



4-A-22-PD  
TIL Version 3  
7/12/2022

July 12, 2022

Mr. Mike Conger  
Knoxville-Knox County Planning  
400 Main Street, Suite 403  
Knoxville, TN 37902

Re: Traffic Letter for Griffin School Apartments

Dear Mr. Conger:

Giffin Senior Community, LLC is proposing a multi-family residential development at 1834 Beech Street in Knoxville, Tennessee. The total area of development is 6.30 acres and the property is currently zoned as RN-2 (Single-Family Residential Neighborhood). The preliminary concept plan shows the construction of a new parking lot, two new apartment buildings with 77 apartment units and the existing two-story brick building to remain. Construction is proposed to take place this year and this analysis assumes full build out for the development will occur in 2025.

A preliminary schematic including the two driveway locations is included in the Attachments.

The purpose of this traffic analysis is to evaluate the trip generation and trip distribution of the development as well as the sight distance at the access points to Beech Street.

### **Existing Site Conditions**

Beech Street is a two-lane road with a minimum width that varies between 22 feet and 24 feet. The Knoxville-Knox County Planning Commission does not classify Beech Street; therefore, it is considered a local street. The posted speed limit on Beech Street is 30 mph. There is an existing sidewalk located on the east side of Beech Street between Lenland Avenue and McClung Avenue. An aerial photo of the existing property is included in the attachments.

### **Transit Network**

The Knoxville Area Transit (KAT) operates in the vicinity of the proposed development. Route 40 (South Knoxville) travels from Knoxville Station to Island Home Drive, to the intersection of Sevier Avenue at Sevierville Pike and to Chapman Highway. The nearest KAT stops are currently located on Sevier Avenue at McClung Avenue and McClung Avenue at South Haven Road on Route 40. The walking distance from the site to the nearest bus stop is approximately 0.2 miles or a 5-minute walk. A map of KAT bus route 40 is included in the attachments and labeled "Transit Network".

### **Pedestrian / Bicycle Network**

There are no designated bike lanes or paved greenways that access the proposed development along Beech Street. The “Knoxville Bicycle Map 2017” classifies McClung Avenue and South Haven Road as comfortable bike routes. Nearby there are signed bike routes along Island Home Avenue and Sevier Avenue as well as the paved Will Skelton Greenway north of the proposed development. A copy of the Knoxville Bicycle Map 2017 is included in the attachments and labeled “Bicycle Network.”

### **Trip Generation**

The Giffin School Apartments proposes 77 apartment units. The Knoxville-Knox County Planning Commission published a memorandum (“Local Trip Generation Rates for Multi-Family Residential Uses”, August 14, 2000) for the purpose of providing locally collected data for all multi-family residential developments. The fitted curve equations from the local study were used to calculate site trips for the Giffin School Apartments. A trip generation summary is shown in Table 1 – Trip Generation Summary.

**Table 1 - Trip Generation Summary  
Giffin School Apartments**

Land Use	Density	Daily Trips	AM Peak Hour		PM Peak Hour	
			Enter	Exit	Enter	Exit
Apartments (Local Trip Gen Study)	77 units	754	9	33	34	28

The total number of new trips generated by the proposed residential development at Giffin School Apartments is estimated to be 754 new daily trips, 42 trips during the AM peak hour and 62 trips during the PM peak hour.

### **Trip Distribution**

The directional distribution of the traffic generated by the Giffin School Apartments was estimated using the existing roadway network. FMA assumed that 50% of traffic would enter/exit from the intersection of S Haven Road at Lenland Avenue and 50% of traffic would enter/exit from the intersection of McClung Avenue at Beech Street.

Figure 1 shows the peak hour trip distribution and Figure 2 shows the peak hour site traffic from the Giffin School Apartments.

### **Driveway Connections**

There are two proposed full access driveway connections shown on the preliminary schematic. The first driveway will tie into the existing intersection of Beech Street at Buford Street and the second driveway connection is located in the vicinity of the existing Giffin School southern driveway.

### **Sight Distance**

The minimum required stopping sight distance was determined using the AASHTO "Geometric Design of Highways and Streets." The required stopping sight distance is 200 feet with a road with a 30 mph design speed. At the driveway connections the stopping sight distance was measured with a driver height of 3.5 feet and an object height of 2.0 feet per AASHTO.

The required stopping sight distance at the proposed intersection of Beech Street at Buford Street / driveway connection (north) is 227 feet traveling northbound with a +9% upgrade and 184 feet traveling southbound with -6% downgrade. The required stopping sight distance at the proposed intersection of Beech Street at driveway connection (south) is 200 feet traveling northbound and southbound with a less than 3% grade.

The sight line profiles for the intersection of Buford Street / driveway connection (north) at Beech Street and Beech Street at driveway connection (south) are included in the attachments.

### **Conclusion and Recommendations**

Beech Street between the intersection with Buford Street and the intersection with McClung Avenue has some pavement sections that are uneven; however, the overall condition of the pavement and sidewalks in the vicinity of the proposed development are in good condition. FMA recommends any improvements on Beech Street, including driveway access and location, resurfacing, striping plan, etc. be coordinated with the City of Knoxville.

The sight distance evaluation showed that the two proposed driveway connections have adequate stopping sight distance. FMA recommends that the sight distance be certified by a surveyor prior to the completion of construction activities.

I hope that this is helpful. Please contact me if you have any questions.

Thank you,



Addie Kirkham, P.E.

Enclosure: Attachments




## Attachments

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6. Concept Site Plan -  
"Historic Giffin Square"

Site Legend

-  Trash / Recycling
-  Secure Bicycle Parking
-  Playground



1" = 60'-0"

0 15 30 60





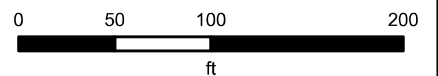


Beech Street

Knoxville - Knox County - KUB Geographic Information System



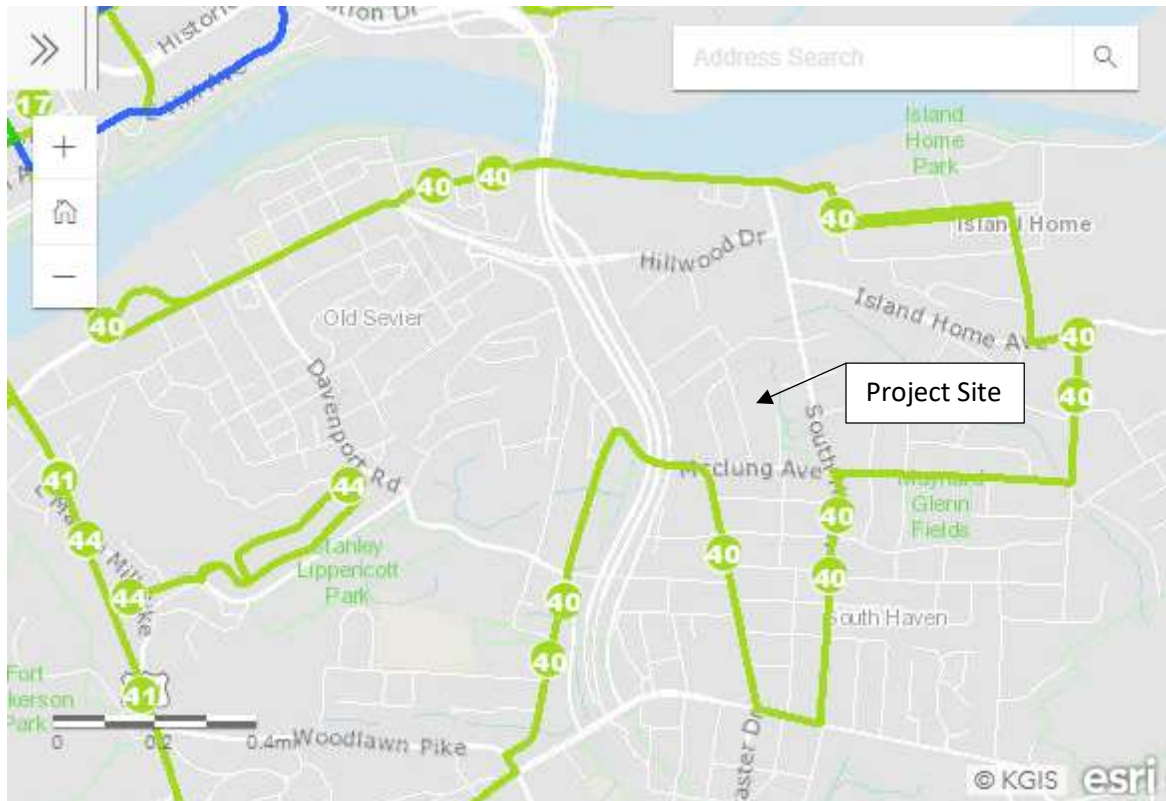
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# Transit Network



Bus Route 40 (South Knoxville)



# Bicycle Network



## Map Features

	Bike lanes
	Climbing bike lane – one-way uphill
	Signed bike routes
	Comfortable routes
	Connections - use caution
	Local/neighborhood streets – generally comfortable for biking
	Collector streets – expect higher traffic speeds and volumes
	Arterial streets – <b>not recommended</b>
	One-way street
	Steep slopes – greater than 10% grade
	Paved greenways
	Multi-use unpaved trails  To be completed in 2018
	Public restrooms
	Parking for trailheads and bike routes
	Transit station & superstops - all KAT buses & trolleys have bike racks
	Skateparks with BMX biking allowed
	School
	Bike Repair Stand



**Project: Giffin School Apartments**

**Date Conducted: 7/12/2022**

**Local Apartment Trip Generation Study**

**77 Apartment Units**

**Average Daily Traffic**

$$T = 15.193 (X)^{0.899}$$

$$T = 15.193 (99)^{0.899}$$

$$T = 754$$

**Peak Hour of Adjacent Street Traffic**

**One Hour Between 7 and 9 a.m.**

$$T = 0.758 (X)^{0.924}$$

$$T = 0.758 (77)^{0.924}$$

$$T = 42$$

**Peak Hour of Adjacent Street Traffic**

**One Hour Between 4 and 6 p.m.**

$$T = 0.669 (X) + 10.069$$

$$T = 0.669 (77) + 10.069$$

$$T = 62$$

Time Period	Total Trips	Percent		Number	
		Enter	Exit	Enter	Exit
Weekday (24 hours)	754	50%	50%	377	377
AM Peak Hour	42	22%	78%	9	33
PM Peak Hour	62	55%	45%	34	28



## MEMORANDUM

**To:** Traffic Impact Study Reviewers and Preparers (see attached list)

**From:** Mike Conger *MC*

**Date:** August 14, 2000

**Subject:** Local Trip Generation Rates for Multi-Family Residential Uses

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Attached please find a summary of the final report with data plots for the Knox County Local Apartment Trip Generation Study. As you will recall, this report was discussed when the traffic impact study group last convened this past February. A consensus was reached at that meeting that the trip generation rates developed in the local study should be used for new apartment complexes and any other "multi-family" residential uses that are being proposed.

The MPC voted at its July 2000 meeting to officially amend the Traffic Impact Study Guidelines with language which reads that "trip generation rates for proposed uses shall be calculated using the latest edition of the ITE Trip Generation Manual, or using local data when it is available". This amendment allows the full implementation of the new rates, and they should be used for future proposed multi-family developments unless it can be demonstrated otherwise.

Thanks for your assistance and cooperation in this matter, if there are any questions or comments, please let me know.



## **TRAFFIC IMPACT STUDY REVIEWER & PREPARER GROUP**

<b>Name</b>	<b>Organization</b>	<b>Phone Number</b>
Daniel Armstrong	Wilbur Smith	584-8584
Rusty Baksa	Land Dev. Solutions	671-2281
Kim Henry Begg	SITE, inc.	693-5010
Mark Best	TDOT	594-9170
Alan Childers	Cannon & Cannon	988-4818
Steve Drummer	Barge Waggoner	637-2810
Mark Geldmeier	City of Knoxville	215-6100
John Gould	Wilbur Smith	584-8584
Barbara Hatcher	SITE, inc.	693-5010
John Heid	AR/TEC	681-8848
Bill Kervin	Allen Hoshall	694-1834
Hollis Loveday	Wilbur Smith	584-8584
David McGinley	City of Knoxville	215-2148
David Moore	TDOT	594-9170
Linda Mosch	Consultant	777-2025
Amanda Rule	TDOT	594-9170
Cindy Pionke	Knox County	215-5800
Pam Porter	TDOT	594-9170
John Sexton	Allen Hoshall	694-1834
Jim Snowden	Knox County	215-5800
Darcy Sullivan	SITE, inc.	693-5010
Jeff Welch	MPC	215-2500

## **KNOX COUNTY**

### **LOCAL APARTMENT TRIP GENERATION STUDY**

#### **PURPOSE**

A Traffic Impact Study (TIS) is currently required in Knox County when a proposed development is projected to generate in excess of 750 trips per day. The determinations of when the threshold is met as well as all subsequent analyses in the TIS are performed using the rates and equations given in the Institute of Transportation Engineers (ITE) Trip Generation Manual. Local governmental agencies rely heavily on the accuracy of these trip generation rates in order to correctly predict the impacts of a proposed development on the transportation system. Therefore, in certain instances, it is logical to verify whether the "national" rates and equations given in the ITE Trip Generation Manual are appropriate for use in a specific local area or region.

The decision was made to study the local trip-making characteristics of apartments because of the discrepancy between the trip generation rates for apartments and single family residential land uses as given in the ITE Trip Generation Manual. While these two land uses are similar in nature, the Trip Generation Manual predicts about three less trips per dwelling unit generated by apartments for the average weekday. Additionally the Trip Generation Manual points out that due to the age of their database, which dates back to the 1960's, "the rates for apartments probably had changed over time". It is also assumed that some of the ITE data had come from larger metropolitan areas with denser development and greater transit use than Knox County, which would contribute to lower trip generation rates. Therefore, this study will be used to either verify the rates given in the Trip Generation Manual or generate new ones that can be applied to locally proposed apartment developments.

#### **PROCEDURE**

The procedures recommended by ITE in conducting local trip generation studies were generally followed for this study, along with some important assumptions that have made. ITE has published a proposed recommended practice entitled "Trip Generation Handbook" which specifically outlines procedures for conducting local trip generation studies and establishing new rates and equations.

The first step in the study was to define the number and location of the sites to be studied, as well as the counting methodology. Initially 14 sites were selected, although one apartment complex – the College Park Apartments – was later omitted due to uncharacteristically high traffic generation numbers. The number of sites used in this study far exceeds the recommended minimum amount suggested by ITE, which is five sites. Traffic counts were taken for week-long periods at 15-minute intervals between July 22, 1996 and August 9, 1996 at the access points to the apartment complexes. A Technical Appendix to this report contains the traffic count data collected at each apartment complex.



## RESULTS

The traffic count data was analyzed using spreadsheets in order to determine the weighted average rates and regression equations. In order to be considered valid, the local rates and equations for each time period of analysis that were generated must meet certain statistical criteria. First, the standard deviation of the independent variable (dwelling units) should be no more than 110 percent of the weighted average rate; and secondly, the regression equations require a computed coefficient of determination ( $R^2$ ) value of at least 0.75 before good data fit is indicated. This statistical criteria is met by the local data results, and in fact it often exceeds the level of data fit given by their counterparts in the ITE Trip Generation Manual. Finally, in order to simplify the use of the local data, plots were generated that appear identical to the actual ones in the ITE Trip Generation Manual.

The resulting rates and equations calculated from the local data indicate that the average weekday trip generation of apartments in this area is well above the national rates reported in the ITE manual. For example, the locally computed average rate for number of trips generated during a weekday is 35% higher than the rate given by ITE (increase from 6.63 trips per dwelling unit to 9.03 trips per dwelling unit). The trip generation rates do not increase as much for the AM and PM peak hours however. The local rate is roughly 8% higher for the AM peak, and 16% higher for the PM peak. The plots from the ITE Trip Generation Manual are included in the Technical Appendix for comparison purposes.

## ASSUMPTIONS MADE

Some important assumptions have been made which may affect the results of the local data that was collected:

- It is important to note that the local trip generation rates were computed for the *total* number of dwelling units in the apartment complex, and not necessarily for the number of *occupied* dwelling units. There are several reasons why this was done, chiefly because of the need for comparability with the rates given in ITE Trip Generation Manual, as it does not specify whether the dwelling units are occupied. According to ITE procedures the selected sites must only be of “reasonably full occupancy (i.e. at least 85%)”. The Apartment Association of Greater Knoxville (AAGK) publishes quarterly reports on occupancy levels of apartment complexes, and the report covering the period of the data collection was reviewed to determine occupancy levels. According to the AAGK report from July 1, 1996 – September 30, 1996 all of the apartment complexes surveyed in this study met the minimum 85% occupancy level, with an average occupancy rate for all sites studied of 94%.
- The count data that was collected at each apartment complex was used “raw” meaning that it was not factored for possible daily or seasonal variations. Once again, according to an ITE representative it is not known whether the data used in the Trip Generation Manual was factored or not, so therefore in order to be able to compare

local rates to those in the manual you must assume that count data should not be factored. Additionally, it was felt that apartment complexes would generally not be as susceptible to major seasonal fluctuations as other land uses might be. The local rates were also developed using count data that was collected and averaged over an entire week, which should limit some of the daily variations. Finally, reliable local daily and seasonal variation factors do not truly exist.

## CONCLUSION

The local apartment study methodology and results were distributed for comment to a group of local transportation professionals who are directly responsible for either preparing or reviewing traffic impact studies. A meeting was held between this group on February 16, 2000 in order to gather comments and discuss the study in greater detail. The following conclusions are based on the discussion and consensus reached at this meeting:

1. The trip generation rates and equations meet statistical requirements and resulted from a study that followed accepted procedures; therefore they should be adopted for future use. Furthermore, the rates and equations are recommended for use in reviewing the traffic impact of any development termed as “multi-family”, such as townhouse and condominium developments due to their similarity to apartment complexes.
2. The Traffic Access and Impact Study Guidelines and Procedures adopted by MPC should be amended with the language that local data should be used when available, which will allow the implementation of these new multi-family trip generation rates.
3. The following suggestions were made for future consideration:
  - This study should be updated with data collected from local townhouse and condominium developments in order to further justify the use of the new trip generation rates.
  - A statistical comparison should be made between any newly developed rates and the ITE single family trip generation rates to determine if there is a significant difference. If there is no difference then perhaps ITE single-family rates could be used for any residential development proposed in Knox County.



# Local Apartment Trip Generation Study

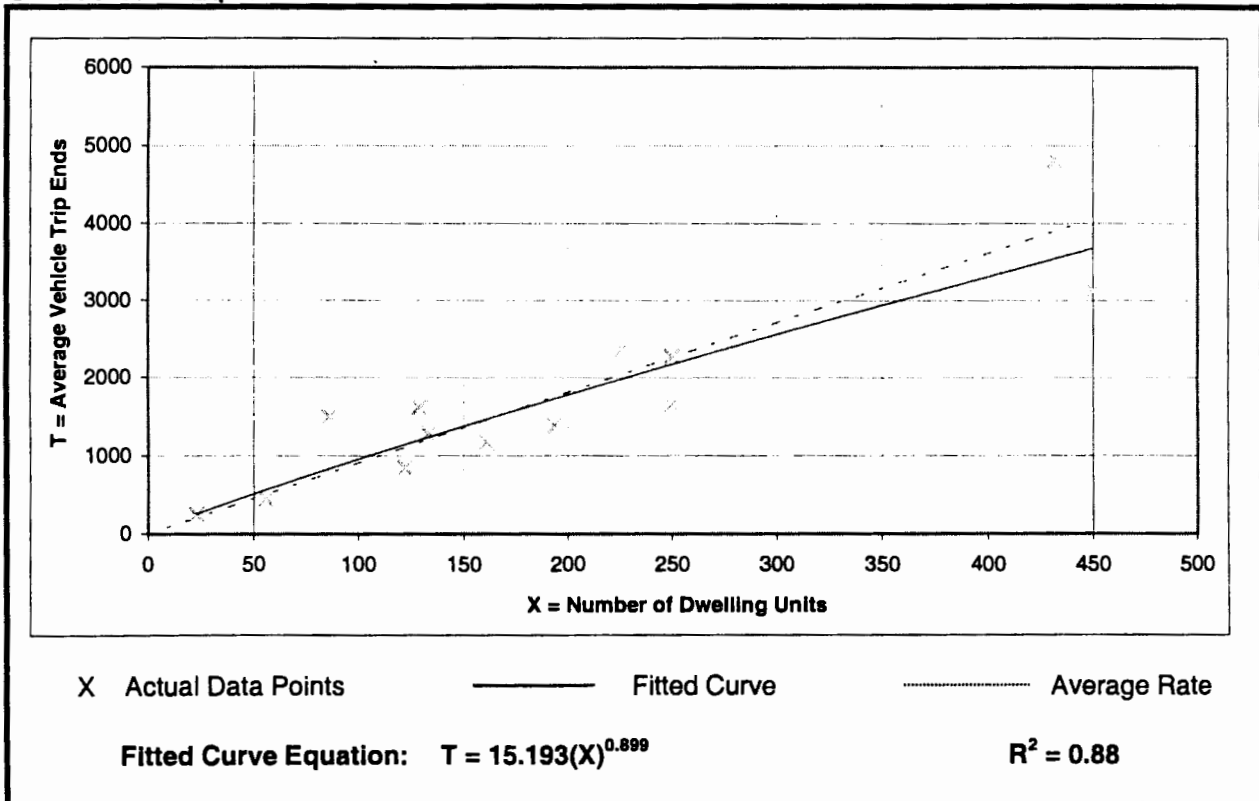
Average Vehicle Trip Ends vs: Dwelling Units  
On a: Weekday

Number of Studies: 13  
Average Number of Dwelling Units: 193  
Directional Distribution: 50% entering, 50% exiting

## Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
9.03	6.59 - 17.41	2.47

## Data Plot and Equation



# Local Apartment Trip Generation Study

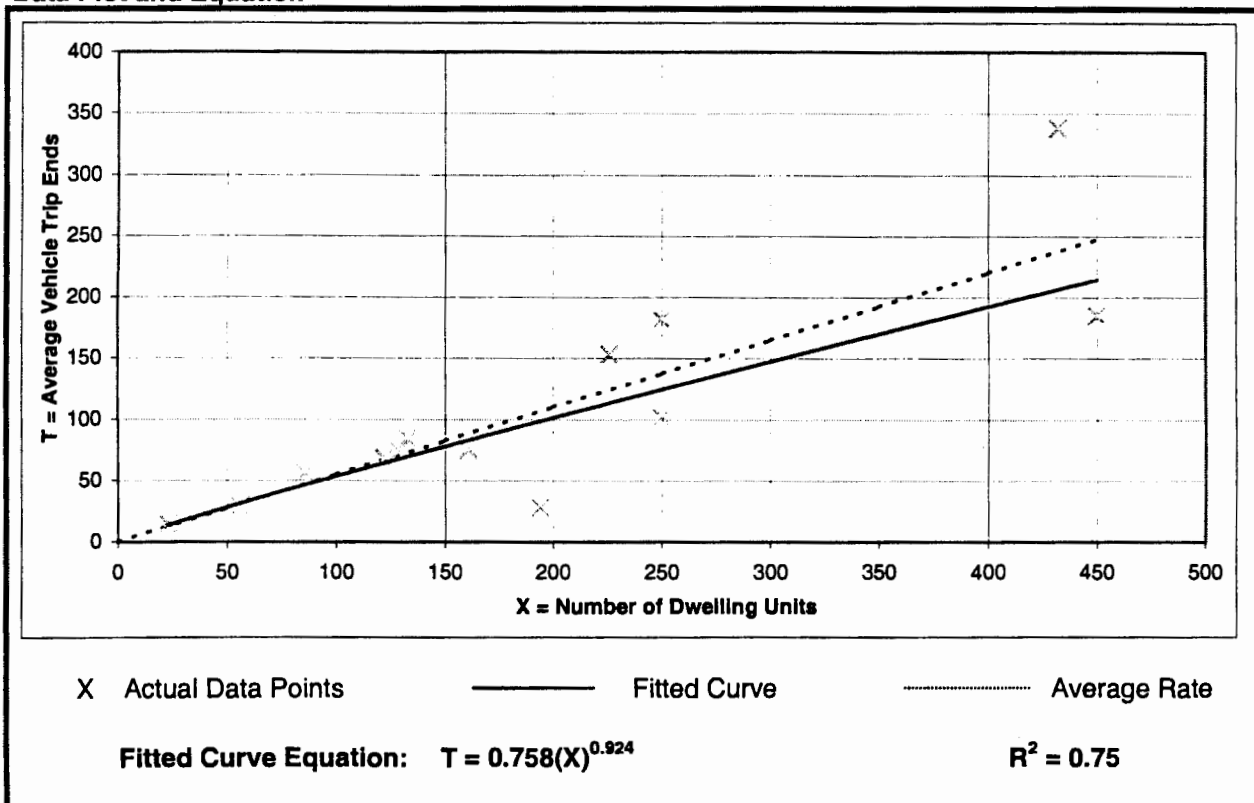
Average Vehicle Trip Ends vs: Dwelling Units  
On a: Weekday,  
Peak Hour of Adjacent Street Traffic,  
One Hour Between 7 and 9 a.m.

Number of Studies: 13  
Average Number of Dwelling Units: 193  
Directional Distribution: 22% entering, 78% exiting

## Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.55	0.14 - 0.78	0.18

## Data Plot and Equation



# Local Apartment Trip Generation Study

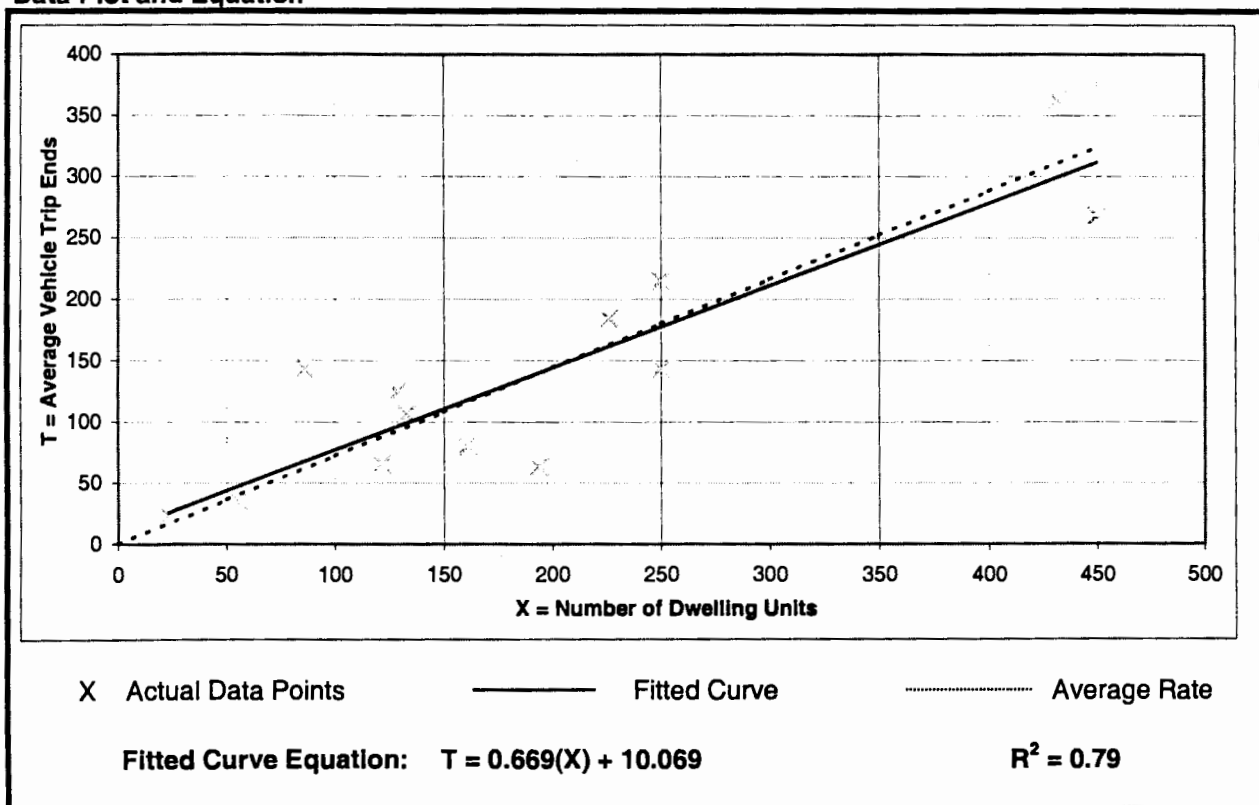
**Average Vehicle Trip Ends vs:** Dwelling Units  
**On a:** Weekday,  
 Peak Hour of Adjacent Street Traffic,  
 One Hour Between 4 and 6 p.m.

Number of Studies: 13  
 Average Number of Dwelling Units: 193  
 Directional Distribution: 55% entering, 45% exiting

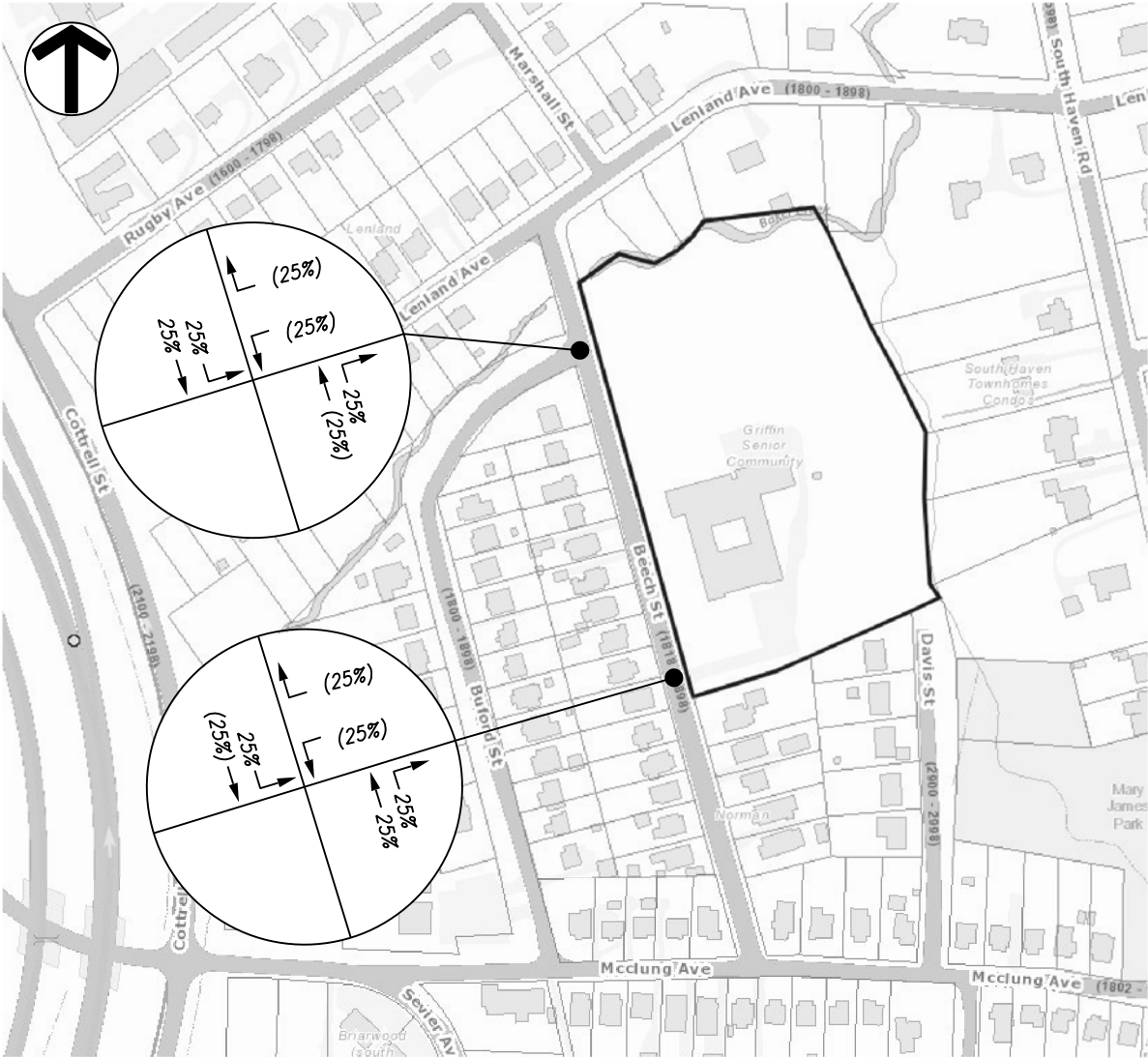
## Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.72	0.32 - 1.66	0.25

## Data Plot and Equation



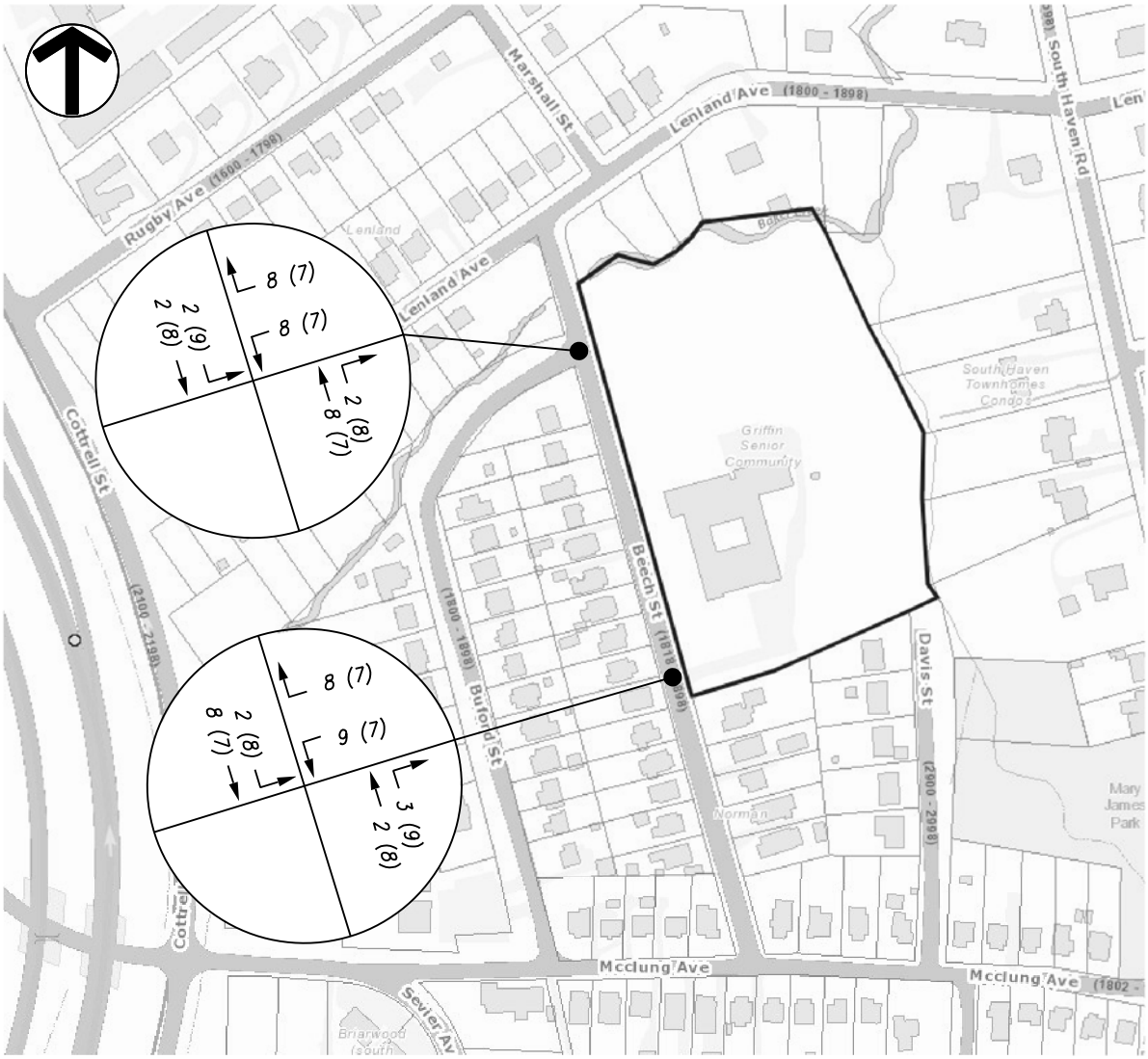




**LEGEND:**

← 50% (50%)      TRIP DISTRIBUTION ENTER (EXIT)

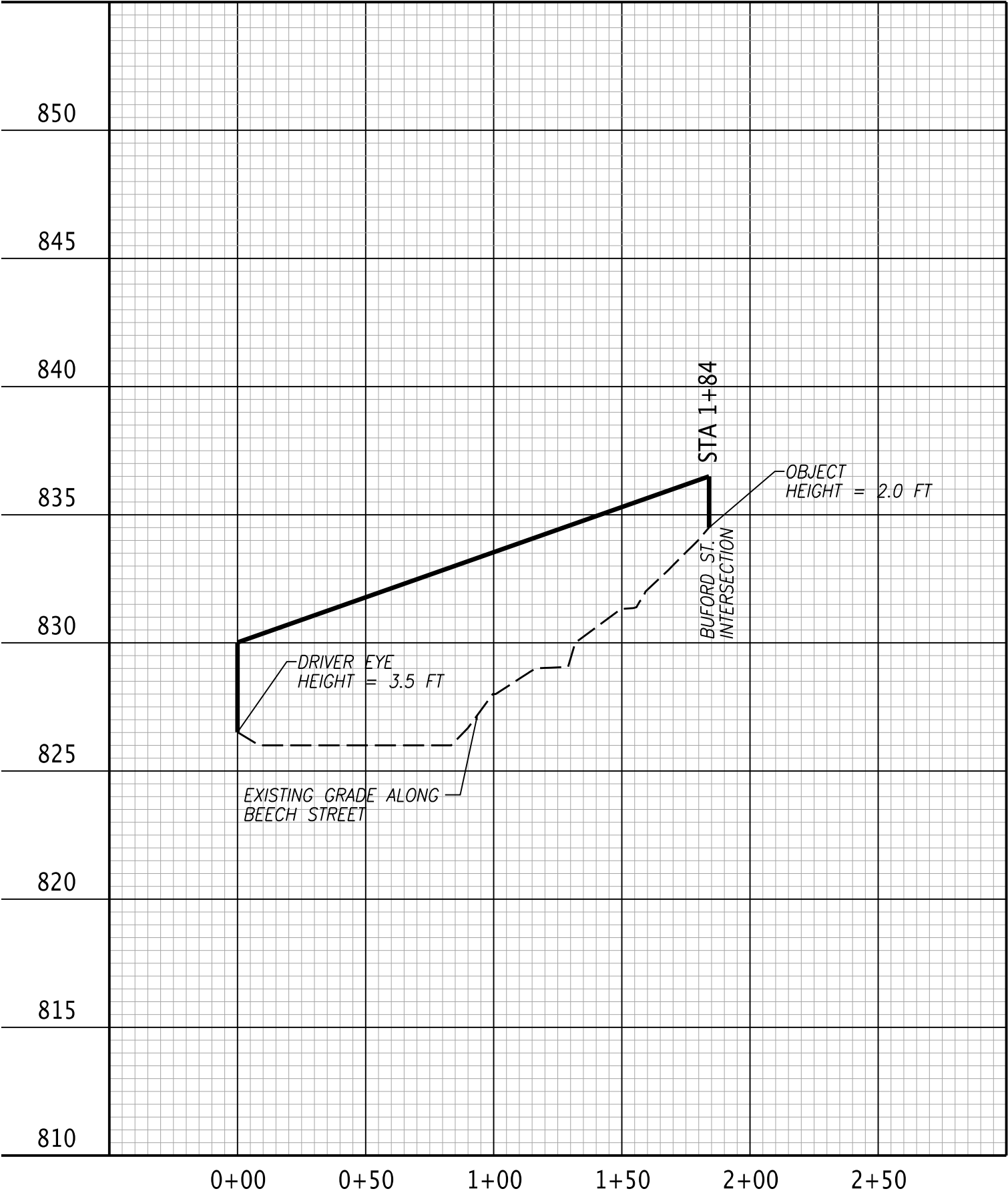
Figure 1: Peak Hour Trip Distribution



**LEGEND:**

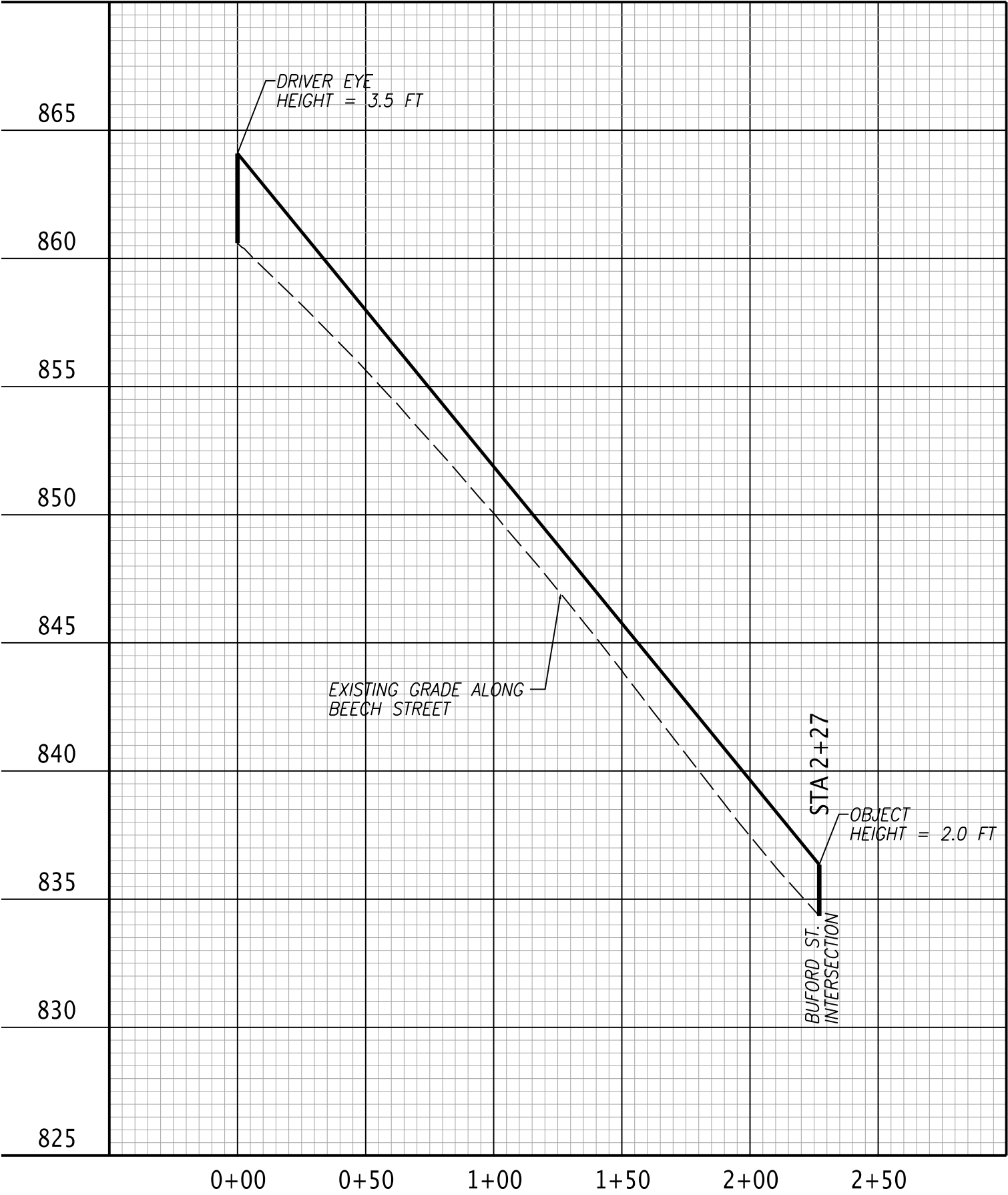
← 123 (23)      TURNING MOVEMENT VOLUME AM (PM)

Figure 2: Peak Hour Site Traffic



STOPPING SIGHT DISTANCE PROFILE – BEECH STREET / BUFORD ST – NORTHERN APPROACH

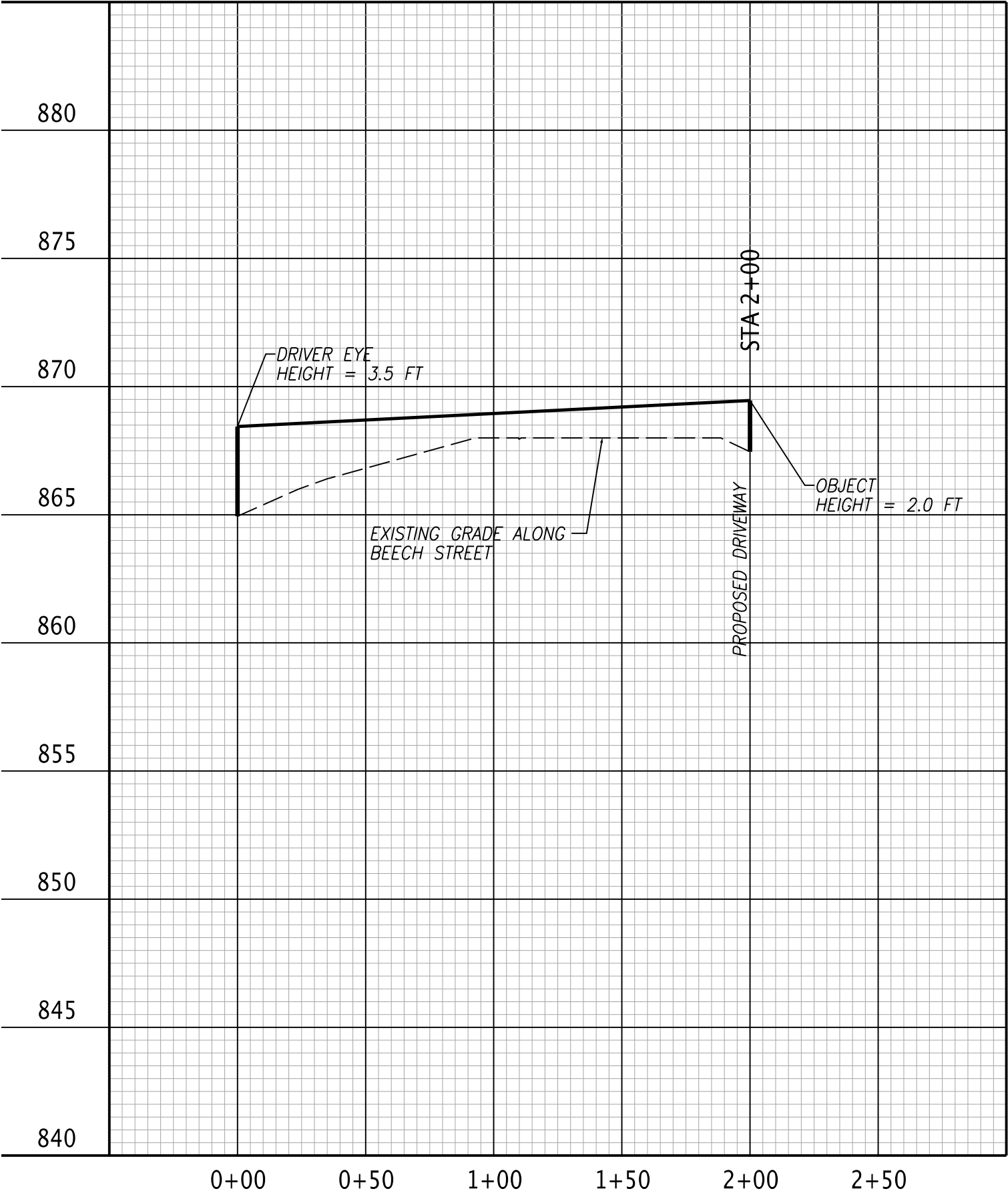
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1"=5' VERT



STOPPING SIGHT DISTANCE PROFILE – BEECH STREET / BUFORD ST – SOUTHERN APPROACH

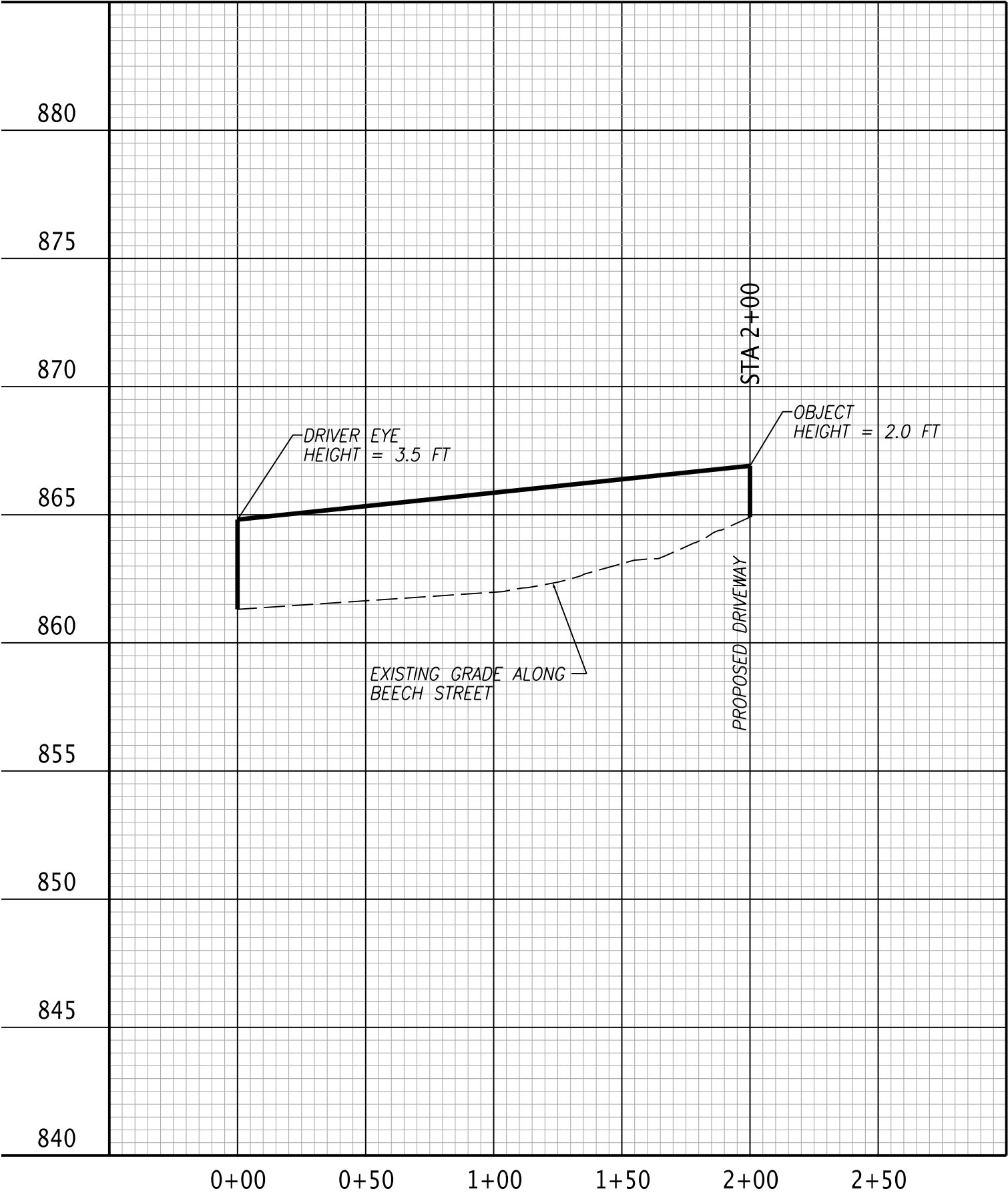
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1"=5' VERT





STOPPING SIGHT DISTANCE PROFILE – BEECH STREET / DRIVEWAY – NORTHERN APPROACH

SCALE: 1"=50' HORIZ  
1"=5' VERT



STOPPING SIGHT DISTANCE PROFILE – BEECH STREET / DRIVEWAY – SOUTHERN APPROACH

SCALE: 1"=50' HORIZ  
1"=5' VERT