 |
| v/s Ratio Perm | | c0.51 | | | 0.34 | | | c0.32 | | | 0.32 | 0.12 |
| v/c Ratio | | 1.02 | | | 0.73 | | | 1.04 | | | 1.02 | 0.38 |
| Uniform Delay, d1 | | 17.5 | | | 17.4 | | | 27.5 | | | 27.5 | 18.3 |
| Progression Factor | | 1.00 | | | 0.36 | | | 1.00 | | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 32.1 | | | 0.5 | | | 52.1 | | | 58.7 | 0.5 |
| Delay (s) | | 49.6 | | | 6.8 | | | 79.6 | | | 86.2 | 18.8 |
| Level of Service | | D | | | A | | | E | | | F | B |
| Approach Delay (s) | | 49.6 | | | 6.8 | | | 79.6 | | | 59.3 | |
| Approach LOS | | D | | | A | | | E | | | E | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 45.8 | HCM 2000 Level of Service | D |
| HCM 2000 Volume to Capacity ratio | 1.09 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 114.3% | ICU Level of Service | H |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

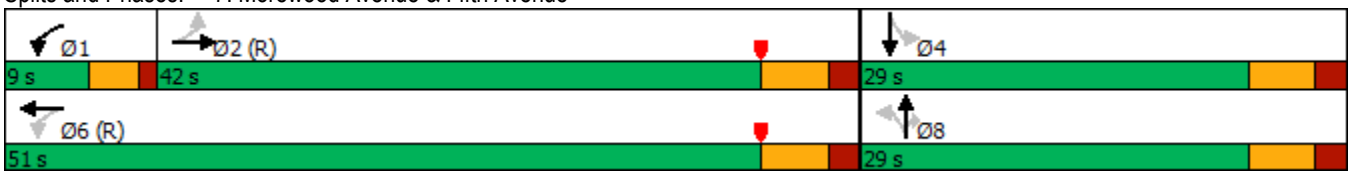


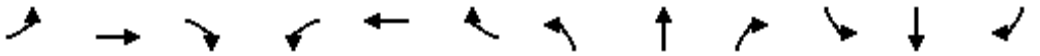
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 45 | 1023 | 85 | 110 | 786 | 117 | 34 | 269 | 321 | 81 | 290 | 42 |
| Future Volume (vph) | 45 | 1023 | 85 | 110 | 786 | 117 | 34 | 269 | 321 | 81 | 290 | 42 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 260 | | 0 | 75 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1349 | | | 803 | | | 419 | | | 464 | |
| Travel Time (s) | | 26.3 | | | 15.6 | | | 11.4 | | | 12.7 | |
| Confl. Peds. (#/hr) | 34 | | 72 | 72 | | 34 | 59 | | 115 | 115 | | 59 |
| Confl. Bikes (#/hr) | | | | | | 6 | | | 17 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 1281 | 0 | 0 | 1125 | 0 | 0 | 337 | 357 | 90 | 369 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 10 | |
| Link Offset(ft) | | 0 | | | 0 | | | 5 | | | 0 | |
| Crosswalk Width(ft) | | 16 | | | 16 | | | 16 | | | 16 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.13 | 1.13 | 1.13 | 1.11 | 1.11 | 1.11 | 1.16 | 1.16 | 1.16 | 1.20 | 1.20 | 1.20 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Detector Phase | 2 | 2 | | 1 | 6 | | 8 | 8 | 8 | 4 | 4 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 15.0 | 15.0 | | 5.0 | 15.0 | | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Minimum Split (s) | 26.0 | 26.0 | | 9.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (s) | 42.0 | 42.0 | | 9.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (%) | 52.5% | 52.5% | | 11.3% | 63.8% | | 36.3% | 36.3% | 36.3% | 36.3% | 36.3% | |
| Yellow Time (s) | 4.0 | 4.0 | | 3.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 1.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | -1.0 | -1.0 | -1.0 | |
| 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 | None | None | None | |
| v/c Ratio | | 0.84 | | | 1.03 | | | 0.87 | 1.00 | 0.53 | 0.78 | |
| Control Delay | | 17.9 | | | 54.8 | | | 51.9 | 78.1 | 37.0 | 39.0 | |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 17.9 | | | 54.8 | | | 51.9 | 78.1 | 37.0 | 39.0 | |
| Queue Length 50th (ft) | | 292 | | | ~318 | | | 159 | 177 | 37 | 167 | |
| Queue Length 95th (ft) | | m276 | | | #445 | | | #309 | #348 | #96 | #302 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 1269 | | | 723 | | | 339 | | | 384 | |
| Turn Bay Length (ft) | | | | | | | | | | 75 | | |
| Base Capacity (vph) | | 1527 | | | 1090 | | | 386 | 358 | 169 | 474 | |
| 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 | | 0.84 | | | 1.03 | | | 0.87 | 1.00 | 0.53 | 0.78 | |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 90 | |
| Control Type: Actuated-Coordinated | |
| ~ Volume exceeds capacity, queue is theoretically infinite. | |
| Queue shown is maximum after two cycles. | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 7: Morewood Avenue & Fifth Avenue





| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 45 | 1023 | 85 | 110 | 786 | 117 | 34 | 269 | 321 | 81 | 290 | 42 |
| Future Volume (vph) | 45 | 1023 | 85 | 110 | 786 | 117 | 34 | 269 | 321 | 81 | 290 | 42 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frpb, ped/bikes | | 0.99 | | | 0.99 | | | 1.00 | 0.84 | 1.00 | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | 1.00 | 0.93 | 1.00 | |
| Frt | | 0.99 | | | 0.98 | | | 1.00 | 0.85 | 1.00 | 0.98 | |
| Flt Protected | | 1.00 | | | 0.99 | | | 0.99 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 3101 | | | 3163 | | | 1648 | 1194 | 1437 | 1582 | |
| Flt Permitted | | 0.85 | | | 0.59 | | | 0.78 | 1.00 | 0.37 | 1.00 | |
| Satd. Flow (perm) | | 2649 | | | 1870 | | | 1290 | 1194 | 566 | 1582 | |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 50 | 1137 | 94 | 122 | 873 | 130 | 38 | 299 | 357 | 90 | 322 | 47 |
| RTOR Reduction (vph) | 0 | 6 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 1275 | 0 | 0 | 1112 | 0 | 0 | 337 | 357 | 90 | 369 | 0 |
| Confl. Peds. (#/hr) | 34 | | 72 | 72 | | 34 | 59 | | 115 | 115 | | 59 |
| Confl. Bikes (#/hr) | | | | | | 6 | | | 17 | | | 10 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Actuated Green, G (s) | | 45.0 | | | 45.0 | | | 23.0 | 23.0 | 23.0 | 23.0 | |
| Effective Green, g (s) | | 46.0 | | | 46.0 | | | 24.0 | 24.0 | 24.0 | 24.0 | |
| Actuated g/C Ratio | | 0.58 | | | 0.58 | | | 0.30 | 0.30 | 0.30 | 0.30 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | 3.0 | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 1523 | | | 1075 | | | 387 | 358 | 169 | 474 | |
| v/s Ratio Prot | | | | | | | | | | | 0.23 | |
| v/s Ratio Perm | | 0.48 | | | c0.59 | | | 0.26 | c0.30 | 0.16 | | |
| v/c Ratio | | 0.84 | | | 1.03 | | | 0.87 | 1.00 | 0.53 | 0.78 | |
| Uniform Delay, d1 | | 13.9 | | | 17.0 | | | 26.5 | 28.0 | 23.3 | 25.6 | |
| Progression Factor | | 1.19 | | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 0.5 | | | 36.8 | | | 18.8 | 46.5 | 3.2 | 7.9 | |
| Delay (s) | | 17.1 | | | 53.8 | | | 45.3 | 74.5 | 26.5 | 33.5 | |
| Level of Service | | B | | | D | | | D | E | C | C | |
| Approach Delay (s) | | 17.1 | | | 53.8 | | | 60.3 | | | 32.1 | |
| Approach LOS | | B | | | D | | | E | | | C | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 39.1 | HCM 2000 Level of Service | D |
| HCM 2000 Volume to Capacity ratio | 1.08 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 118.0% | ICU Level of Service | H |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

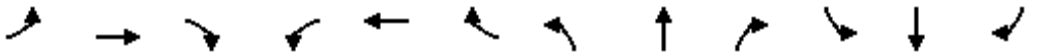
# APPENDIX L

## Capacity Calculations

## 2032 Forecasted Master Plan Year with Development and Transportation Demand Management Mitigation



gai consultants
transforming ideas into reality®

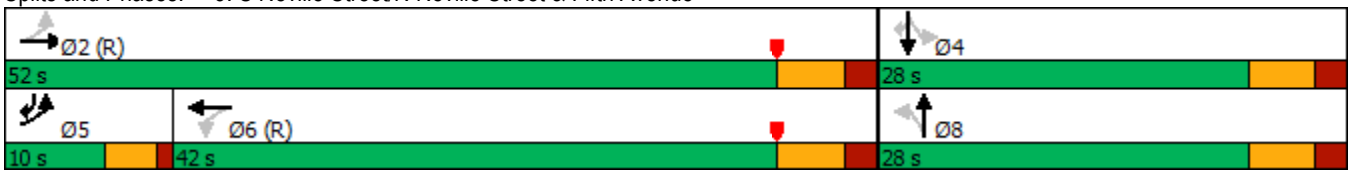


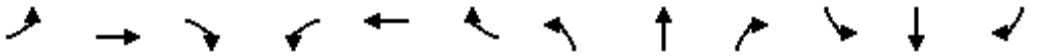
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 46 | 299 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 73 | 203 | 393 |
| Future Volume (vph) | 46 | 299 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 73 | 203 | 393 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 110 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | No | | | No | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 646 | | | 1349 | | | 479 | | | 639 | |
| Travel Time (s) | | 12.6 | | | 26.3 | | | 13.1 | | | 17.4 | |
| Confl. Peds. (#/hr) | 60 | | 71 | 71 | | 60 | 20 | | 50 | 50 | | 20 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 25% | 8% | 9% | 1% | 4% | 4% | 0% | 1% | 3% | 26% | 2% | 7% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 412 | 0 | 0 | 966 | 0 | 0 | 275 | 0 | 0 | 307 | 437 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Link Offset(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Crosswalk Width(ft) | | 10 | | | 10 | | | 10 | | | 10 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.11 | 1.11 | 1.11 | 1.13 | 1.13 | 1.13 | 1.18 | 1.18 | 1.18 | 1.13 | 1.13 | 1.13 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Detector Phase | 5 | 2 | | 6 | 6 | | 8 | 8 | | 4 | 4 | 5 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | 4.0 |
| Minimum Split (s) | 8.0 | 27.0 | | 27.0 | 27.0 | | 22.0 | 22.0 | | 22.0 | 22.0 | 8.0 |
| Total Split (s) | 10.0 | 52.0 | | 42.0 | 42.0 | | 28.0 | 28.0 | | 28.0 | 28.0 | 10.0 |
| Total Split (%) | 12.5% | 65.0% | | 52.5% | 52.5% | | 35.0% | 35.0% | | 35.0% | 35.0% | 12.5% |
| Yellow Time (s) | 3.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 3.0 |
| All-Red Time (s) | 1.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 1.0 |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | | | -1.0 | -1.0 |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lead/Lag | Lead | | | Lag | Lag | | | | | | | Lead |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | | | | | | | Yes |
| Recall Mode | None | C-Min | | C-Min | C-Min | | None | None | | None | None | None |
| v/c Ratio | | 0.29 | | | 0.84 | | | 0.72 | | | 0.92 | 0.84 |
| Control Delay | | 8.4 | | | 19.9 | | | 37.8 | | | 63.9 | 37.0 |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | 0.0 |
| Total Delay | | 8.4 | | | 19.9 | | | 37.8 | | | 63.9 | 37.0 |
| Queue Length 50th (ft) | | 47 | | | 90 | | | 122 | | | 146 | 173 |
| Queue Length 95th (ft) | | 70 | | | #334 | | | #225 | | | #294 | #289 |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 566 | | | 1269 | | | 399 | | | 559 | |
| Turn Bay Length (ft) | | | | | | | | | | | | 110 |
| Base Capacity (vph) | | 1406 | | | 1147 | | | 397 | | | 343 | 518 |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Reduced v/c Ratio | | 0.29 | | | 0.84 | | | 0.69 | | | 0.90 | 0.84 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 10 (13%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 80 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |

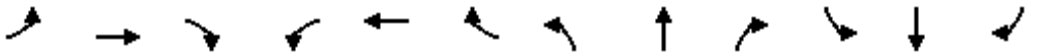
Splits and Phases: 3: S Neville Street/N Neville Street & Fifth Avenue





| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 46 | 299 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 73 | 203 | 393 |
| Future Volume (vph) | 46 | 299 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 73 | 203 | 393 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | 1.00 |
| Frpb, ped/bikes | | 0.99 | | | 1.00 | | | 0.96 | | | 1.00 | 0.96 |
| Flpb, ped/bikes | | 1.00 | | | 0.99 | | | 1.00 | | | 0.99 | 1.00 |
| Frt | | 0.99 | | | 1.00 | | | 0.93 | | | 1.00 | 0.85 |
| Flt Protected | | 0.99 | | | 0.99 | | | 1.00 | | | 0.99 | 1.00 |
| Satd. Flow (prot) | | 2928 | | | 3069 | | | 1450 | | | 1562 | 1326 |
| Flt Permitted | | 0.78 | | | 0.79 | | | 0.95 | | | 0.76 | 1.00 |
| Satd. Flow (perm) | | 2291 | | | 2433 | | | 1384 | | | 1197 | 1326 |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 51 | 332 | 29 | 156 | 779 | 31 | 24 | 111 | 140 | 81 | 226 | 437 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 412 | 0 | 0 | 966 | 0 | 0 | 275 | 0 | 0 | 307 | 437 |
| Confl. Peds. (#/hr) | 60 | | 71 | 71 | | 60 | 20 | | 50 | 50 | | 20 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Heavy Vehicles (%) | 25% | 8% | 9% | 1% | 4% | 4% | 0% | 1% | 3% | 26% | 2% | 7% |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Actuated Green, G (s) | | 46.7 | | | 36.7 | | | 21.3 | | | 21.3 | 27.3 |
| Effective Green, g (s) | | 47.7 | | | 37.7 | | | 22.3 | | | 22.3 | 29.3 |
| Actuated g/C Ratio | | 0.60 | | | 0.47 | | | 0.28 | | | 0.28 | 0.37 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 4.0 |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | | 1421 | | | 1146 | | | 385 | | | 333 | 485 |
| v/s Ratio Prot | | 0.03 | | | | | | | | | | c0.08 |
| v/s Ratio Perm | | 0.15 | | | c0.40 | | | 0.20 | | | c0.26 | 0.25 |
| v/c Ratio | | 0.29 | | | 0.84 | | | 0.71 | | | 0.92 | 0.90 |
| Uniform Delay, d1 | | 7.9 | | | 18.6 | | | 26.0 | | | 28.0 | 24.0 |
| Progression Factor | | 1.00 | | | 0.68 | | | 1.00 | | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 0.1 | | | 6.0 | | | 6.2 | | | 30.0 | 19.7 |
| Delay (s) | | 8.0 | | | 18.6 | | | 32.2 | | | 58.0 | 43.7 |
| Level of Service | | A | | | B | | | C | | | E | D |
| Approach Delay (s) | | 8.0 | | | 18.6 | | | 32.2 | | | 49.6 | |
| Approach LOS | | A | | | B | | | C | | | D | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 27.9 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.89 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 92.3% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

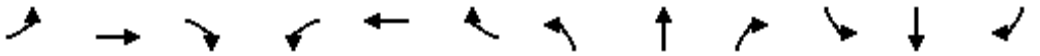


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 15 | 388 | 47 | 158 | 690 | 159 | 18 | 220 | 144 | 64 | 248 | 34 |
| Future Volume (vph) | 15 | 388 | 47 | 158 | 690 | 159 | 18 | 220 | 144 | 64 | 248 | 34 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 260 | | 0 | 75 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1349 | | | 803 | | | 419 | | | 464 | |
| Travel Time (s) | | 26.3 | | | 15.6 | | | 11.4 | | | 12.7 | |
| Confl. Peds. (#/hr) | 75 | | 35 | 35 | | 75 | 83 | | 161 | 161 | | 83 |
| Confl. Bikes (#/hr) | | | 1 | | | 7 | | | 4 | | | 3 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 500 | 0 | 0 | 1120 | 0 | 0 | 264 | 160 | 71 | 314 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 10 | |
| Link Offset(ft) | | 0 | | | 0 | | | 5 | | | 0 | |
| Crosswalk Width(ft) | | 16 | | | 16 | | | 16 | | | 16 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.13 | 1.13 | 1.13 | 1.11 | 1.11 | 1.11 | 1.16 | 1.16 | 1.16 | 1.20 | 1.20 | 1.20 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Detector Phase | 2 | 2 | | 1 | 6 | | 8 | 8 | 8 | 4 | 4 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 15.0 | 15.0 | | 5.0 | 15.0 | | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Minimum Split (s) | 25.0 | 25.0 | | 9.0 | 25.0 | | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | |
| Total Split (s) | 45.0 | 45.0 | | 9.0 | 54.0 | | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | |
| Total Split (%) | 56.3% | 56.3% | | 11.3% | 67.5% | | 32.5% | 32.5% | 32.5% | 32.5% | 32.5% | |
| Yellow Time (s) | 4.0 | 4.0 | | 3.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 1.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | -1.0 | -1.0 | -1.0 | |
| 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 | None | None | None | |
| v/c Ratio | | 0.28 | | | 0.75 | | | 0.75 | 0.58 | 0.47 | 0.82 | |
| Control Delay | | 5.7 | | | 14.1 | | | 42.2 | 35.7 | 36.8 | 46.4 | |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 5.7 | | | 14.1 | | | 42.2 | 35.7 | 36.8 | 46.4 | |
| Queue Length 50th (ft) | | 28 | | | 185 | | | 119 | 69 | 30 | 144 | |
| Queue Length 95th (ft) | | m39 | | | 271 | | | #221 | 131 | 72 | #266 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 1269 | | | 723 | | | 339 | | | 384 | |
| Turn Bay Length (ft) | | | | | | | | | | 75 | | |
| Base Capacity (vph) | | 1768 | | | 1504 | | | 379 | 294 | 161 | 414 | |
| 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 | | 0.28 | | | 0.74 | | | 0.70 | 0.54 | 0.44 | 0.76 | |

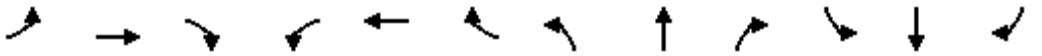
| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 60 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 7: Morewood Avenue & Fifth Avenue



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 15 | 388 | 47 | 158 | 690 | 159 | 18 | 220 | 144 | 64 | 248 | 34 |
| Future Volume (vph) | 15 | 388 | 47 | 158 | 690 | 159 | 18 | 220 | 144 | 64 | 248 | 34 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frpb, ped/bikes | | 0.99 | | | 0.97 | | | 1.00 | 0.79 | 1.00 | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 0.99 | | | 1.00 | 1.00 | 0.88 | 1.00 | |
| Frt | | 0.98 | | | 0.98 | | | 1.00 | 0.85 | 1.00 | 0.98 | |
| Flt Protected | | 1.00 | | | 0.99 | | | 1.00 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 3085 | | | 3069 | | | 1650 | 1123 | 1361 | 1580 | |
| Flt Permitted | | 0.90 | | | 0.76 | | | 0.87 | 1.00 | 0.43 | 1.00 | |
| Satd. Flow (perm) | | 2794 | | | 2352 | | | 1444 | 1123 | 618 | 1580 | |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 17 | 431 | 52 | 176 | 767 | 177 | 20 | 244 | 160 | 71 | 276 | 38 |
| RTOR Reduction (vph) | 0 | 8 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 492 | 0 | 0 | 1102 | 0 | 0 | 264 | 160 | 71 | 314 | 0 |
| Confl. Peds. (#/hr) | 75 | | 35 | 35 | | 75 | 83 | | 161 | 161 | | 83 |
| Confl. Bikes (#/hr) | | | 1 | | | 7 | | | 4 | | | 3 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Actuated Green, G (s) | | 49.5 | | | 49.5 | | | 18.5 | 18.5 | 18.5 | 18.5 | |
| Effective Green, g (s) | | 50.5 | | | 50.5 | | | 19.5 | 19.5 | 19.5 | 19.5 | |
| Actuated g/C Ratio | | 0.63 | | | 0.63 | | | 0.24 | 0.24 | 0.24 | 0.24 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | 3.0 | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 1763 | | | 1484 | | | 351 | 273 | 150 | 385 | |
| v/s Ratio Prot | | | | | | | | | | | c0.20 | |
| v/s Ratio Perm | | 0.18 | | | c0.47 | | | 0.18 | 0.14 | 0.11 | | |
| v/c Ratio | | 0.28 | | | 0.74 | | | 0.75 | 0.59 | 0.47 | 0.82 | |
| Uniform Delay, d1 | | 6.6 | | | 10.2 | | | 28.0 | 26.7 | 25.9 | 28.6 | |
| Progression Factor | | 0.79 | | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 0.4 | | | 2.0 | | | 8.8 | 3.2 | 2.3 | 12.5 | |
| Delay (s) | | 5.6 | | | 12.3 | | | 36.8 | 29.9 | 28.2 | 41.1 | |
| Level of Service | | A | | | B | | | D | C | C | D | |
| Approach Delay (s) | | 5.6 | | | 12.3 | | | 34.2 | | | 38.7 | |
| Approach LOS | | A | | | B | | | C | | | D | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 18.9 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.81 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 96.1% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

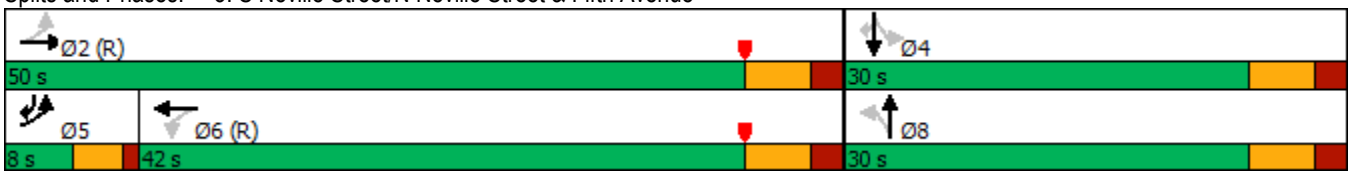


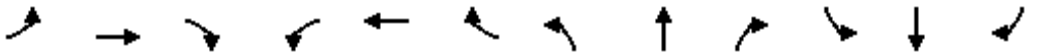
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 147 | 946 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 82 | 170 | 153 |
| Future Volume (vph) | 147 | 946 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 82 | 170 | 153 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 110 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | No | | | No | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 646 | | | 1349 | | | 479 | | | 639 | |
| Travel Time (s) | | 12.6 | | | 26.3 | | | 13.1 | | | 17.4 | |
| Confl. Peds. (#/hr) | 85 | | 120 | 120 | | 85 | 36 | | 66 | 66 | | 36 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 1.00 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 12% | 2% | 0% | 0% | 2% | 21% | 0% | 0% | 0% | 3% | 0% | 7% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 1236 | 0 | 0 | 696 | 0 | 0 | 473 | 0 | 0 | 280 | 170 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Link Offset(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Crosswalk Width(ft) | | 10 | | | 10 | | | 10 | | | 10 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.11 | 1.11 | 1.11 | 1.13 | 1.13 | 1.13 | 1.18 | 1.18 | 1.18 | 1.13 | 1.13 | 1.13 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Detector Phase | 5 | 2 | | 6 | 6 | | 8 | 8 | | 4 | 4 | 5 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | 4.0 |
| Minimum Split (s) | 8.0 | 27.0 | | 27.0 | 27.0 | | 25.0 | 25.0 | | 25.0 | 25.0 | 8.0 |
| Total Split (s) | 8.0 | 50.0 | | 42.0 | 42.0 | | 30.0 | 30.0 | | 30.0 | 30.0 | 8.0 |
| Total Split (%) | 10.0% | 62.5% | | 52.5% | 52.5% | | 37.5% | 37.5% | | 37.5% | 37.5% | 10.0% |
| Yellow Time (s) | 3.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 3.0 |
| All-Red Time (s) | 1.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 1.0 |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | | | -1.0 | -1.0 |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lead/Lag | Lead | | | Lag | Lag | | | | | | | Lead |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | | | | | | | Yes |
| Recall Mode | None | C-Min | | C-Min | C-Min | | None | None | | None | None | None |
| v/c Ratio | | 1.02 | | | 0.72 | | | 1.04 | | | 0.99 | 0.33 |
| Control Delay | | 49.2 | | | 9.5 | | | 82.1 | | | 82.0 | 16.8 |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | 0.0 |
| Total Delay | | 49.2 | | | 9.5 | | | 82.1 | | | 82.0 | 16.8 |
| Queue Length 50th (ft) | | ~223 | | | 76 | | | ~259 | | | 138 | 53 |
| Queue Length 95th (ft) | | #398 | | | m90 | | | #437 | | | #293 | 97 |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 566 | | | 1269 | | | 399 | | | 559 | |
| Turn Bay Length (ft) | | | | | | | | | | | | 110 |
| Base Capacity (vph) | | 1215 | | | 964 | | | 456 | | | 283 | 521 |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | 0 |
| Reduced v/c Ratio | | 1.02 | | | 0.72 | | | 1.04 | | | 0.99 | 0.33 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 26 (33%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 80 | |
| Control Type: Actuated-Coordinated | |
| ~ Volume exceeds capacity, queue is theoretically infinite. | |
| Queue shown is maximum after two cycles. | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

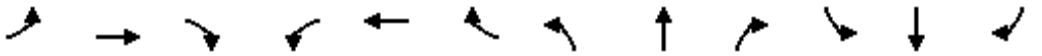
Splits and Phases: 3: S Neville Street/N Neville Street & Fifth Avenue





| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 147 | 946 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 82 | 170 | 153 |
| Future Volume (vph) | 147 | 946 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 82 | 170 | 153 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 3.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | 1.00 |
| Frpb, ped/bikes | | 1.00 | | | 0.99 | | | 0.95 | | | 1.00 | 0.95 |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | | | 0.99 | 1.00 |
| Frt | | 1.00 | | | 0.99 | | | 0.93 | | | 1.00 | 0.85 |
| Flt Protected | | 0.99 | | | 0.99 | | | 1.00 | | | 0.98 | 1.00 |
| Satd. Flow (prot) | | 3160 | | | 3128 | | | 1470 | | | 1673 | 1304 |
| Flt Permitted | | 0.66 | | | 0.66 | | | 0.99 | | | 0.53 | 1.00 |
| Satd. Flow (perm) | | 2092 | | | 2088 | | | 1461 | | | 908 | 1304 |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 1.00 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 163 | 1051 | 22 | 83 | 589 | 24 | 8 | 213 | 252 | 91 | 189 | 170 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 1236 | 0 | 0 | 696 | 0 | 0 | 473 | 0 | 0 | 280 | 170 |
| Confl. Peds. (#/hr) | 85 | | 120 | 120 | | 85 | 36 | | 66 | 66 | | 36 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Heavy Vehicles (%) | 12% | 2% | 0% | 0% | 2% | 21% | 0% | 0% | 0% | 3% | 0% | 7% |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | 4 |
| Actuated Green, G (s) | | 44.0 | | | 36.0 | | | 24.0 | | | 24.0 | 28.0 |
| Effective Green, g (s) | | 45.0 | | | 37.0 | | | 25.0 | | | 25.0 | 30.0 |
| Actuated g/C Ratio | | 0.56 | | | 0.46 | | | 0.31 | | | 0.31 | 0.38 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 4.0 |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | | 1243 | | | 965 | | | 456 | | | 283 | 489 |
| v/s Ratio Prot | | c0.06 | | | | | | | | | | 0.02 |
| v/s Ratio Perm | | c0.50 | | | 0.33 | | | c0.32 | | | 0.31 | 0.11 |
| v/c Ratio | | 0.99 | | | 0.72 | | | 1.04 | | | 0.99 | 0.35 |
| Uniform Delay, d1 | | 17.4 | | | 17.3 | | | 27.5 | | | 27.4 | 18.0 |
| Progression Factor | | 1.00 | | | 0.41 | | | 1.00 | | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 24.0 | | | 2.1 | | | 52.1 | | | 50.0 | 0.4 |
| Delay (s) | | 41.4 | | | 9.2 | | | 79.6 | | | 77.4 | 18.4 |
| Level of Service | | D | | | A | | | E | | | E | B |
| Approach Delay (s) | | 41.4 | | | 9.2 | | | 79.6 | | | 55.1 | |
| Approach LOS | | D | | | A | | | E | | | E | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 42.0 | HCM 2000 Level of Service | D |
| HCM 2000 Volume to Capacity ratio | 1.07 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 113.6% | ICU Level of Service | H |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

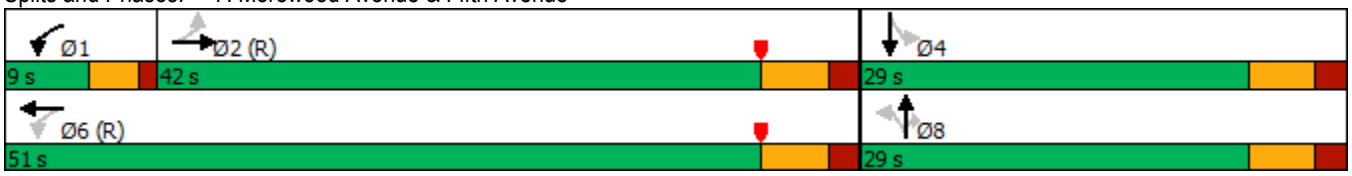


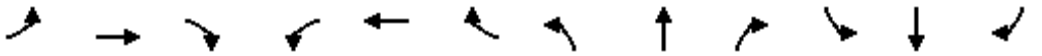
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 45 | 1023 | 82 | 86 | 786 | 117 | 34 | 241 | 267 | 81 | 281 | 42 |
| Future Volume (vph) | 45 | 1023 | 82 | 86 | 786 | 117 | 34 | 241 | 267 | 81 | 281 | 42 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 260 | | 0 | 75 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1349 | | | 803 | | | 419 | | | 464 | |
| Travel Time (s) | | 26.3 | | | 15.6 | | | 11.4 | | | 12.7 | |
| Confl. Peds. (#/hr) | 34 | | 72 | 72 | | 34 | 59 | | 115 | 115 | | 59 |
| Confl. Bikes (#/hr) | | | | | | 6 | | | 17 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 1278 | 0 | 0 | 1099 | 0 | 0 | 306 | 297 | 90 | 359 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 10 | |
| Link Offset(ft) | | 0 | | | 0 | | | 5 | | | 0 | |
| Crosswalk Width(ft) | | 16 | | | 16 | | | 16 | | | 16 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.13 | 1.13 | 1.13 | 1.11 | 1.11 | 1.11 | 1.16 | 1.16 | 1.16 | 1.20 | 1.20 | 1.20 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Detector Phase | 2 | 2 | | 1 | 6 | | 8 | 8 | 8 | 4 | 4 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 15.0 | 15.0 | | 5.0 | 15.0 | | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Minimum Split (s) | 26.0 | 26.0 | | 9.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (s) | 42.0 | 42.0 | | 9.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (%) | 52.5% | 52.5% | | 11.3% | 63.8% | | 36.3% | 36.3% | 36.3% | 36.3% | 36.3% | |
| Yellow Time (s) | 4.0 | 4.0 | | 3.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 1.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | -1.0 | -1.0 | -1.0 | |
| 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 | None | None | None | |
| v/c Ratio | | 0.81 | | | 0.89 | | | 0.86 | 0.88 | 0.52 | 0.80 | |
| Control Delay | | 17.0 | | | 25.8 | | | 52.2 | 54.4 | 35.8 | 41.2 | |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 17.0 | | | 25.8 | | | 52.2 | 54.4 | 35.8 | 41.2 | |
| Queue Length 50th (ft) | | 290 | | | 232 | | | 141 | 137 | 37 | 161 | |
| Queue Length 95th (ft) | | m283 | | | #397 | | | #277 | #274 | 86 | #289 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 1269 | | | 723 | | | 339 | | | 384 | |
| Turn Bay Length (ft) | | | | | | | | | | 75 | | |
| Base Capacity (vph) | | 1576 | | | 1232 | | | 373 | 358 | 182 | 474 | |
| 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 | | 0.81 | | | 0.89 | | | 0.82 | 0.83 | 0.49 | 0.76 | |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 90 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 7: Morewood Avenue & Fifth Avenue





| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 45 | 1023 | 82 | 86 | 786 | 117 | 34 | 241 | 267 | 81 | 281 | 42 |
| Future Volume (vph) | 45 | 1023 | 82 | 86 | 786 | 117 | 34 | 241 | 267 | 81 | 281 | 42 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frpb, ped/bikes | | 0.99 | | | 0.99 | | | 1.00 | 0.84 | 1.00 | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | 1.00 | 0.92 | 1.00 | |
| Frt | | 0.99 | | | 0.98 | | | 1.00 | 0.85 | 1.00 | 0.98 | |
| Flt Protected | | 1.00 | | | 1.00 | | | 0.99 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 3104 | | | 3165 | | | 1646 | 1193 | 1428 | 1581 | |
| Flt Permitted | | 0.86 | | | 0.65 | | | 0.75 | 1.00 | 0.40 | 1.00 | |
| Satd. Flow (perm) | | 2661 | | | 2065 | | | 1244 | 1193 | 608 | 1581 | |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 50 | 1137 | 91 | 96 | 873 | 130 | 38 | 268 | 297 | 90 | 312 | 47 |
| RTOR Reduction (vph) | 0 | 5 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 1273 | 0 | 0 | 1086 | 0 | 0 | 306 | 297 | 90 | 359 | 0 |
| Confl. Peds. (#/hr) | 34 | | 72 | 72 | | 34 | 59 | | 115 | 115 | | 59 |
| Confl. Bikes (#/hr) | | | | | | 6 | | | 17 | | | 10 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Actuated Green, G (s) | | 46.2 | | | 46.2 | | | 21.8 | 21.8 | 21.8 | 21.8 | |
| Effective Green, g (s) | | 47.2 | | | 47.2 | | | 22.8 | 22.8 | 22.8 | 22.8 | |
| Actuated g/C Ratio | | 0.59 | | | 0.59 | | | 0.29 | 0.29 | 0.29 | 0.29 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | 3.0 | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 1569 | | | 1218 | | | 354 | 340 | 173 | 450 | |
| v/s Ratio Prot | | | | | | | | | | | 0.23 | |
| v/s Ratio Perm | | 0.48 | | | c0.53 | | | 0.25 | c0.25 | 0.15 | | |
| v/c Ratio | | 0.81 | | | 0.89 | | | 0.86 | 0.87 | 0.52 | 0.80 | |
| Uniform Delay, d1 | | 12.9 | | | 14.2 | | | 27.1 | 27.2 | 24.0 | 26.5 | |
| Progression Factor | | 1.20 | | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 0.4 | | | 8.5 | | | 19.1 | 21.1 | 2.8 | 9.5 | |
| Delay (s) | | 15.9 | | | 22.7 | | | 46.3 | 48.3 | 26.8 | 36.0 | |
| Level of Service | | B | | | C | | | D | D | C | D | |
| Approach Delay (s) | | 15.9 | | | 22.7 | | | 47.3 | | | 34.1 | |
| Approach LOS | | B | | | C | | | D | | | C | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 26.0 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.94 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 115.6% | ICU Level of Service | H |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

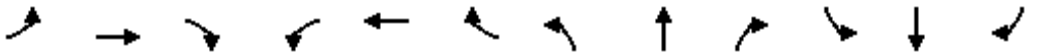
# APPENDIX M

## Capacity Calculations

## 2032 Forecasted Master Plan Year with Development Transportation Demand Management Mitigation Roadway Improvements

R200398.00 / May 2022

gai consultants
transforming ideas into reality®

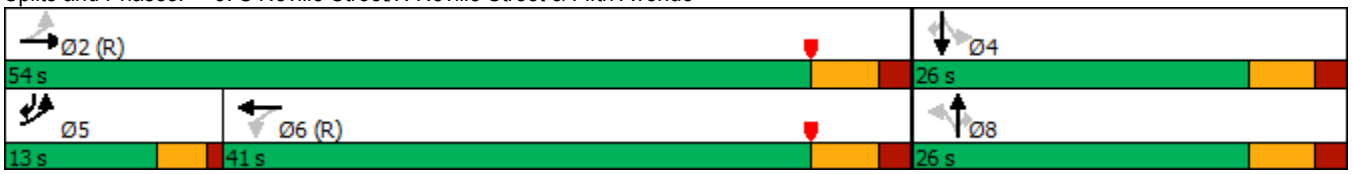


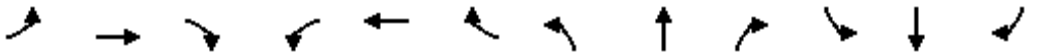
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 46 | 299 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 73 | 203 | 393 |
| Future Volume (vph) | 46 | 299 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 73 | 203 | 393 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 120 | | 0 | 0 | | 110 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 0 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | No | | | No | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 646 | | | 1349 | | | 479 | | | 639 | |
| Travel Time (s) | | 12.6 | | | 26.3 | | | 13.1 | | | 17.4 | |
| Confl. Peds. (#/hr) | 60 | | 71 | 71 | | 60 | 20 | | 50 | 50 | | 20 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 25% | 8% | 9% | 1% | 4% | 4% | 0% | 1% | 3% | 26% | 2% | 7% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 412 | 0 | 0 | 966 | 0 | 0 | 135 | 140 | 0 | 307 | 437 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Link Offset(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Crosswalk Width(ft) | | 10 | | | 10 | | | 10 | | | 10 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.11 | 1.11 | 1.11 | 1.13 | 1.13 | 1.13 | 1.23 | 1.23 | 1.23 | 1.18 | 1.18 | 1.18 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | Perm | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | 4 |
| Detector Phase | 5 | 2 | | 6 | 6 | | 8 | 8 | 8 | 4 | 4 | 5 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 4.0 |
| Minimum Split (s) | 9.0 | 27.0 | | 27.0 | 27.0 | | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 9.0 |
| Total Split (s) | 13.0 | 54.0 | | 41.0 | 41.0 | | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 13.0 |
| Total Split (%) | 16.3% | 67.5% | | 51.3% | 51.3% | | 32.5% | 32.5% | 32.5% | 32.5% | 32.5% | 16.3% |
| Yellow Time (s) | 3.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 3.0 |
| All-Red Time (s) | 1.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 1.0 |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | 0.0 | | -1.0 | -1.0 |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | | 5.0 | 6.0 | | 5.0 | 3.0 |
| Lead/Lag | Lead | | | Lag | Lag | | | | | | | Lead |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Recall Mode | None | C-Min | | C-Min | C-Min | | None | None | None | None | None | None |
| v/c Ratio | | 0.28 | | | 0.86 | | | 0.39 | 0.47 | | 0.91 | 0.85 |
| Control Delay | | 7.4 | | | 21.9 | | | 28.3 | 31.8 | | 61.9 | 37.0 |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | 0.0 | | 0.0 | 0.0 |
| Total Delay | | 7.4 | | | 21.9 | | | 28.3 | 31.8 | | 61.9 | 37.0 |
| Queue Length 50th (ft) | | 43 | | | 168 | | | 55 | 59 | | 147 | 172 |
| Queue Length 95th (ft) | | 65 | | | #343 | | | 106 | 115 | | #292 | #265 |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 566 | | | 1269 | | | 399 | | | 559 | |
| Turn Bay Length (ft) | | | | | | | | | | | | 110 |
| Base Capacity (vph) | | 1493 | | | 1121 | | | 354 | 303 | | 346 | 521 |
| 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 | | 0.28 | | | 0.86 | | | 0.38 | 0.46 | | 0.89 | 0.84 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 23 (29%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 65 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |

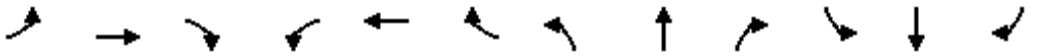
Splits and Phases: 3: S Neville Street/N Neville Street & Fifth Avenue





| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 46 | 299 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 73 | 203 | 393 |
| Future Volume (vph) | 46 | 299 | 26 | 140 | 701 | 28 | 22 | 100 | 126 | 73 | 203 | 393 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | 6.0 | | 5.0 | 3.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | | 0.99 | | | 1.00 | | | 1.00 | 0.91 | | 1.00 | 0.97 |
| Flpb, ped/bikes | | 1.00 | | | 0.99 | | | 1.00 | 1.00 | | 0.98 | 1.00 |
| Frt | | 0.99 | | | 1.00 | | | 1.00 | 0.85 | | 1.00 | 0.85 |
| Flt Protected | | 0.99 | | | 0.99 | | | 0.99 | 1.00 | | 0.99 | 1.00 |
| Satd. Flow (prot) | | 2928 | | | 3069 | | | 1581 | 1215 | | 1498 | 1286 |
| Flt Permitted | | 0.79 | | | 0.79 | | | 0.85 | 1.00 | | 0.87 | 1.00 |
| Satd. Flow (perm) | | 2319 | | | 2434 | | | 1352 | 1215 | | 1320 | 1286 |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 51 | 332 | 29 | 156 | 779 | 31 | 24 | 111 | 140 | 81 | 226 | 437 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 412 | 0 | 0 | 966 | 0 | 0 | 135 | 140 | 0 | 307 | 437 |
| Confl. Peds. (#/hr) | 60 | | 71 | 71 | | 60 | 20 | | 50 | 50 | | 20 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Heavy Vehicles (%) | 25% | 8% | 9% | 1% | 4% | 4% | 0% | 1% | 3% | 26% | 2% | 7% |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | Perm | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | 4 |
| Actuated Green, G (s) | | 48.5 | | | 35.8 | | | 19.5 | 19.5 | | 19.5 | 28.2 |
| Effective Green, g (s) | | 49.5 | | | 36.8 | | | 20.5 | 19.5 | | 20.5 | 30.2 |
| Actuated g/C Ratio | | 0.62 | | | 0.46 | | | 0.26 | 0.24 | | 0.26 | 0.38 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | 6.0 | | 6.0 | 4.0 |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | | 1508 | | | 1119 | | | 346 | 296 | | 338 | 485 |
| v/s Ratio Prot | | 0.03 | | | | | | | | | | c0.11 |
| v/s Ratio Perm | | 0.14 | | | c0.40 | | | 0.10 | 0.12 | | c0.23 | 0.23 |
| v/c Ratio | | 0.27 | | | 0.86 | | | 0.39 | 0.47 | | 0.91 | 0.90 |
| Uniform Delay, d1 | | 7.0 | | | 19.3 | | | 24.6 | 25.9 | | 28.8 | 23.5 |
| Progression Factor | | 1.00 | | | 0.69 | | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 0.1 | | | 7.1 | | | 0.7 | 1.2 | | 26.8 | 19.7 |
| Delay (s) | | 7.1 | | | 20.5 | | | 25.3 | 27.1 | | 55.7 | 43.2 |
| Level of Service | | A | | | C | | | C | C | | E | D |
| Approach Delay (s) | | 7.1 | | | 20.5 | | | 26.2 | | | 48.3 | |
| Approach LOS | | A | | | C | | | C | | | D | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 27.5 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.90 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 81.3% | ICU Level of Service | D |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

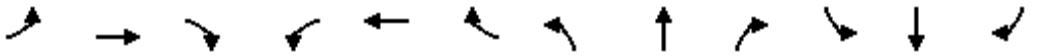


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 15 | 388 | 47 | 158 | 690 | 159 | 18 | 220 | 144 | 64 | 248 | 34 |
| Future Volume (vph) | 15 | 388 | 47 | 158 | 690 | 159 | 18 | 220 | 144 | 64 | 248 | 34 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 50 | | 260 | 75 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1349 | | | 803 | | | 419 | | | 464 | |
| Travel Time (s) | | 26.3 | | | 15.6 | | | 11.4 | | | 12.7 | |
| Confl. Peds. (#/hr) | 75 | | 35 | 35 | | 75 | 83 | | 161 | 161 | | 83 |
| Confl. Bikes (#/hr) | | | 1 | | | 7 | | | 4 | | | 3 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 500 | 0 | 0 | 1120 | 0 | 20 | 244 | 160 | 71 | 314 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 10 | | | 10 | |
| Link Offset(ft) | | 0 | | | 0 | | | 5 | | | 0 | |
| Crosswalk Width(ft) | | 16 | | | 16 | | | 16 | | | 16 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.13 | 1.13 | 1.13 | 1.11 | 1.11 | 1.11 | 1.16 | 1.16 | 1.16 | 1.20 | 1.20 | 1.20 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Detector Phase | 2 | 2 | | 1 | 6 | | 8 | 8 | 8 | 4 | 4 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 15.0 | 15.0 | | 5.0 | 15.0 | | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Minimum Split (s) | 25.0 | 25.0 | | 10.0 | 25.0 | | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | |
| Total Split (s) | 44.0 | 44.0 | | 10.0 | 54.0 | | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | |
| Total Split (%) | 55.0% | 55.0% | | 12.5% | 67.5% | | 32.5% | 32.5% | 32.5% | 32.5% | 32.5% | |
| Yellow Time (s) | 4.0 | 4.0 | | 3.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 1.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | 0.0 | -1.0 | -1.0 | -1.0 | -1.0 | |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | 6.0 | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lead/Lag | Lag | Lag | | Lead | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Recall Mode | C-Min | C-Min | | None | C-Min | | None | None | None | None | None | |
| v/c Ratio | | 0.28 | | | 0.75 | | 0.17 | 0.60 | 0.58 | 0.44 | 0.82 | |
| Control Delay | | 5.3 | | | 14.1 | | 27.6 | 33.3 | 35.7 | 34.4 | 46.4 | |
| Queue Delay | | 0.0 | | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 5.3 | | | 14.1 | | 27.6 | 33.3 | 35.7 | 34.4 | 46.4 | |
| Queue Length 50th (ft) | | 28 | | | 185 | | 8 | 105 | 69 | 29 | 144 | |
| Queue Length 95th (ft) | | m39 | | | 271 | | 26 | 178 | 131 | 70 | #266 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 1269 | | | 723 | | | 339 | | | 384 | |
| Turn Bay Length (ft) | | | | | | | 50 | | 260 | 75 | | |
| Base Capacity (vph) | | 1768 | | | 1504 | | 129 | 436 | 294 | 174 | 414 | |
| Starvation Cap Reductn | | 0 | | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | | 0 | | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | | 0 | | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | | 0.28 | | | 0.74 | | 0.16 | 0.56 | 0.54 | 0.41 | 0.76 | |

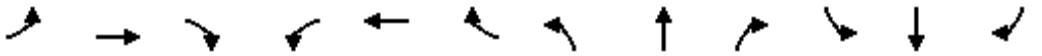
| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 8 (10%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 60 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 7: Morewood Avenue & Fifth Avenue



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 15 | 388 | 47 | 158 | 690 | 159 | 18 | 220 | 144 | 64 | 248 | 34 |
| Future Volume (vph) | 15 | 388 | 47 | 158 | 690 | 159 | 18 | 220 | 144 | 64 | 248 | 34 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | 6.0 | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frpb, ped/bikes | | 0.99 | | | 0.97 | | 1.00 | 1.00 | 0.79 | 1.00 | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 0.99 | | 0.95 | 1.00 | 1.00 | 0.87 | 1.00 | |
| Frt | | 0.98 | | | 0.98 | | 1.00 | 1.00 | 0.85 | 1.00 | 0.98 | |
| Flt Protected | | 1.00 | | | 0.99 | | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 3085 | | | 3069 | | 1495 | 1664 | 1123 | 1351 | 1580 | |
| Flt Permitted | | 0.90 | | | 0.76 | | 0.33 | 1.00 | 1.00 | 0.47 | 1.00 | |
| Satd. Flow (perm) | | 2794 | | | 2352 | | 519 | 1664 | 1123 | 665 | 1580 | |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 17 | 431 | 52 | 176 | 767 | 177 | 20 | 244 | 160 | 71 | 276 | 38 |
| RTOR Reduction (vph) | 0 | 8 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 492 | 0 | 0 | 1102 | 0 | 20 | 244 | 160 | 71 | 314 | 0 |
| Confl. Peds. (#/hr) | 75 | | 35 | 35 | | 75 | 83 | | 161 | 161 | | 83 |
| Confl. Bikes (#/hr) | | | 1 | | | 7 | | | 4 | | | 3 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Actuated Green, G (s) | | 49.5 | | | 49.5 | | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | |
| Effective Green, g (s) | | 50.5 | | | 50.5 | | 18.5 | 19.5 | 19.5 | 19.5 | 19.5 | |
| Actuated g/C Ratio | | 0.63 | | | 0.63 | | 0.23 | 0.24 | 0.24 | 0.24 | 0.24 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 1763 | | | 1484 | | 120 | 405 | 273 | 162 | 385 | |
| v/s Ratio Prot | | | | | | | | 0.15 | | | c0.20 | |
| v/s Ratio Perm | | 0.18 | | | c0.47 | | 0.04 | | 0.14 | 0.11 | | |
| v/c Ratio | | 0.28 | | | 0.74 | | 0.17 | 0.60 | 0.59 | 0.44 | 0.82 | |
| Uniform Delay, d1 | | 6.6 | | | 10.2 | | 24.6 | 26.8 | 26.7 | 25.6 | 28.6 | |
| Progression Factor | | 0.74 | | | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 0.4 | | | 2.0 | | 0.7 | 2.5 | 3.2 | 1.9 | 12.5 | |
| Delay (s) | | 5.3 | | | 12.3 | | 25.2 | 29.3 | 29.9 | 27.5 | 41.1 | |
| Level of Service | | A | | | B | | C | C | C | C | D | |
| Approach Delay (s) | | 5.3 | | | 12.3 | | | 29.4 | | | 38.6 | |
| Approach LOS | | A | | | B | | | C | | | D | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 18.0 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.81 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 86.9% | ICU Level of Service | E |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

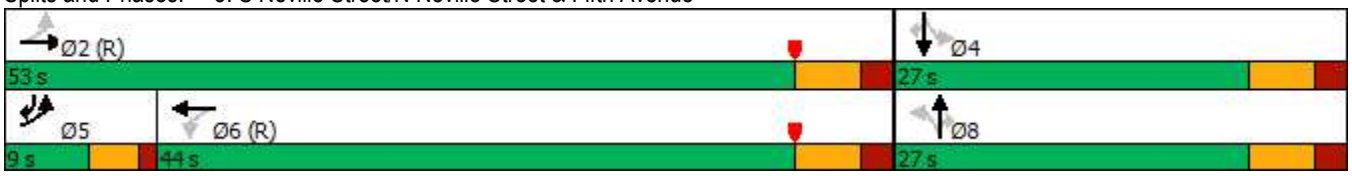


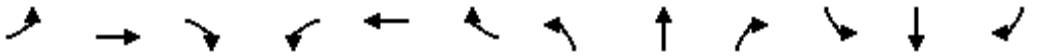
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 147 | 946 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 82 | 170 | 153 |
| Future Volume (vph) | 147 | 946 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 82 | 170 | 153 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 120 | | 0 | 0 | | 110 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 0 | | 1 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | No | | | No | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 646 | | | 1349 | | | 479 | | | 639 | |
| Travel Time (s) | | 12.6 | | | 26.3 | | | 13.1 | | | 17.4 | |
| Confl. Peds. (#/hr) | 85 | | 120 | 120 | | 85 | 36 | | 66 | 66 | | 36 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 1.00 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 12% | 2% | 0% | 0% | 2% | 21% | 0% | 0% | 0% | 3% | 0% | 7% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 1236 | 0 | 0 | 696 | 0 | 0 | 221 | 252 | 0 | 280 | 170 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Link Offset(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Crosswalk Width(ft) | | 10 | | | 10 | | | 10 | | | 10 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.11 | 1.11 | 1.11 | 1.13 | 1.13 | 1.13 | 1.23 | 1.23 | 1.23 | 1.18 | 1.18 | 1.18 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | Perm | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | 4 |
| Detector Phase | 5 | 2 | | 6 | 6 | | 8 | 8 | 8 | 4 | 4 | 5 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 10.0 | | 10.0 | 10.0 | | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 4.0 |
| Minimum Split (s) | 9.0 | 27.0 | | 27.0 | 27.0 | | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 9.0 |
| Total Split (s) | 9.0 | 53.0 | | 44.0 | 44.0 | | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 9.0 |
| Total Split (%) | 11.3% | 66.3% | | 55.0% | 55.0% | | 33.8% | 33.8% | 33.8% | 33.8% | 33.8% | 11.3% |
| Yellow Time (s) | 3.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 3.0 |
| All-Red Time (s) | 1.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 1.0 |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | | -1.0 | 0.0 | | -1.0 | -1.0 |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | | 5.0 | 6.0 | | 5.0 | 3.0 |
| Lead/Lag | Lead | | | Lag | Lag | | | | | | | Lead |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | | | | | | | Yes |
| Recall Mode | None | C-Min | | C-Min | C-Min | | None | None | None | None | None | None |
| v/c Ratio | | 0.92 | | | 0.65 | | | 0.52 | 0.80 | | 0.93 | 0.37 |
| Control Delay | | 26.6 | | | 8.7 | | | 30.0 | 48.9 | | 67.4 | 19.0 |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | 0.0 | | 0.0 | 0.0 |
| Total Delay | | 26.6 | | | 8.7 | | | 30.0 | 48.9 | | 67.4 | 19.0 |
| Queue Length 50th (ft) | | 192 | | | 82 | | | 93 | 117 | | 134 | 55 |
| Queue Length 95th (ft) | | #318 | | | m94 | | | 160 | #234 | | #277 | 103 |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 566 | | | 1269 | | | 399 | | | 559 | |
| Turn Bay Length (ft) | | | | | | | | | | | | 110 |
| Base Capacity (vph) | | 1344 | | | 1064 | | | 436 | 325 | | 312 | 462 |
| 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 | | 0.92 | | | 0.65 | | | 0.51 | 0.78 | | 0.90 | 0.37 |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 41 (51%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 75 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

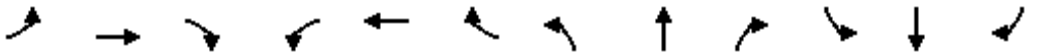
Splits and Phases: 3: S Neville Street/N Neville Street & Fifth Avenue





| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 147 | 946 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 82 | 170 | 153 |
| Future Volume (vph) | 147 | 946 | 20 | 75 | 530 | 22 | 7 | 192 | 252 | 82 | 170 | 153 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | -1% | | | 2% | | | 8% | | | 1% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | | 5.0 | 6.0 | | 5.0 | 3.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | | 1.00 | | | 0.99 | | | 1.00 | 0.90 | | 1.00 | 0.95 |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | 1.00 | | 0.98 | 1.00 |
| Frt | | 1.00 | | | 0.99 | | | 1.00 | 0.85 | | 1.00 | 0.85 |
| Flt Protected | | 0.99 | | | 0.99 | | | 1.00 | 1.00 | | 0.98 | 1.00 |
| Satd. Flow (prot) | | 3160 | | | 3127 | | | 1608 | 1240 | | 1599 | 1263 |
| Flt Permitted | | 0.67 | | | 0.68 | | | 0.98 | 1.00 | | 0.70 | 1.00 |
| Satd. Flow (perm) | | 2129 | | | 2146 | | | 1586 | 1240 | | 1138 | 1263 |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 1.00 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 163 | 1051 | 22 | 83 | 589 | 24 | 8 | 213 | 252 | 91 | 189 | 170 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 1236 | 0 | 0 | 696 | 0 | 0 | 221 | 252 | 0 | 280 | 170 |
| Confl. Peds. (#/hr) | 85 | | 120 | 120 | | 85 | 36 | | 66 | 66 | | 36 |
| Confl. Bikes (#/hr) | | | 2 | | | 5 | | | 2 | | | 10 |
| Heavy Vehicles (%) | 12% | 2% | 0% | 0% | 2% | 21% | 0% | 0% | 0% | 3% | 0% | 7% |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | Perm | Perm | NA | pm+ov |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | 4 | 5 |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | 4 |
| Actuated Green, G (s) | | 47.7 | | | 38.7 | | | 20.3 | 20.3 | | 20.3 | 25.3 |
| Effective Green, g (s) | | 48.7 | | | 39.7 | | | 21.3 | 20.3 | | 21.3 | 27.3 |
| Actuated g/C Ratio | | 0.61 | | | 0.50 | | | 0.27 | 0.25 | | 0.27 | 0.34 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | 6.0 | | 6.0 | 4.0 |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | | 3.0 | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | | 1373 | | | 1064 | | | 422 | 314 | | 302 | 430 |
| v/s Ratio Prot | | c0.07 | | | | | | | | | | 0.03 |
| v/s Ratio Perm | | c0.48 | | | 0.32 | | | 0.14 | 0.20 | | c0.25 | 0.11 |
| v/c Ratio | | 0.90 | | | 0.65 | | | 0.52 | 0.80 | | 0.93 | 0.40 |
| Uniform Delay, d1 | | 13.5 | | | 15.0 | | | 25.0 | 28.0 | | 28.6 | 20.1 |
| Progression Factor | | 1.00 | | | 0.45 | | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 8.4 | | | 1.5 | | | 1.2 | 13.7 | | 33.0 | 0.6 |
| Delay (s) | | 21.9 | | | 8.4 | | | 26.2 | 41.7 | | 61.6 | 20.7 |
| Level of Service | | C | | | A | | | C | D | | E | C |
| Approach Delay (s) | | 21.9 | | | 8.4 | | | 34.5 | | | 46.1 | |
| Approach LOS | | C | | | A | | | C | | | D | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 24.5 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.96 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 98.9% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

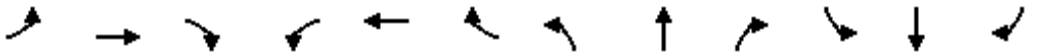


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 45 | 1023 | 82 | 86 | 786 | 117 | 34 | 241 | 267 | 81 | 281 | 42 |
| Future Volume (vph) | 45 | 1023 | 82 | 86 | 786 | 117 | 34 | 241 | 267 | 81 | 281 | 42 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 50 | | 260 | 75 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Right Turn on Red | | | Yes | | | Yes | | | No | | | No |
| Link Speed (mph) | | 35 | | | 35 | | | 25 | | | 25 | |
| Link Distance (ft) | | 1349 | | | 803 | | | 419 | | | 464 | |
| Travel Time (s) | | 26.3 | | | 15.6 | | | 11.4 | | | 12.7 | |
| Confl. Peds. (#/hr) | 34 | | 72 | 72 | | 34 | 59 | | 115 | 115 | | 59 |
| Confl. Bikes (#/hr) | | | | | | 6 | | | 17 | | | 10 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 1278 | 0 | 0 | 1099 | 0 | 38 | 268 | 297 | 90 | 359 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(ft) | | 0 | | | 0 | | | 10 | | | 10 | |
| Link Offset(ft) | | 0 | | | 0 | | | 0 | | | 0 | |
| Crosswalk Width(ft) | | 16 | | | 16 | | | 16 | | | 16 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.13 | 1.13 | 1.13 | 1.11 | 1.11 | 1.11 | 1.16 | 1.16 | 1.16 | 1.20 | 1.20 | 1.20 |
| Turning Speed (mph) | 15 | | 9 | 15 | | 9 | 15 | | 9 | 15 | | 9 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Detector Phase | 2 | 2 | | 1 | 6 | | 8 | 8 | 8 | 4 | 4 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 15.0 | 15.0 | | 5.0 | 15.0 | | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Minimum Split (s) | 26.0 | 26.0 | | 10.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (s) | 41.0 | 41.0 | | 10.0 | 51.0 | | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | |
| Total Split (%) | 51.3% | 51.3% | | 12.5% | 63.8% | | 36.3% | 36.3% | 36.3% | 36.3% | 36.3% | |
| Yellow Time (s) | 4.0 | 4.0 | | 3.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 1.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | -1.0 | | | -1.0 | | 0.0 | -1.0 | -1.0 | -1.0 | -1.0 | |
| Total Lost Time (s) | | 5.0 | | | 5.0 | | 6.0 | 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 | None | None | None | |
| v/c Ratio | | 0.81 | | | 0.89 | | 0.28 | 0.57 | 0.88 | 0.46 | 0.80 | |
| Control Delay | | 17.1 | | | 25.8 | | 28.4 | 29.4 | 54.4 | 31.7 | 41.2 | |
| Queue Delay | | 0.0 | | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 17.1 | | | 25.8 | | 28.4 | 29.4 | 54.4 | 31.7 | 41.2 | |
| Queue Length 50th (ft) | | 282 | | | 232 | | 15 | 111 | 137 | 36 | 161 | |
| Queue Length 95th (ft) | | m321 | | | #397 | | 41 | 185 | #274 | 82 | #289 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal Link Dist (ft) | | 1269 | | | 723 | | | 339 | | | 384 | |
| Turn Bay Length (ft) | | | | | | | 50 | | 260 | 75 | | |
| Base Capacity (vph) | | 1576 | | | 1232 | | 145 | 499 | 358 | 207 | 474 | |
| Starvation Cap Reductn | | 0 | | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | | 0 | | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | | 0 | | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | | 0.81 | | | 0.89 | | 0.26 | 0.54 | 0.83 | 0.43 | 0.76 | |

| Intersection Summary | |
|---|---|
| Area Type: | Other |
| Cycle Length: 80 | |
| Actuated Cycle Length: 80 | |
| Offset: 12 (15%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow | |
| Natural Cycle: 90 | |
| Control Type: Actuated-Coordinated | |
| # 95th percentile volume exceeds capacity, queue may be longer. | |
| Queue shown is maximum after two cycles. | |
| m Volume for 95th percentile queue is metered by upstream signal. | |

Splits and Phases: 7: Morewood Avenue & Fifth Avenue



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 45 | 1023 | 82 | 86 | 786 | 117 | 34 | 241 | 267 | 81 | 281 | 42 |
| Future Volume (vph) | 45 | 1023 | 82 | 86 | 786 | 117 | 34 | 241 | 267 | 81 | 281 | 42 |
| Ideal Flow (vphpl) | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Lane Width | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Grade (%) | | 2% | | | -2% | | | -2% | | | 4% | |
| Total Lost time (s) | | 5.0 | | | 5.0 | | 6.0 | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frpb, ped/bikes | | 0.99 | | | 0.99 | | 1.00 | 1.00 | 0.84 | 1.00 | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | 0.97 | 1.00 | 1.00 | 0.91 | 1.00 | |
| Frt | | 0.99 | | | 0.98 | | 1.00 | 1.00 | 0.85 | 1.00 | 0.98 | |
| Flt Protected | | 1.00 | | | 1.00 | | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 3104 | | | 3165 | | 1526 | 1664 | 1193 | 1414 | 1581 | |
| Flt Permitted | | 0.86 | | | 0.65 | | 0.31 | 1.00 | 1.00 | 0.46 | 1.00 | |
| Satd. Flow (perm) | | 2661 | | | 2065 | | 506 | 1664 | 1193 | 690 | 1581 | |
| Peak-hour factor, PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Adj. Flow (vph) | 50 | 1137 | 91 | 96 | 873 | 130 | 38 | 268 | 297 | 90 | 312 | 47 |
| RTOR Reduction (vph) | 0 | 5 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 1273 | 0 | 0 | 1086 | 0 | 38 | 268 | 297 | 90 | 359 | 0 |
| Confl. Peds. (#/hr) | 34 | | 72 | 72 | | 34 | 59 | | 115 | 115 | | 59 |
| Confl. Bikes (#/hr) | | | | | | 6 | | | 17 | | | 10 |
| Heavy Vehicles (%) | 3% | 2% | 13% | 2% | 2% | 1% | 2% | 2% | 1% | 1% | 1% | 0% |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | 8 | 4 | | |
| Actuated Green, G (s) | | 46.2 | | | 46.2 | | 21.8 | 21.8 | 21.8 | 21.8 | 21.8 | |
| Effective Green, g (s) | | 47.2 | | | 47.2 | | 21.8 | 22.8 | 22.8 | 22.8 | 22.8 | |
| Actuated g/C Ratio | | 0.59 | | | 0.59 | | 0.27 | 0.29 | 0.29 | 0.29 | 0.29 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 1569 | | | 1218 | | 137 | 474 | 340 | 196 | 450 | |
| v/s Ratio Prot | | | | | | | | 0.16 | | | 0.23 | |
| v/s Ratio Perm | | 0.48 | | | c0.53 | | 0.08 | | c0.25 | 0.13 | | |
| v/c Ratio | | 0.81 | | | 0.89 | | 0.28 | 0.57 | 0.87 | 0.46 | 0.80 | |
| Uniform Delay, d1 | | 12.9 | | | 14.2 | | 22.9 | 24.4 | 27.2 | 23.5 | 26.5 | |
| Progression Factor | | 1.08 | | | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 2.1 | | | 8.5 | | 1.1 | 1.5 | 21.1 | 1.7 | 9.5 | |
| Delay (s) | | 16.0 | | | 22.7 | | 24.0 | 25.9 | 48.3 | 25.2 | 36.0 | |
| Level of Service | | B | | | C | | C | C | D | C | D | |
| Approach Delay (s) | | 16.0 | | | 22.7 | | | 36.8 | | | 33.8 | |
| Approach LOS | | B | | | C | | | D | | | C | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 24.1 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.94 | | |
| Actuated Cycle Length (s) | 80.0 | Sum of lost time (s) | 14.0 |
| Intersection Capacity Utilization | 106.4% | ICU Level of Service | G |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

# APPENDIX N
## SimTraffic 95th Percentile Queue Length Summaries



gai consultants
transforming ideas into reality®

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Start Time | 7:20 | 7:20 | 7:20 | 7:20 | 7:20 | 7:20 |
| End Time | 8:30 | 8:30 | 8:30 | 8:30 | 8:30 | 8:30 |
| Total Time (min) | 70 | 70 | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 2937 | 2953 | 2889 | 2917 | 2961 | 2931 |
| Vehs Exited | 2949 | 2958 | 2863 | 2924 | 2944 | 2926 |
| Starting Vehs | 70 | 62 | 60 | 81 | 42 | 65 |
| Ending Vehs | 58 | 57 | 86 | 74 | 59 | 66 |
| Travel Distance (mi) | 973 | 962 | 956 | 968 | 965 | 965 |
| Travel Time (hr) | 63.0 | 72.0 | 68.6 | 62.7 | 71.7 | 67.6 |
| Total Delay (hr) | 30.2 | 39.4 | 36.5 | 30.2 | 39.2 | 35.1 |
| Total Stops | 2735 | 3048 | 2651 | 2719 | 2927 | 2818 |
| Fuel Used (gal) | 43.3 | 45.5 | 43.9 | 43.3 | 45.2 | 44.2 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 7:20 |
| End Time | 7:30 |
| Total Time (min) | 10 |

Volumes adjusted by Growth Factors.

No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 7:30 |
| End Time | 8:30 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Vehs Entered | 2937 | 2953 | 2889 | 2917 | 2961 | 2931 |
| Vehs Exited | 2949 | 2958 | 2863 | 2924 | 2944 | 2926 |
| Starting Vehs | 70 | 62 | 60 | 81 | 42 | 65 |
| Ending Vehs | 58 | 57 | 86 | 74 | 59 | 66 |
| Travel Distance (mi) | 973 | 962 | 956 | 968 | 965 | 965 |
| Travel Time (hr) | 63.0 | 72.0 | 68.6 | 62.7 | 71.7 | 67.6 |
| Total Delay (hr) | 30.2 | 39.4 | 36.5 | 30.2 | 39.2 | 35.1 |
| Total Stops | 2735 | 3048 | 2651 | 2719 | 2927 | 2818 |
| Fuel Used (gal) | 43.3 | 45.5 | 43.9 | 43.3 | 45.2 | 44.2 |

## Intersection: 3: S Neville Street/N Neville Street & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LTR | LT | R |
| Maximum Queue (ft) | 154 | 136 | 162 | 152 | 199 | 652 | 160 |
| Average Queue (ft) | 71 | 31 | 92 | 69 | 102 | 459 | 156 |
| 95th Queue (ft) | 129 | 82 | 150 | 128 | 166 | 752 | 176 |
| Link Distance (ft) | 618 | 618 | 1288 | 1288 | 440 | 602 | |
| Upstream Blk Time (%) | | | | | | 23 | |
| Queuing Penalty (veh) | | | | | | 0 | |
| Storage Bay Dist (ft) | | | | | | | 110 |
| Storage Blk Time (%) | | | | | | 44 | 31 |
| Queuing Penalty (veh) | | | | | | 168 | 84 |

## Intersection: 7: Morewood Avenue & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LT | R | L | TR |
| Maximum Queue (ft) | 105 | 118 | 289 | 255 | 227 | 170 | 100 | 318 |
| Average Queue (ft) | 56 | 52 | 161 | 118 | 112 | 78 | 50 | 153 |
| 95th Queue (ft) | 96 | 98 | 250 | 213 | 195 | 140 | 103 | 274 |
| Link Distance (ft) | 1288 | 1288 | 762 | 762 | | 379 | | 426 |
| Upstream Blk Time (%) | | | | | | | | 0 |
| Queuing Penalty (veh) | | | | | | | | 0 |
| Storage Bay Dist (ft) | | | | | 260 | | 75 | |
| Storage Blk Time (%) | | | | | 0 | | 4 | 34 |
| Queuing Penalty (veh) | | | | | 0 | | 12 | 21 |

## Network Summary

Network wide Queuing Penalty: 286

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Start Time | 4:35 | 4:35 | 4:35 | 4:35 | 4:35 | 4:35 |
| End Time | 5:45 | 5:45 | 5:45 | 5:45 | 5:45 | 5:45 |
| Total Time (min) | 70 | 70 | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 3686 | 3691 | 3534 | 3590 | 3652 | 3633 |
| Vehs Exited | 3679 | 3660 | 3527 | 3598 | 3641 | 3622 |
| Starting Vehs | 103 | 102 | 100 | 112 | 100 | 103 |
| Ending Vehs | 110 | 133 | 107 | 104 | 111 | 114 |
| Travel Distance (mi) | 1303 | 1292 | 1251 | 1266 | 1270 | 1276 |
| Travel Time (hr) | 174.3 | 144.7 | 158.1 | 178.2 | 102.9 | 151.7 |
| Total Delay (hr) | 131.8 | 102.4 | 117.5 | 137.0 | 61.4 | 110.0 |
| Total Stops | 3904 | 3757 | 3431 | 3456 | 3671 | 3644 |
| Fuel Used (gal) | 79.8 | 72.9 | 74.0 | 79.0 | 61.8 | 73.5 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 4:35 |
| End Time | 4:45 |
| Total Time (min) | 10 |

Volumes adjusted by Growth Factors.

No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 4:45 |
| End Time | 5:45 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Vehs Entered | 3686 | 3691 | 3534 | 3590 | 3652 | 3633 |
| Vehs Exited | 3679 | 3660 | 3527 | 3598 | 3641 | 3622 |
| Starting Vehs | 103 | 102 | 100 | 112 | 100 | 103 |
| Ending Vehs | 110 | 133 | 107 | 104 | 111 | 114 |
| Travel Distance (mi) | 1303 | 1292 | 1251 | 1266 | 1270 | 1276 |
| Travel Time (hr) | 174.3 | 144.7 | 158.1 | 178.2 | 102.9 | 151.7 |
| Total Delay (hr) | 131.8 | 102.4 | 117.5 | 137.0 | 61.4 | 110.0 |
| Total Stops | 3904 | 3757 | 3431 | 3456 | 3671 | 3644 |
| Fuel Used (gal) | 79.8 | 72.9 | 74.0 | 79.0 | 61.8 | 73.5 |

## Intersection: 3: S Neville Street/N Neville Street & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LTR | LT | R |
| Maximum Queue (ft) | 377 | 336 | 123 | 126 | 455 | 311 | 158 |
| Average Queue (ft) | 204 | 151 | 64 | 56 | 428 | 128 | 77 |
| 95th Queue (ft) | 316 | 271 | 115 | 112 | 549 | 254 | 168 |
| Link Distance (ft) | 618 | 618 | 1288 | 1288 | 440 | 602 | |
| Upstream Blk Time (%) | | | | | 73 | | |
| Queuing Penalty (veh) | | | | | 0 | | |
| Storage Bay Dist (ft) | | | | | | | 110 |
| Storage Blk Time (%) | | | | | | 16 | 3 |
| Queuing Penalty (veh) | | | | | | 27 | 6 |

## Intersection: 7: Morewood Avenue & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LT | R | L | TR |
| Maximum Queue (ft) | 305 | 338 | 346 | 312 | 285 | 421 | 100 | 354 |
| Average Queue (ft) | 182 | 197 | 198 | 156 | 269 | 374 | 65 | 190 |
| 95th Queue (ft) | 277 | 305 | 310 | 272 | 348 | 483 | 120 | 309 |
| Link Distance (ft) | 1288 | 1288 | 762 | 762 | | 379 | | 426 |
| Upstream Blk Time (%) | | | | | | 64 | | 0 |
| Queuing Penalty (veh) | | | | | | 0 | | 0 |
| Storage Bay Dist (ft) | | | | | 260 | | 75 | |
| Storage Blk Time (%) | | | | | 10 | 63 | 8 | 46 |
| Queuing Penalty (veh) | | | | | 30 | 186 | 25 | 36 |

## Network Summary

Network wide Queuing Penalty: 309

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Start Time | 7:20 | 7:20 | 7:20 | 7:20 | 7:20 | 7:20 |
| End Time | 8:30 | 8:30 | 8:30 | 8:30 | 8:30 | 8:30 |
| Total Time (min) | 70 | 70 | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 3022 | 3075 | 3082 | 3004 | 2983 | 3031 |
| Vehs Exited | 3018 | 3074 | 3070 | 3014 | 2983 | 3033 |
| Starting Vehs | 68 | 64 | 55 | 59 | 56 | 61 |
| Ending Vehs | 72 | 65 | 67 | 49 | 56 | 61 |
| Travel Distance (mi) | 989 | 1025 | 1017 | 984 | 975 | 998 |
| Travel Time (hr) | 64.6 | 62.6 | 65.6 | 63.1 | 62.5 | 63.7 |
| Total Delay (hr) | 31.2 | 28.4 | 31.4 | 29.9 | 29.5 | 30.1 |
| Total Stops | 2876 | 2774 | 2821 | 2764 | 2659 | 2779 |
| Fuel Used (gal) | 44.6 | 45.6 | 45.6 | 44.4 | 43.5 | 44.7 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 7:20 |
| End Time | 7:30 |
| Total Time (min) | 10 |

Volumes adjusted by Growth Factors.

No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 7:30 |
| End Time | 8:30 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Vehs Entered | 3022 | 3075 | 3082 | 3004 | 2983 | 3031 |
| Vehs Exited | 3018 | 3074 | 3070 | 3014 | 2983 | 3033 |
| Starting Vehs | 68 | 64 | 55 | 59 | 56 | 61 |
| Ending Vehs | 72 | 65 | 67 | 49 | 56 | 61 |
| Travel Distance (mi) | 989 | 1025 | 1017 | 984 | 975 | 998 |
| Travel Time (hr) | 64.6 | 62.6 | 65.6 | 63.1 | 62.5 | 63.7 |
| Total Delay (hr) | 31.2 | 28.4 | 31.4 | 29.9 | 29.5 | 30.1 |
| Total Stops | 2876 | 2774 | 2821 | 2764 | 2659 | 2779 |
| Fuel Used (gal) | 44.6 | 45.6 | 45.6 | 44.4 | 43.5 | 44.7 |

## Intersection: 3: S Neville Street/N Neville Street & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LTR | LT | R |
| Maximum Queue (ft) | 162 | 135 | 196 | 181 | 181 | 620 | 160 |
| Average Queue (ft) | 87 | 39 | 96 | 80 | 89 | 325 | 150 |
| 95th Queue (ft) | 151 | 99 | 165 | 151 | 155 | 615 | 189 |
| Link Distance (ft) | 618 | 618 | 1288 | 1288 | 440 | 602 | |
| Upstream Blk Time (%) | | | | | | 5 | |
| Queuing Penalty (veh) | | | | | | 0 | |
| Storage Bay Dist (ft) | | | | | | | 110 |
| Storage Blk Time (%) | | | | | | 29 | 21 |
| Queuing Penalty (veh) | | | | | | 114 | 58 |

## Intersection: 7: Morewood Avenue & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LT | R | L | TR |
| Maximum Queue (ft) | 123 | 140 | 275 | 217 | 246 | 230 | 100 | 364 |
| Average Queue (ft) | 54 | 52 | 171 | 122 | 122 | 82 | 59 | 182 |
| 95th Queue (ft) | 102 | 111 | 261 | 217 | 203 | 155 | 116 | 324 |
| Link Distance (ft) | 1288 | 1288 | 762 | 762 | | 379 | | 426 |
| Upstream Blk Time (%) | | | | | | | | 0 |
| Queuing Penalty (veh) | | | | | | | | 0 |
| Storage Bay Dist (ft) | | | | | 260 | | 75 | |
| Storage Blk Time (%) | | | | | 1 | | 5 | 43 |
| Queuing Penalty (veh) | | | | | 2 | | 13 | 28 |

## Network Summary

Network wide Queuing Penalty: 215

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Start Time | 4:35 | 4:35 | 4:35 | 4:35 | 4:35 | 4:35 |
| End Time | 5:45 | 5:45 | 5:45 | 5:45 | 5:45 | 5:45 |
| Total Time (min) | 70 | 70 | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 3618 | 3624 | 3690 | 3582 | 3589 | 3620 |
| Vehs Exited | 3566 | 3594 | 3663 | 3555 | 3554 | 3588 |
| Starting Vehs | 70 | 63 | 94 | 97 | 76 | 78 |
| Ending Vehs | 122 | 93 | 121 | 124 | 111 | 114 |
| Travel Distance (mi) | 1265 | 1269 | 1296 | 1248 | 1259 | 1267 |
| Travel Time (hr) | 126.7 | 112.5 | 119.7 | 109.8 | 106.0 | 114.9 |
| Total Delay (hr) | 85.6 | 71.0 | 77.5 | 68.9 | 64.7 | 73.5 |
| Total Stops | 3453 | 3634 | 3916 | 3592 | 3576 | 3636 |
| Fuel Used (gal) | 67.9 | 64.7 | 67.3 | 63.3 | 62.4 | 65.1 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 4:35 |
| End Time | 4:45 |
| Total Time (min) | 10 |

Volumes adjusted by Growth Factors.

No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 4:45 |
| End Time | 5:45 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Vehs Entered | 3618 | 3624 | 3690 | 3582 | 3589 | 3620 |
| Vehs Exited | 3566 | 3594 | 3663 | 3555 | 3554 | 3588 |
| Starting Vehs | 70 | 63 | 94 | 97 | 76 | 78 |
| Ending Vehs | 122 | 93 | 121 | 124 | 111 | 114 |
| Travel Distance (mi) | 1265 | 1269 | 1296 | 1248 | 1259 | 1267 |
| Travel Time (hr) | 126.7 | 112.5 | 119.7 | 109.8 | 106.0 | 114.9 |
| Total Delay (hr) | 85.6 | 71.0 | 77.5 | 68.9 | 64.7 | 73.5 |
| Total Stops | 3453 | 3634 | 3916 | 3592 | 3576 | 3636 |
| Fuel Used (gal) | 67.9 | 64.7 | 67.3 | 63.3 | 62.4 | 65.1 |

## Intersection: 3: S Neville Street/N Neville Street & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LTR | LT | R |
| Maximum Queue (ft) | 387 | 340 | 107 | 106 | 455 | 332 | 160 |
| Average Queue (ft) | 216 | 159 | 51 | 35 | 402 | 125 | 87 |
| 95th Queue (ft) | 325 | 280 | 95 | 85 | 560 | 259 | 168 |
| Link Distance (ft) | 618 | 618 | 1288 | 1288 | 440 | 602 | |
| Upstream Blk Time (%) | | | | | 59 | | |
| Queuing Penalty (veh) | | | | | 0 | | |
| Storage Bay Dist (ft) | | | | | | | 110 |
| Storage Blk Time (%) | | | | | | 14 | 3 |
| Queuing Penalty (veh) | | | | | | 24 | 6 |

## Intersection: 7: Morewood Avenue & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LT | R | L | TR |
| Maximum Queue (ft) | 290 | 304 | 334 | 287 | 285 | 412 | 100 | 370 |
| Average Queue (ft) | 166 | 181 | 209 | 168 | 243 | 329 | 58 | 165 |
| 95th Queue (ft) | 252 | 268 | 299 | 268 | 355 | 506 | 111 | 297 |
| Link Distance (ft) | 1288 | 1288 | 762 | 762 | | 379 | | 426 |
| Upstream Blk Time (%) | | | | | | 43 | | 1 |
| Queuing Penalty (veh) | | | | | | 0 | | 0 |
| Storage Bay Dist (ft) | | | | | 260 | | 75 | |
| Storage Blk Time (%) | | | | | 7 | 47 | 5 | 39 |
| Queuing Penalty (veh) | | | | | 20 | 137 | 14 | 31 |

## Network Summary

Network wide Queuing Penalty: 233

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Start Time | 7:20 | 7:20 | 7:20 | 7:20 | 7:20 | 7:20 |
| End Time | 8:30 | 8:30 | 8:30 | 8:30 | 8:30 | 8:30 |
| Total Time (min) | 70 | 70 | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 3276 | 3290 | 3297 | 3240 | 3293 | 3279 |
| Vehs Exited | 3276 | 3297 | 3279 | 3238 | 3262 | 3269 |
| Starting Vehs | 82 | 82 | 85 | 73 | 68 | 77 |
| Ending Vehs | 82 | 75 | 103 | 75 | 99 | 84 |
| Travel Distance (mi) | 1076 | 1061 | 1058 | 1049 | 1063 | 1061 |
| Travel Time (hr) | 90.5 | 75.0 | 88.3 | 78.3 | 109.4 | 88.3 |
| Total Delay (hr) | 54.2 | 38.8 | 52.3 | 42.7 | 73.3 | 52.3 |
| Total Stops | 3252 | 3251 | 3368 | 3339 | 3235 | 3291 |
| Fuel Used (gal) | 53.5 | 49.7 | 52.2 | 50.0 | 56.9 | 52.5 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 7:20 |
| End Time | 7:30 |
| Total Time (min) | 10 |

Volumes adjusted by Growth Factors.
No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 7:30 |
| End Time | 8:30 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Vehs Entered | 3276 | 3290 | 3297 | 3240 | 3293 | 3279 |
| Vehs Exited | 3276 | 3297 | 3279 | 3238 | 3262 | 3269 |
| Starting Vehs | 82 | 82 | 85 | 73 | 68 | 77 |
| Ending Vehs | 82 | 75 | 103 | 75 | 99 | 84 |
| Travel Distance (mi) | 1076 | 1061 | 1058 | 1049 | 1063 | 1061 |
| Travel Time (hr) | 90.5 | 75.0 | 88.3 | 78.3 | 109.4 | 88.3 |
| Total Delay (hr) | 54.2 | 38.8 | 52.3 | 42.7 | 73.3 | 52.3 |
| Total Stops | 3252 | 3251 | 3368 | 3339 | 3235 | 3291 |
| Fuel Used (gal) | 53.5 | 49.7 | 52.2 | 50.0 | 56.9 | 52.5 |

## Intersection: 3: S Neville Street/N Neville Street & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LTR | LT | R |
| Maximum Queue (ft) | 193 | 136 | 219 | 184 | 351 | 662 | 160 |
| Average Queue (ft) | 90 | 41 | 122 | 96 | 160 | 417 | 155 |
| 95th Queue (ft) | 160 | 98 | 194 | 165 | 297 | 724 | 181 |
| Link Distance (ft) | 618 | 618 | 1288 | 1288 | 440 | 602 | |
| Upstream Blk Time (%) | | | | | 0 | 16 | |
| Queuing Penalty (veh) | | | | | 0 | 0 | |
| Storage Bay Dist (ft) | | | | | | | 110 |
| Storage Blk Time (%) | | | | | | 40 | 23 |
| Queuing Penalty (veh) | | | | | | 169 | 67 |

## Intersection: 7: Morewood Avenue & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LT | R | L | TR |
| Maximum Queue (ft) | 96 | 108 | 312 | 273 | 277 | 378 | 100 | 446 |
| Average Queue (ft) | 44 | 40 | 187 | 130 | 188 | 222 | 66 | 270 |
| 95th Queue (ft) | 84 | 85 | 270 | 233 | 329 | 432 | 126 | 477 |
| Link Distance (ft) | 1288 | 1288 | 762 | 762 | | 379 | | 426 |
| Upstream Blk Time (%) | | | | | | 20 | | 12 |
| Queuing Penalty (veh) | | | | | | 0 | | 0 |
| Storage Bay Dist (ft) | | | | | 260 | | 75 | |
| Storage Blk Time (%) | | | | | 3 | 24 | 6 | 61 |
| Queuing Penalty (veh) | | | | | 6 | 62 | 18 | 39 |

## Network Summary

Network wide Queuing Penalty: 360

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Start Time | 4:35 | 4:35 | 4:35 | 4:35 | 4:35 | 4:35 |
| End Time | 5:45 | 5:45 | 5:45 | 5:45 | 5:45 | 5:45 |
| Total Time (min) | 70 | 70 | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 3977 | 3904 | 3904 | 3911 | 3897 | 3919 |
| Vehs Exited | 3920 | 3853 | 3842 | 3863 | 3869 | 3870 |
| Starting Vehs | 131 | 159 | 113 | 155 | 146 | 141 |
| Ending Vehs | 188 | 210 | 175 | 203 | 174 | 190 |
| Travel Distance (mi) | 1373 | 1362 | 1340 | 1338 | 1353 | 1353 |
| Travel Time (hr) | 266.1 | 344.9 | 244.8 | 260.1 | 250.4 | 273.3 |
| Total Delay (hr) | 221.0 | 300.2 | 200.9 | 216.0 | 206.0 | 228.8 |
| Total Stops | 4606 | 4879 | 4630 | 4465 | 4694 | 4654 |
| Fuel Used (gal) | 103.9 | 121.3 | 97.6 | 101.0 | 99.6 | 104.7 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 4:35 |
| End Time | 4:45 |
| Total Time (min) | 10 |

Volumes adjusted by Growth Factors.
No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 4:45 |
| End Time | 5:45 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Vehs Entered | 3977 | 3904 | 3904 | 3911 | 3897 | 3919 |
| Vehs Exited | 3920 | 3853 | 3842 | 3863 | 3869 | 3870 |
| Starting Vehs | 131 | 159 | 113 | 155 | 146 | 141 |
| Ending Vehs | 188 | 210 | 175 | 203 | 174 | 190 |
| Travel Distance (mi) | 1373 | 1362 | 1340 | 1338 | 1353 | 1353 |
| Travel Time (hr) | 266.1 | 344.9 | 244.8 | 260.1 | 250.4 | 273.3 |
| Total Delay (hr) | 221.0 | 300.2 | 200.9 | 216.0 | 206.0 | 228.8 |
| Total Stops | 4606 | 4879 | 4630 | 4465 | 4694 | 4654 |
| Fuel Used (gal) | 103.9 | 121.3 | 97.6 | 101.0 | 99.6 | 104.7 |

## Intersection: 3: S Neville Street/N Neville Street & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LTR | LT | R |
| Maximum Queue (ft) | 441 | 405 | 153 | 130 | 455 | 572 | 160 |
| Average Queue (ft) | 276 | 222 | 65 | 42 | 455 | 213 | 97 |
| 95th Queue (ft) | 399 | 359 | 122 | 95 | 455 | 515 | 189 |
| Link Distance (ft) | 618 | 618 | 1288 | 1288 | 440 | 602 | |
| Upstream Blk Time (%) | | | | | 96 | 9 | |
| Queuing Penalty (veh) | | | | | 0 | 0 | |
| Storage Bay Dist (ft) | | | | | | | 110 |
| Storage Blk Time (%) | | | | | | 27 | 4 |
| Queuing Penalty (veh) | | | | | | 45 | 10 |

## Intersection: 7: Morewood Avenue & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LT | R | L | TR |
| Maximum Queue (ft) | 708 | 714 | 799 | 799 | 285 | 414 | 100 | 411 |
| Average Queue (ft) | 344 | 364 | 598 | 575 | 273 | 376 | 73 | 210 |
| 95th Queue (ft) | 670 | 680 | 954 | 955 | 339 | 478 | 122 | 377 |
| Link Distance (ft) | 1288 | 1288 | 762 | 762 | | 379 | | 426 |
| Upstream Blk Time (%) | | | 43 | 39 | | 65 | | 2 |
| Queuing Penalty (veh) | | | 0 | 0 | | 0 | | 0 |
| Storage Bay Dist (ft) | | | | | 260 | | 75 | |
| Storage Blk Time (%) | | | | | 18 | 57 | 9 | 47 |
| Queuing Penalty (veh) | | | | | 57 | 173 | 31 | 38 |

## Network Summary

Network wide Queuing Penalty: 354

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Start Time | 7:20 | 7:20 | 7:20 | 7:20 | 7:20 | 7:20 |
| End Time | 8:30 | 8:30 | 8:30 | 8:30 | 8:30 | 8:30 |
| Total Time (min) | 70 | 70 | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 3117 | 3281 | 3127 | 3119 | 3056 | 3136 |
| Vehs Exited | 3122 | 3269 | 3166 | 3144 | 3050 | 3150 |
| Starting Vehs | 73 | 57 | 89 | 73 | 56 | 68 |
| Ending Vehs | 68 | 69 | 50 | 48 | 62 | 59 |
| Travel Distance (mi) | 1013 | 1074 | 1030 | 1045 | 1002 | 1033 |
| Travel Time (hr) | 70.9 | 85.4 | 78.3 | 66.5 | 64.2 | 73.1 |
| Total Delay (hr) | 36.5 | 49.1 | 43.6 | 31.3 | 30.4 | 38.2 |
| Total Stops | 3093 | 3396 | 3119 | 2894 | 2859 | 3073 |
| Fuel Used (gal) | 46.9 | 52.7 | 49.4 | 46.9 | 44.9 | 48.1 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 7:20 |
| End Time | 7:30 |
| Total Time (min) | 10 |

Volumes adjusted by Growth Factors.
No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 7:30 |
| End Time | 8:30 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Vehs Entered | 3117 | 3281 | 3127 | 3119 | 3056 | 3136 |
| Vehs Exited | 3122 | 3269 | 3166 | 3144 | 3050 | 3150 |
| Starting Vehs | 73 | 57 | 89 | 73 | 56 | 68 |
| Ending Vehs | 68 | 69 | 50 | 48 | 62 | 59 |
| Travel Distance (mi) | 1013 | 1074 | 1030 | 1045 | 1002 | 1033 |
| Travel Time (hr) | 70.9 | 85.4 | 78.3 | 66.5 | 64.2 | 73.1 |
| Total Delay (hr) | 36.5 | 49.1 | 43.6 | 31.3 | 30.4 | 38.2 |
| Total Stops | 3093 | 3396 | 3119 | 2894 | 2859 | 3073 |
| Fuel Used (gal) | 46.9 | 52.7 | 49.4 | 46.9 | 44.9 | 48.1 |

## Intersection: 3: S Neville Street/N Neville Street & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LTR | LT | R |
| Maximum Queue (ft) | 178 | 133 | 202 | 201 | 333 | 629 | 160 |
| Average Queue (ft) | 82 | 41 | 119 | 97 | 158 | 400 | 153 |
| 95th Queue (ft) | 147 | 97 | 187 | 169 | 277 | 720 | 186 |
| Link Distance (ft) | 618 | 618 | 1288 | 1288 | 440 | 602 | |
| Upstream Blk Time (%) | | | | | | 17 | |
| Queuing Penalty (veh) | | | | | | 0 | |
| Storage Bay Dist (ft) | | | | | | | 110 |
| Storage Blk Time (%) | | | | | | 36 | 25 |
| Queuing Penalty (veh) | | | | | | 142 | 70 |

## Intersection: 7: Morewood Avenue & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LT | R | L | TR |
| Maximum Queue (ft) | 112 | 119 | 284 | 250 | 263 | 317 | 100 | 352 |
| Average Queue (ft) | 46 | 42 | 178 | 132 | 137 | 108 | 56 | 169 |
| 95th Queue (ft) | 90 | 98 | 260 | 223 | 235 | 237 | 112 | 295 |
| Link Distance (ft) | 1288 | 1288 | 762 | 762 | | 379 | | 426 |
| Upstream Blk Time (%) | | | | | | 1 | | 0 |
| Queuing Penalty (veh) | | | | | | 0 | | 0 |
| Storage Bay Dist (ft) | | | | | 260 | | 75 | |
| Storage Blk Time (%) | | | | | 2 | 0 | 6 | 42 |
| Queuing Penalty (veh) | | | | | 3 | 1 | 16 | 27 |

## Network Summary

Network wide Queuing Penalty: 260

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Start Time | 4:35 | 4:35 | 4:35 | 4:35 | 4:35 | 4:35 |
| End Time | 5:45 | 5:45 | 5:45 | 5:45 | 5:45 | 5:45 |
| Total Time (min) | 70 | 70 | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 3816 | 3837 | 3827 | 3826 | 3767 | 3813 |
| Vehs Exited | 3814 | 3868 | 3833 | 3789 | 3740 | 3809 |
| Starting Vehs | 129 | 131 | 119 | 112 | 86 | 113 |
| Ending Vehs | 131 | 100 | 113 | 149 | 113 | 123 |
| Travel Distance (mi) | 1349 | 1351 | 1344 | 1346 | 1332 | 1344 |
| Travel Time (hr) | 190.1 | 192.2 | 151.9 | 197.2 | 135.7 | 173.4 |
| Total Delay (hr) | 145.9 | 147.8 | 107.9 | 153.1 | 92.1 | 129.4 |
| Total Stops | 4240 | 4488 | 4124 | 4709 | 3941 | 4300 |
| Fuel Used (gal) | 85.6 | 86.1 | 76.5 | 86.9 | 71.9 | 81.4 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 4:35 |
| End Time | 4:45 |
| Total Time (min) | 10 |

Volumes adjusted by Growth Factors.

No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 4:45 |
| End Time | 5:45 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Vehs Entered | 3816 | 3837 | 3827 | 3826 | 3767 | 3813 |
| Vehs Exited | 3814 | 3868 | 3833 | 3789 | 3740 | 3809 |
| Starting Vehs | 129 | 131 | 119 | 112 | 86 | 113 |
| Ending Vehs | 131 | 100 | 113 | 149 | 113 | 123 |
| Travel Distance (mi) | 1349 | 1351 | 1344 | 1346 | 1332 | 1344 |
| Travel Time (hr) | 190.1 | 192.2 | 151.9 | 197.2 | 135.7 | 173.4 |
| Total Delay (hr) | 145.9 | 147.8 | 107.9 | 153.1 | 92.1 | 129.4 |
| Total Stops | 4240 | 4488 | 4124 | 4709 | 3941 | 4300 |
| Fuel Used (gal) | 85.6 | 86.1 | 76.5 | 86.9 | 71.9 | 81.4 |

## Intersection: 3: S Neville Street/N Neville Street & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | SB | SB |
|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LTR | LT | R |
| Maximum Queue (ft) | 475 | 400 | 144 | 132 | 455 | 478 | 160 |
| Average Queue (ft) | 276 | 221 | 73 | 55 | 455 | 163 | 78 |
| 95th Queue (ft) | 416 | 359 | 127 | 106 | 459 | 374 | 169 |
| Link Distance (ft) | 618 | 618 | 1288 | 1288 | 440 | 602 | |
| Upstream Blk Time (%) | 0 | | | | 96 | 2 | |
| Queuing Penalty (veh) | 0 | | | | 0 | 0 | |
| Storage Bay Dist (ft) | | | | | | | 110 |
| Storage Blk Time (%) | | | | | | 21 | 3 |
| Queuing Penalty (veh) | | | | | | 32 | 7 |

## Intersection: 7: Morewood Avenue & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LT | R | L | TR |
| Maximum Queue (ft) | 477 | 497 | 556 | 517 | 285 | 411 | 100 | 360 |
| Average Queue (ft) | 229 | 245 | 312 | 274 | 198 | 241 | 60 | 175 |
| 95th Queue (ft) | 424 | 450 | 545 | 515 | 334 | 438 | 113 | 306 |
| Link Distance (ft) | 1288 | 1288 | 762 | 762 | | 379 | | 426 |
| Upstream Blk Time (%) | | | 1 | 1 | | 12 | | 0 |
| Queuing Penalty (veh) | | | 0 | 0 | | 0 | | 0 |
| Storage Bay Dist (ft) | | | | | 260 | | 75 | |
| Storage Blk Time (%) | | | | | 6 | 16 | 4 | 43 |
| Queuing Penalty (veh) | | | | | 15 | 43 | 14 | 35 |

## Network Summary

Network wide Queuing Penalty: 147

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Start Time | 7:20 | 7:20 | 7:20 | 7:20 | 7:20 | 7:20 |
| End Time | 8:30 | 8:30 | 8:30 | 8:30 | 8:30 | 8:30 |
| Total Time (min) | 70 | 70 | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 3086 | 3163 | 3146 | 3040 | 3157 | 3120 |
| Vehs Exited | 3078 | 3162 | 3127 | 3078 | 3196 | 3128 |
| Starting Vehs | 72 | 64 | 58 | 89 | 84 | 72 |
| Ending Vehs | 80 | 65 | 77 | 51 | 45 | 64 |
| Travel Distance (mi) | 1007 | 1046 | 1028 | 1021 | 1055 | 1031 |
| Travel Time (hr) | 66.2 | 76.7 | 65.4 | 64.5 | 74.3 | 69.4 |
| Total Delay (hr) | 32.1 | 41.4 | 30.7 | 30.0 | 38.7 | 34.6 |
| Total Stops | 2885 | 3090 | 2810 | 2758 | 3198 | 2948 |
| Fuel Used (gal) | 45.2 | 49.5 | 45.8 | 45.6 | 48.9 | 47.0 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 7:20 |
| End Time | 7:30 |
| Total Time (min) | 10 |

Volumes adjusted by Growth Factors.

No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 7:30 |
| End Time | 8:30 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Vehs Entered | 3086 | 3163 | 3146 | 3040 | 3157 | 3120 |
| Vehs Exited | 3078 | 3162 | 3127 | 3078 | 3196 | 3128 |
| Starting Vehs | 72 | 64 | 58 | 89 | 84 | 72 |
| Ending Vehs | 80 | 65 | 77 | 51 | 45 | 64 |
| Travel Distance (mi) | 1007 | 1046 | 1028 | 1021 | 1055 | 1031 |
| Travel Time (hr) | 66.2 | 76.7 | 65.4 | 64.5 | 74.3 | 69.4 |
| Total Delay (hr) | 32.1 | 41.4 | 30.7 | 30.0 | 38.7 | 34.6 |
| Total Stops | 2885 | 3090 | 2810 | 2758 | 3198 | 2948 |
| Fuel Used (gal) | 45.2 | 49.5 | 45.8 | 45.6 | 48.9 | 47.0 |

## Intersection: 3: S Neville Street/N Neville Street & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LT | R | LT | R |
| Maximum Queue (ft) | 157 | 106 | 198 | 201 | 134 | 177 | 646 | 160 |
| Average Queue (ft) | 72 | 31 | 109 | 82 | 64 | 74 | 392 | 150 |
| 95th Queue (ft) | 132 | 76 | 175 | 159 | 118 | 140 | 718 | 187 |
| Link Distance (ft) | 620 | 620 | 1280 | 1280 | | 438 | 602 | |
| Upstream Blk Time (%) | | | | | | | 14 | |
| Queuing Penalty (veh) | | | | | | | 0 | |
| Storage Bay Dist (ft) | | | | | 120 | | | 110 |
| Storage Blk Time (%) | | | | | 0 | 3 | 40 | 21 |
| Queuing Penalty (veh) | | | | | 1 | 3 | 156 | 59 |

## Intersection: 7: Morewood Avenue & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | L | T | R | L | TR |
| Maximum Queue (ft) | 125 | 133 | 292 | 268 | 70 | 233 | 203 | 100 | 366 |
| Average Queue (ft) | 61 | 58 | 168 | 120 | 19 | 106 | 99 | 54 | 178 |
| 95th Queue (ft) | 105 | 110 | 254 | 224 | 57 | 189 | 177 | 112 | 314 |
| Link Distance (ft) | 1280 | 1280 | 756 | 756 | | 379 | | | 426 |
| Upstream Blk Time (%) | | | | | | | | | 1 |
| Queuing Penalty (veh) | | | | | | | | | 0 |
| Storage Bay Dist (ft) | | | | | 50 | | 260 | 75 | |
| Storage Blk Time (%) | | | | | 3 | 34 | 0 | 3 | 45 |
| Queuing Penalty (veh) | | | | | 12 | 55 | 0 | 7 | 29 |

## Network Summary

Network wide Queuing Penalty: 322

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Start Time | 4:35 | 4:35 | 4:35 | 4:35 | 4:35 | 4:35 |
| End Time | 5:45 | 5:45 | 5:45 | 5:45 | 5:45 | 5:45 |
| Total Time (min) | 70 | 70 | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 3833 | 3917 | 3898 | 3860 | 3913 | 3885 |
| Vehs Exited | 3839 | 3905 | 3833 | 3843 | 3908 | 3867 |
| Starting Vehs | 106 | 90 | 112 | 145 | 110 | 111 |
| Ending Vehs | 100 | 102 | 177 | 162 | 115 | 130 |
| Travel Distance (mi) | 1359 | 1374 | 1361 | 1346 | 1368 | 1362 |
| Travel Time (hr) | 99.6 | 120.3 | 135.4 | 118.5 | 120.5 | 118.9 |
| Total Delay (hr) | 55.2 | 75.1 | 90.8 | 74.3 | 75.5 | 74.2 |
| Total Stops | 4375 | 4876 | 4965 | 4869 | 4866 | 4791 |
| Fuel Used (gal) | 65.1 | 70.4 | 72.9 | 68.8 | 69.2 | 69.3 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 4:35 |
| End Time | 4:45 |
| Total Time (min) | 10 |

Volumes adjusted by Growth Factors.

No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 4:45 |
| End Time | 5:45 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | Avg |
|---|---|---|---|---|---|---|
| Vehs Entered | 3833 | 3917 | 3898 | 3860 | 3913 | 3885 |
| Vehs Exited | 3839 | 3905 | 3833 | 3843 | 3908 | 3867 |
| Starting Vehs | 106 | 90 | 112 | 145 | 110 | 111 |
| Ending Vehs | 100 | 102 | 177 | 162 | 115 | 130 |
| Travel Distance (mi) | 1359 | 1374 | 1361 | 1346 | 1368 | 1362 |
| Travel Time (hr) | 99.6 | 120.3 | 135.4 | 118.5 | 120.5 | 118.9 |
| Total Delay (hr) | 55.2 | 75.1 | 90.8 | 74.3 | 75.5 | 74.2 |
| Total Stops | 4375 | 4876 | 4965 | 4869 | 4866 | 4791 |
| Fuel Used (gal) | 65.1 | 70.4 | 72.9 | 68.8 | 69.2 | 69.3 |

## Intersection: 3: S Neville Street/N Neville Street & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | LT | R | LT | R |
| Maximum Queue (ft) | 391 | 369 | 131 | 124 | 145 | 453 | 438 | 160 |
| Average Queue (ft) | 232 | 180 | 54 | 37 | 120 | 268 | 184 | 94 |
| 95th Queue (ft) | 351 | 304 | 106 | 86 | 183 | 499 | 369 | 197 |
| Link Distance (ft) | 620 | 620 | 1277 | 1277 | | 438 | 602 | |
| Upstream Blk Time (%) | | | | | | 13 | 1 | |
| Queuing Penalty (veh) | | | | | | 0 | 0 | |
| Storage Bay Dist (ft) | | | | | 120 | | | 110 |
| Storage Blk Time (%) | | | | | 11 | 43 | 30 | 2 |
| Queuing Penalty (veh) | | | | | 27 | 86 | 46 | 5 |

## Intersection: 7: Morewood Avenue & Fifth Avenue

| Movement | EB | EB | WB | WB | NB | NB | NB | SB | SB |
|---|---|---|---|---|---|---|---|---|---|
| Directions Served | LT | TR | LT | TR | L | T | R | L | TR |
| Maximum Queue (ft) | 601 | 615 | 552 | 498 | 75 | 400 | 285 | 100 | 370 |
| Average Queue (ft) | 297 | 313 | 336 | 296 | 31 | 221 | 205 | 64 | 197 |
| 95th Queue (ft) | 567 | 586 | 516 | 484 | 74 | 428 | 323 | 117 | 337 |
| Link Distance (ft) | 1277 | 1277 | 762 | 762 | | 379 | | | 426 |
| Upstream Blk Time (%) | | | 2 | 1 | | 16 | | | 1 |
| Queuing Penalty (veh) | | | 0 | 0 | | 0 | | | 0 |
| Storage Bay Dist (ft) | | | | | 50 | | 260 | 75 | |
| Storage Blk Time (%) | | | | | 6 | 41 | 22 | 7 | 44 |
| Queuing Penalty (veh) | | | | | 30 | 125 | 61 | 22 | 35 |

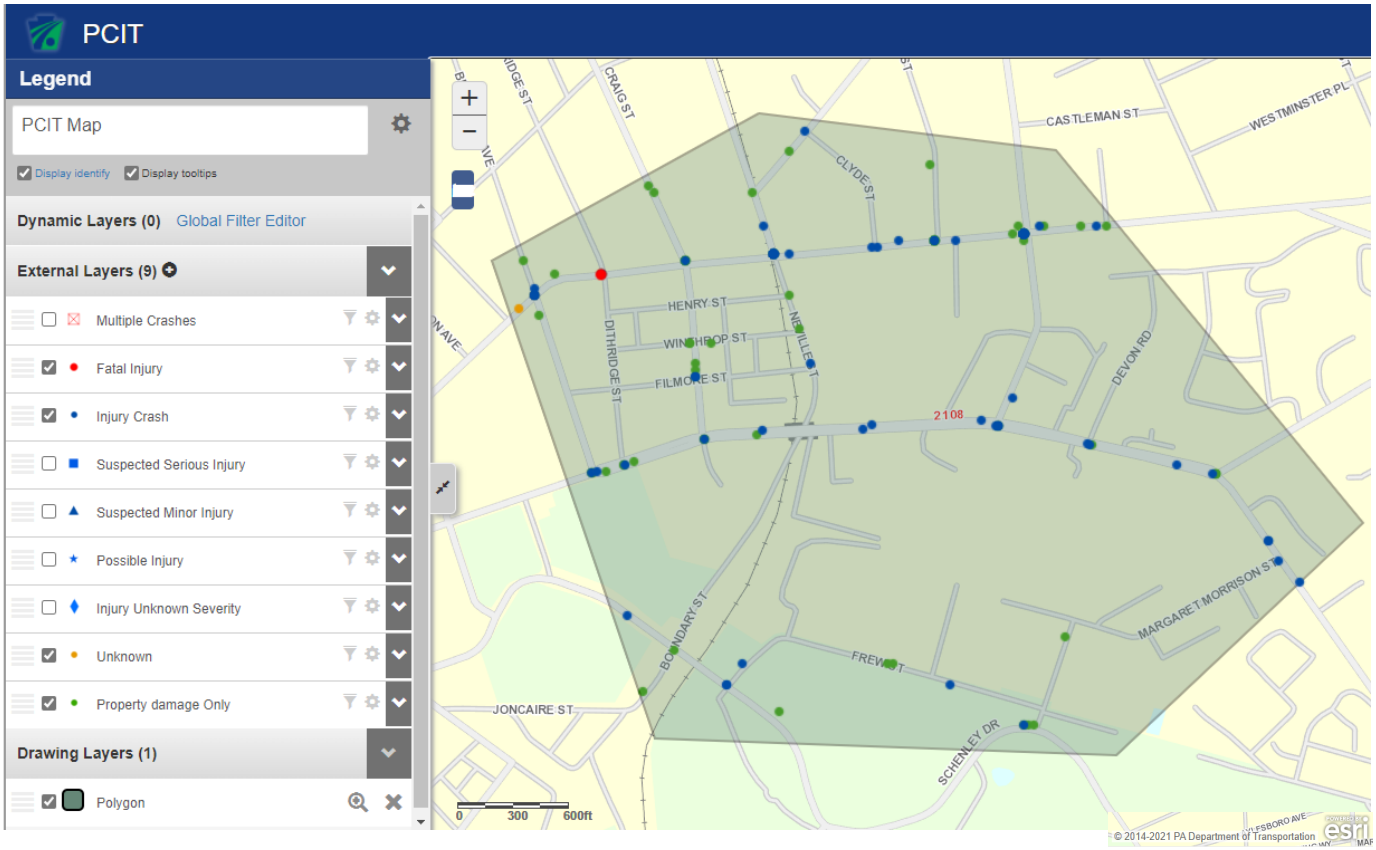
## Network Summary

Network wide Queuing Penalty: 437

# APPENDIX O
## Five-year Reportable Crash Summaries



gai consultants
transforming ideas into reality®




FILE NAME: Z:\2020\R200398.00 - CMU-2022 IMP\CAD\TIS Figures\CMU_IMP_Border.dgn

PLOTTED: 2/2/2022

gai consultants

| | |
|---|---|
| PROJECT NO/CLIENT | R200398.00 / Carnegie Mellon University |
| PROJECT | 2032 Carnegie Mellon Institutional Master Plan<br>City of Pittsburgh, Allegheny County |
| TITLE | Summary Crash Locations (5 Years) |
| SCALE: N.T.S. | |
| DWN. | TMW |
| CHKD. | RAK |
| APPENDIX | O |

Date Range: 01/01/2016 to 12/31/2020*

## CRASH SEVERITY LEVEL BY YEAR

| | 2016 CRASHES | 2017 CRASHES | 2018 CRASHES | 2019 CRASHES | 2020 CRASHES | ALL YEARS CRASHES |
|---|---|---|---|---|---|---|
| FATAL INJURY | 0 | 0 | 0 | 0 | 1 | 1 |
| SUSPECTED SERIOUS INJURY | 0 | 0 | 2 | 2 | 2 | 6 |
| SUSPECTED MINOR INJURY | 3 | 7 | 6 | 8 | 6 | 30 |
| POSSIBLE INJURY | 4 | 4 | 3 | 2 | 2 | 15 |
| UNKNOWN SEVERITY | 10 | 5 | 9 | 4 | 3 | 31 |
| UNKNOWN IF INJURED | 0 | 0 | 1 | 0 | 1 | 2 |
| PROPERTY DMG ONLY | 15 | 19 | 20 | 16 | 14 | 84 |
| TOTAL | 32 | 35 | 41 | 32 | 29 | 169 |

## CRASH DESCRIPTION TYPES BY YEAR

| | 2016 CRASHES | 2017 CRASHES | 2018 CRASHES | 2019 CRASHES | 2020 CRASHES | ALL YEARS CRASHES |
|---|---|---|---|---|---|---|
| ANGLE | 9 | 16 | 15 | 14 | 10 | 64 |
| BACKING | 1 | 0 | 1 | 0 | 0 | 2 |
| HEAD ON | 2 | 1 | 0 | 2 | 2 | 7 |
| HIT FIXED OBJECT | 4 | 1 | 5 | 2 | 5 | 17 |
| OPP DIRECTION SIDESWIPE | 1 | 1 | 0 | 0 | 0 | 2 |
| PEDESTRIAN | 4 | 3 | 8 | 6 | 5 | 26 |
| REAR END | 8 | 9 | 8 | 3 | 5 | 33 |
| SAME DIRECTION SIDESWIPE | 3 | 4 | 4 | 5 | 2 | 18 |
| TOTAL | 32 | 35 | 41 | 32 | 29 | 169 |

## PERSON INJURY SUMMARY BY YEAR

| | 2016 PERSONS | 2017 PERSONS | 2018 PERSONS | 2019 PERSONS | 2020 PERSONS | ALL YEARS PERSONS |
|---|---|---|---|---|---|---|
| FATALITIES | 0 | 0 | 0 | 0 | 1 | 1 |
| SUSPECTED SERIOUS INJURIES | 0 | 0 | 2 | 2 | 2 | 6 |
| SUSPECTED MINOR INJURIES | 3 | 8 | 7 | 9 | 12 | 39 |
| POSSIBLE INJURIES | 5 | 6 | 4 | 3 | 3 | 21 |
| UNKNOWN SEVERITY | 11 | 6 | 11 | 4 | 4 | 36 |
| UNKNOWN IF INJURED | 0 | 0 | 5 | 1 | 3 | 9 |

*** PLEASE NOTE: Years which do not appear in the report contain zero crashes for this request.**

* Complete records of reportable crashes are available in PCIT for the following years: 2001 - 2020

* Crash information for 2021 to 2022 is incomplete at the time of this printing. As such, data for 2021 to 2022 is not included in this report.

**IMPORTANT:** The information contained in this document is drawn from raw data and should not be interpreted as representing an engineering judgement or determination made by the Department of Transportation as to the type and severity of accidents noted herein.

Print Date: 05/27/2022

Print Date: 05/27/2022

PCIT - PUBLIC REQUEST / PRESS INQUIRY REPORT (01-07)

**NOTES:**

1 Injury Severity Disclaimer

Please note that beginning January 1, 2016, PennDOT adopted the Federal standard for collecting injury severity data. The field descriptions and definitions changed from the state standard that had been in use for decades. This resulted in a substantial shift in severity levels. Therefore, comparison of the “Suspected Serious Injury”, “Suspected Minor Injury” and “Possible Injury” categories will not be consistent for crashes taking place before versus after the adoption of the new standard.

**REPORT PARAMETERS:**

Date Range : 01/01/2016 to 12/31/2020

Selected Shapes : Polygon

Filter Characteristics:

This report counts the number of crashes.

# APPENDIX P
## Existing Parking Lot Inventory and Capacity



gai consultants
transforming ideas into reality®

# Observed Parking Occupancy

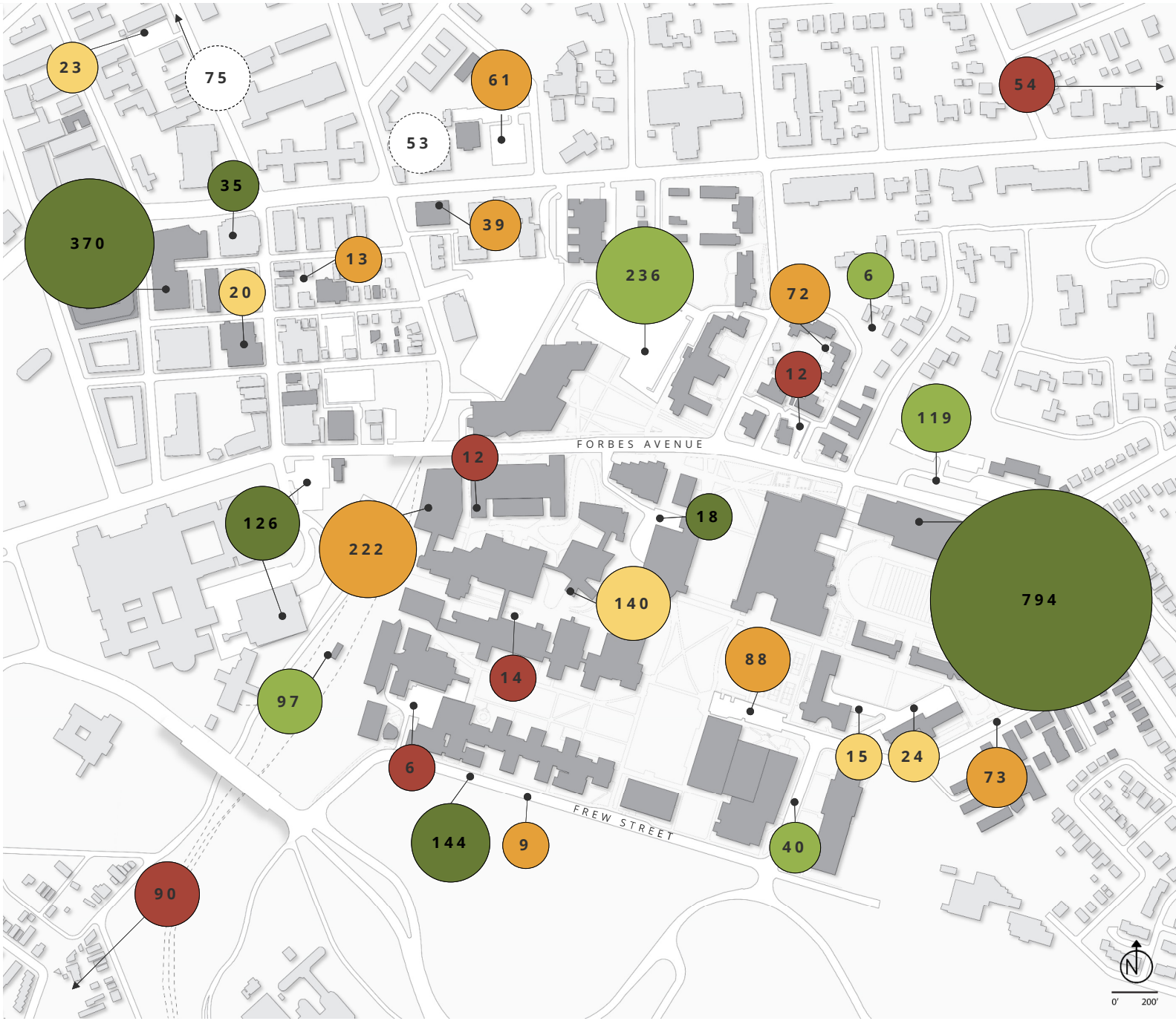
## EXISTING SUPPLY

- OCCUPANCY ≤ 55%
- 55% < OCCUPANCY ≤ 65%
- 65% < OCCUPANCY ≤ 75%
- 75% < OCCUPANCY ≤ 85%
- OCCUPANCY > 85%
- NEWLY-ACQUIRED

**OBSERVATIONS:**

- Parking is distributed across campus
- Large lots are highly utilized
- Many of the small lots are inefficient

➢ *Note: Circles are scaled to represent the total number of parking spaces, which is also indicated by the number noted in the center. Data from TCS Hall Transportation Study, June 2017.*



# APPENDIX Q
## Parking Demand Analysis Calculation



gai consultants
transforming ideas into reality®

| | | | |
|---|---|---|---|
| Subject: | **Parking Supply and Demand Analysis per Net Assignable Square Footage (NASF)** | | |
| Project No.: | **R200398.00** | | |
| Project Name: | **Carnegie Mellon University 2022-2023 Institutional Master Plan** | | |
| Computed By: | **TMW** | Date: | **2/17/2022** |
| Checked By: | **RAK** | Date: | **2/17/2022** |

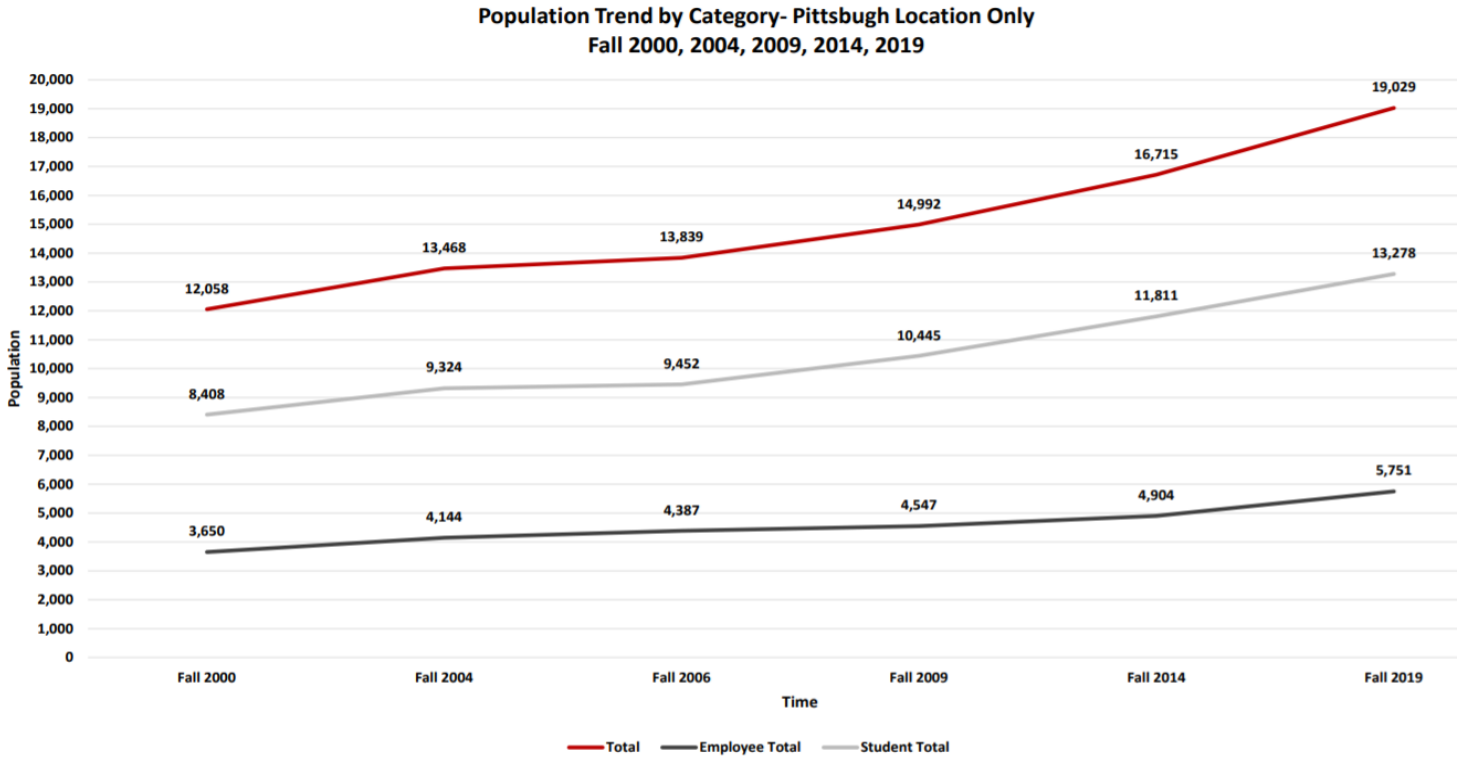
gai consultants

**Demographic Data, per 2022-32 IMP, Appendix D**

5751 Employees

13278 Students

**19029 Total**



| | | | |
|---|---|---|---|
| Subject: | **Parking Supply and Demand Analysis per Net Assignable Square Footage (NASF)** | | |
| Project No.: | **R200398.00** | | |
| Project Name: | **Carnegie Mellon University 2022-2023 Institutional Master Plan** | | |
| Computed By: | **TMW** | Date: | **2/17/2022** |
| Checked By: | **RAK** | Date: | **2/17/2022** |

gai consultants

**Net Assignable Square Footage, per 2022-32 IMP, Appendix D**

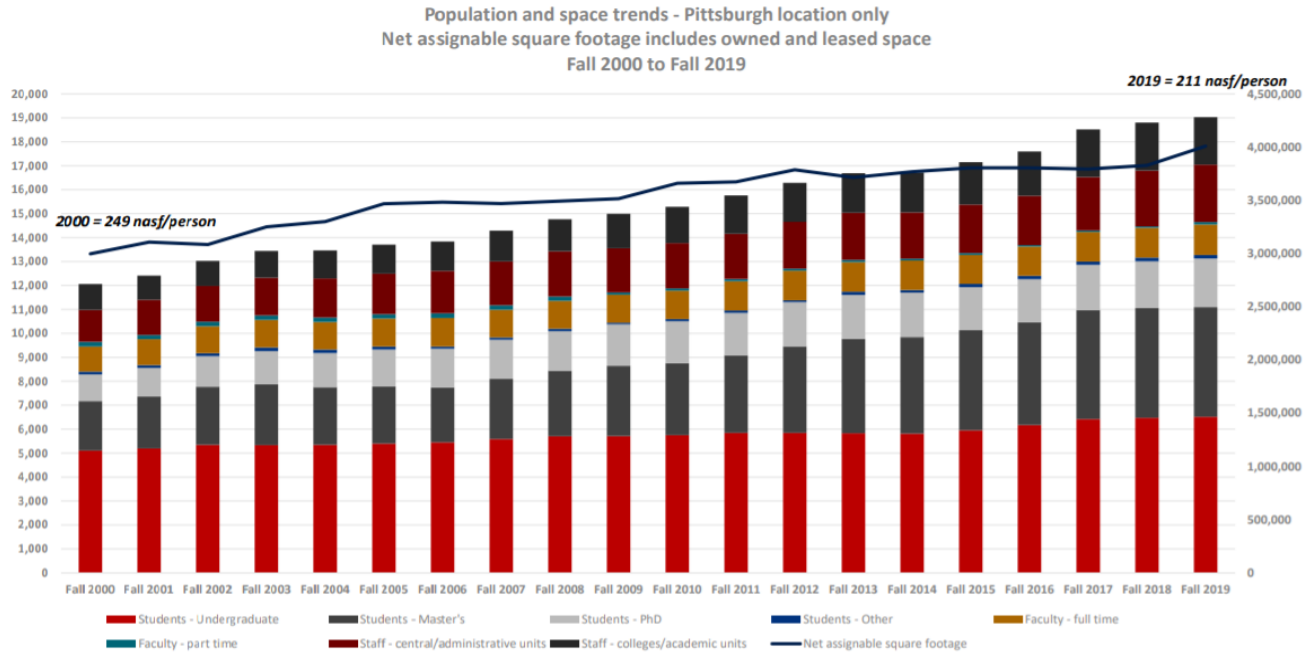
249 nasf/person, 2000

211 nasf/person, 2019

250 nasf/person, 2032 target

4,015,119 total nasf, 2019

Through proposed developments in the IMP, Carnegie Mellon is using expansion projects to return to the year 2000 level of campus density, 250 nasf/person. Work from home policies will also help reduce density. Anticipated trip generation is thus based on 250 nasf/person.




4,757,250 2019 nasf equivalent at 250 nasf/person

742,131 Space from existing buildings to be shifted to take up space in new buildings to achieve 250 nasf/person

1,198,300 Proposed nasf, assuming 50% of the master plan's full buildout is completed (Table 6.2)

456,169 Net new nasf, after existing campus uses shifted to new buildings to achieve 250 nasf/person

| | | | |
|---|---|---|---|
| Subject: | **Parking Supply and Demand Analysis per Net Assignable Square Footage (NASF)** | | |
| Project No.: | **R200398.00** | | |
| Project Name: | **Carnegie Mellon University 2022-2023 Institutional Master Plan** | | |
| Computed By: | **TMW** | Date: | **2/17/2022** |
| Checked By: | **RAK** | Date: | **2/17/2022** |

gai consultants

**Estimate of Parking Demand per nasf**

2972 Existing on-campus parking supply at 4,015,119 nasf (211 nasf/person)

2972 Proposed on-campus parking supply at 4,757,250 nasf (250 nasf/person) to achieve IMP Performance Target goal

38% 2018 Parking Master Plan, mode share of typical employee commuters by automobile

30% TDM mode share target for auto commuters

8% TDM auto mode share target reduction

Parking at 211 nasf/person

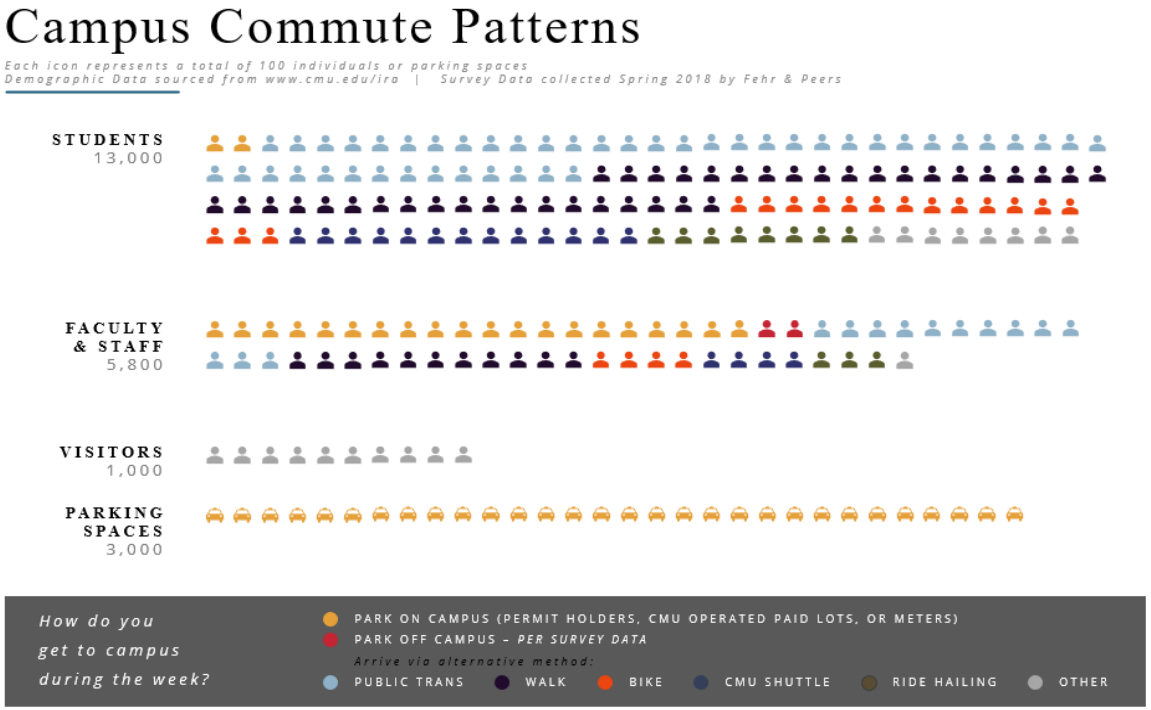
0.000740 Parking per nasf, existing density (211 nasf/person)

0.000681 Parking per nasf, existing density with TDM 8% reduction

Parking at 250 nasf/person

0.000625 Parking per nasf, proposed density (250 nasf/person)

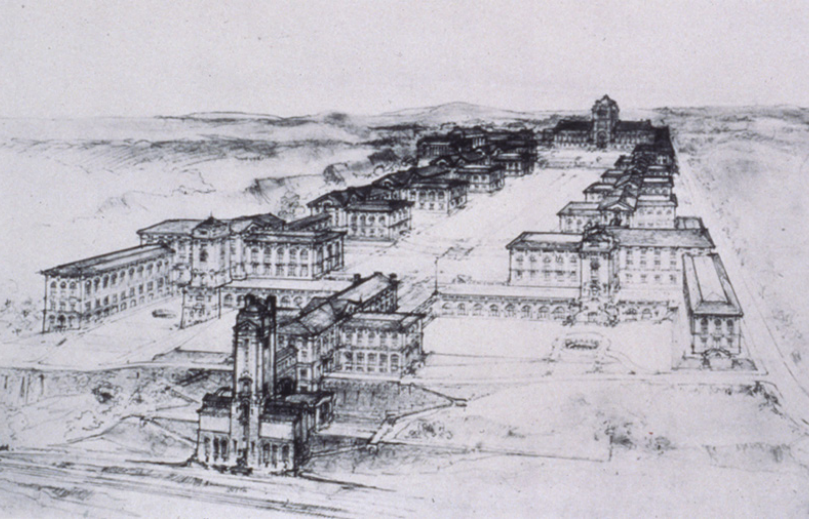
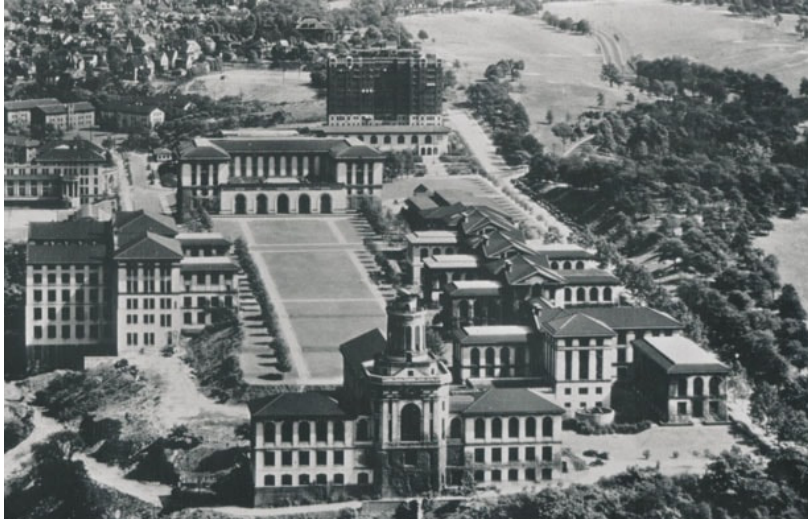
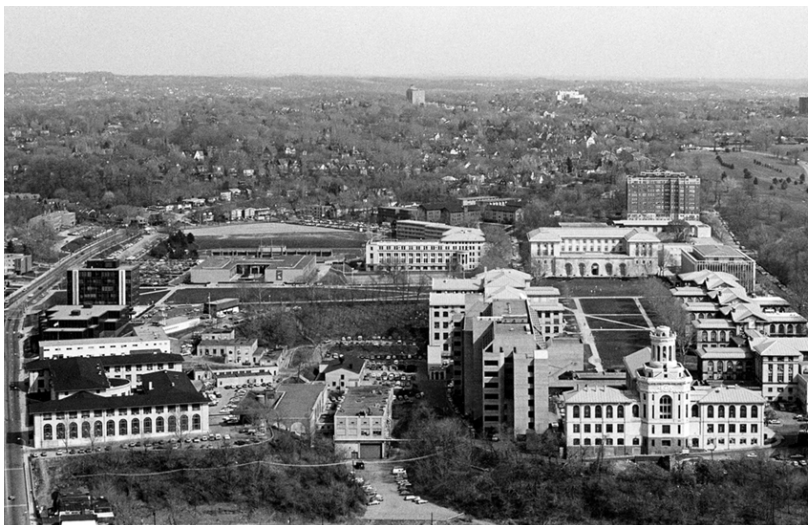
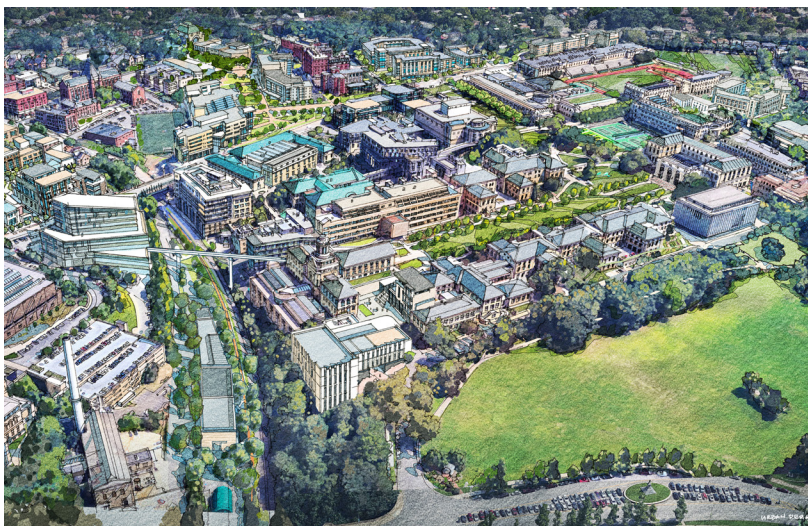
0.000575 Parking per nasf, proposed density (250 nasf/person) with 8% TDM reduction



| | | | |
|---|---|---|---|
| Subject: | **Parking Supply and Demand Analysis per Net Assignable Square Footage (NASF)** | | |
| Project No.: | **R200398.00** | | |
| Project Name: | **Carnegie Mellon University 2022-2023 Institutional Master Plan** | | |
| Computed By: | **TMW** | Date: | **2/17/2022** |
| Checked By: | **RAK** | Date: | **2/17/2022** |

gai consultants

**Parking Calculations after TDM**

| | |
|---|---|
| 2972 | Existing parking supply |
| 2621 | Existing parking demand, February 2020 (88%) |
| 2411 | Parking demand after 8% TDM reduction |
| 2675 | Total parking spaces at 90% capacity |
| 262 | Demand for new parking at 250 nasf/person for 456,169 nasf (50% of total) |
| 2673 | Total parking demand, 2032, with 50% of IMP projects realized |
| 90% | Anticipated parking occupancy at 50% full buildout in 2032 (2972 spaces) |

Conclusion: If campus development from 2022-2032 does not exceed 50% of the maximum potential size of IMP development projects, if Carnegie Mellon is successful in achieving the 250 nasf/person goal, and if the target 8% parking demand reduction is successfully achieved through TDM, Carnegie Mellon can successfully achieve their mobility goal of providing no net new parking for projects within the 2022-2032 IMP. Should any of these conditions not be met, Carnegie Mellon will submit an amended TIS to analyze impacts of overages.