23 April 2024

Grant Webster
Transportation Planner
Transportation and Mobility Department
1700 Convention Center Drive, Miami Beach, Florida 33139

Re: Traffic Generation Statement
1525 Lenox Avenue Residential Development
Miami Beach Land Use Board No.: HPB23-0605
Langan Project No.: 300335101

Dear Mr. Webster:

Langan Engineering & Environmental Services, Inc. prepared this traffic-generation statement for the proposed 6-unit residential development at 1525 Lenox Avenue in Miami Beach, Florida. We determined that the proposed development is not expected generate any additional traffic compared to the existing use on site. The expected ingress volumes do not warrant the need for exclusive turn lanes at the project's main driveway. This letter report includes daily and peak-hour trip-generation calculations for the development, and peak hour driveway volumes. **Figure 1** shows an aerial photograph of the site location.

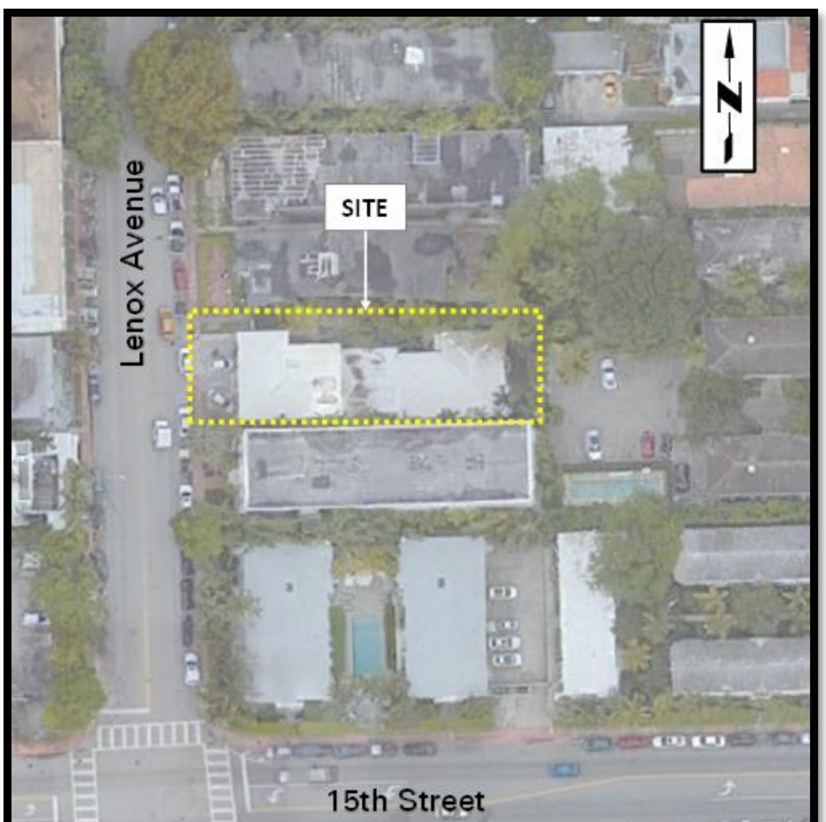

Figure 1: Site Aerial Photograph

Project Description

The proposed development comprises of a multifamily (low-rise) residential building with six (6) dwelling units that is expected to be built by 2027. The site is currently occupied by a two-story residential building with six (6) units. The proposed development will demolish the existing building to construct a three-story residential building with six (6) residential units. The 0.18-acre site (Folio Number 02-3234-151-0001) is located east of Lenox Avenue between 15th and 16th streets in Miami Beach, Florida. The development will have access through one full-access driveway connection to Lenox Avenue. Attachment A contains the site plan showing the proposed development program and driveway connection.

Trip Generation Analysis

The proposed development is expected to generate zero (0) daily, morning peak-hour, and afternoon peak-hour net-new trips when compared to the existing land use. We prepared trip-generation estimates for the existing and proposed development, summarized in **Table 1**, using equations from the 11th Edition of the ITE *Trip Generation Manual*. To provide a conservative analysis, we did not apply a multimodal reduction factor. Attachment B contains excerpts from the ITE manual.

Table 1 - Trip Generation Estimates

Use	Size	Daily	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
			In	Out	Total	In	Out	Total
Existing Uses								
Multifamily Housing (Low-Rise)	6 DU	40	1	2	3	2	1	3
Proposed Uses								
Multifamily Housing (Low-Rise)	6 DU	40	1	2	3	2	1	3
Net New Trips		**0**	**0**	**0**	**0**	**0**	**0**	**0**

Project Traffic Distribution

We determined the directional distribution of site-generated trips based on the cardinal distribution data for TAZ 642 from the Miami-Dade County 2045 Transportation Model (see Attachment C) and from the development's access to the surrounding roadway network. Project traffic was assigned 59% north and 41% south based on the TAZ data and the surrounding roadway network. We interpolated the 2015 and 2045 directional-distribution values from the model data to develop 2027 percentages. **Table 2** shows the proposed development's trip-distribution percentages.

Table 2 - Cardinal Distribution

Year	NNE	ENE	ESE	SSE	SSW	WSW	WNW	NNW
2015	16.40%	12.50%	1.00%	11.20%	4.10%	23.90%	17.40%	13.50%
2045	14.60%	10.30%	1.00%	8.30%	3.70%	29.80%	18.40%	14.00%
2027	**15.68%**	**11.62%**	**1.00%**	**10.04%**	**3.94%**	**26.26%**	**17.80%**	**13.70%**

Driveway Analysis & Turn Lane Analysis

The development will have access through a full-access driveway connection to Lenox Avenue. The proposed development is expected to generate at most one (1) left turn and one (1) right turn into the driveway connection during peak hours. We performed left-turn and right-turn warrant analyses and found that the development traffic does not warrant a left-turn or right-turn lane. The warrant analyses were based on the latest FDOT Access Management Guidelines and using 24-hour ATR count data collected at Lenox Avenue in front of the project site on January 9, 2024. The data was adjusted by a 1.06 peak season factor to convert the data into peak season volumes and was then grown to 2027 based on a 0.5% growth factor to estimate 2027 volumes along Lenox Avenue. Additionally, the driveway is proposed to be 12 feet wide and will accommodate one vehicle at a time. This is not expected to impact operations of the driveway and Lenox Avenue due to the expected low volumes of traffic generated by the proposed development. Attachment C includes the data and warrant analysis. **Figure 2** below shows the site-driveway peak-hour volumes.

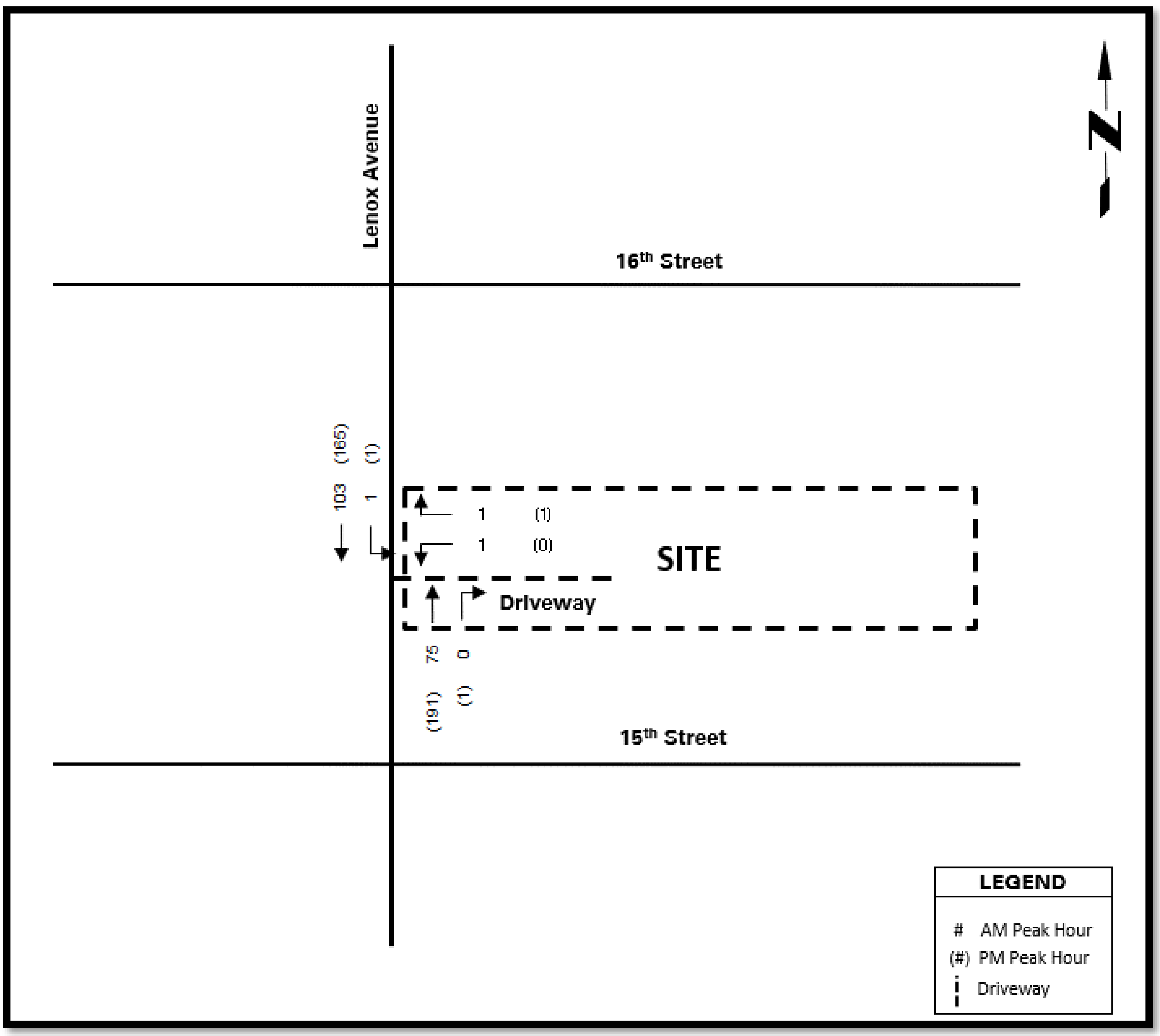

Figure 2: Driveway Volumes Figure

Queuing Analysis

The site driveway will have a proposed entry gate to be used by residents. A queuing analysis was performed for this gate-controlled entrance, and we found that it will not cause entering traffic to spill back into public roadways (Lenox Avenue). The site plan shows the location of the gated-controlled entrance.

We used the queuing-analysis methodology from Transportation and Land Development published by the ITE. This methodology requires hourly rates of vehicle arrival and service times for each gate-controlled driveway to determine vehicle queue lengths. The queues resulting from this analysis are 95th percentile queues, which are those expected to be generated 95 percent of the time. The vehicle arrival rate was based on the project's peak-hour trip generation, summarized in Table 1. The development is expected to generate 2 afternoon peak-hour entering trips. We used the afternoon peak-hour values because they were higher than morning peak-hour values. Visitors are not expected to use the driveway and gate, as visitor parking is not provided on site. Therefore, visitors were not factored into the analysis.

The developer confirmed that the gate operation will have access control barriers with gate arms that operate vertically for each lane. The resident lanes will operate by remote control. We collected service times at the gated entrance of the Fiji at the Oasis residential development, which operates with the same type of gate equipment proposed by the developer. The data was collected on Wednesday, September 18, 2019, between 3:30 and 6:00 PM. The service-time data is included in Attachment D and shows that the average service time was three seconds for the resident's lane. To be conservative, we used the maximum service time of 60 seconds for the resident's lane. Vehicle lengths of 25 feet were used to convert the number of vehicles to linear feet.

Table 3 summarizes the results of the queuing analysis and indicates that queues for the proposed gated entrance are not expected to exceed one vehicle and will not exceed vehicle-storage capacity at the entrance. The gated entrance on Lenox Avenue will provide vehicle-storage capacity of 31 feet for residents. Attachment D contains excerpts from the ITE and the queuing analysis calculations.

Table 3 - Queuing Analysis Summary

Entrance	Entrance Type	Storage Capacity (feet)	95th Percentile Queue Length		Exceeds Capacity?
			Vehicles	Feet	
Lenox Avenue	Resident	31	1	25	**NO**

Loading Operations

The proposed development will have on-street trash pick-up, which is similar to all developments along Lenox Avenue. As such, trash trucks will not be required to enter or exit the site and all trash bins will be rolled out onto Lenox Avenue by on-site personnel. Therefore, we only prepared a maneuverability analysis for passenger vehicles to demonstrate that there are no maneuverability deficiencies. Attachment E includes the maneuverability analysis plans.

Multimodal Evaluation Analysis

The site is approximately a three-minute walk to the nearest bus stop located at Alton Road and 15th Street and a two-minute walk to the nearest Citi Bike stand at 15th Street and Lenox Court. There are existing sidewalks on both sides of the road and crosswalks on most roadways in proximity of the site. This provides high pedestrian connectivity to the surrounding neighborhood, retail developments, Citi Bike stand, and bus stops. Bike lanes are also provided on nearby roadways including 16th Street, 17th Street, West Avenue, and Euclid Avenue. Attachment F shows pedestrian access to the site and contains a copy of the transit route maps.

Transportation Demand Management Strategies

The proposed development will be within a dense urban area with access to public transportation and pedestrian infrastructure allowing the use of the available multimodal transportation systems provided in the area. The development will provide a covered bike room with 10 bike parking spaces. In addition, the development will provide Miami-Dade Transit bus route and Citi Bike information in or near the main lobby to promote the use of public transportation. Appendix D contains information regarding Miami-Dade bus routes.

The development's proposed TDM strategies will encourage and support the use of the available transportation systems. The most important action will be doing a regular outreach to provide residents with multiple commute options and establish preferences to target TDM efforts. **Table 6** summarizes the proposed TDM strategies.

Table 6 - Proposed TDM Strategies

Action	Details
Education, Marketing, and Outreach	Offer new residents a packet of materials and/or provide personal consultation detailing sustainable (non-SOV) travel options.
Travel Mapping	Transit route maps and schedules will be made available on site to residents and visitors.
Bike Facility	Covered bike room with 10 bike parking spaces

Conclusion

We determined that the proposed 1525 Lenox Avenue residential development will not generate any additional traffic compared to the existing use on site. The expected ingress volumes do not warrant the need for any exclusive turn lanes, and the proposed gate-controlled entrance will not cause queues to back up into public roadways. Please contact me at (954) 320-2155 with any questions or comments.

Sincerely,
Langan Engineering and Environmental Services, Inc.

MAXIMO G. POLANCO
LICENSE
No. 91355
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

This item has been digitally signed and sealed by Maximo Polanco, PE on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Maximo G Polanco

Digitally signed by Maximo G Polanco
DN: CN=Maximo G Polanco, dnQualifier=A01410D00000186E085EAE8000103B9, O=LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES INC, C=US
Reason: I am the author of this document
Date: 2024.04.23 14:09:10-04'00'

Maximo G. Polanco, P.E.
P.E. License No. 91355
Senior Project Engineer

Eric Schwarz, P.E., LEED AP
Principal/Vice President

MGP:mgp

Attachments:

- Attachment A – Site Plan
- Attachment B – ITE Excerpts
- Attachment C – Traffic & Distribution Data
- Attachment D – Queueing Analysis
- Attachment E – Maneuverability Analysis Plans
- Attachment F – Multimodal Evaluation

Florida Certificate of Authorization No. 6601

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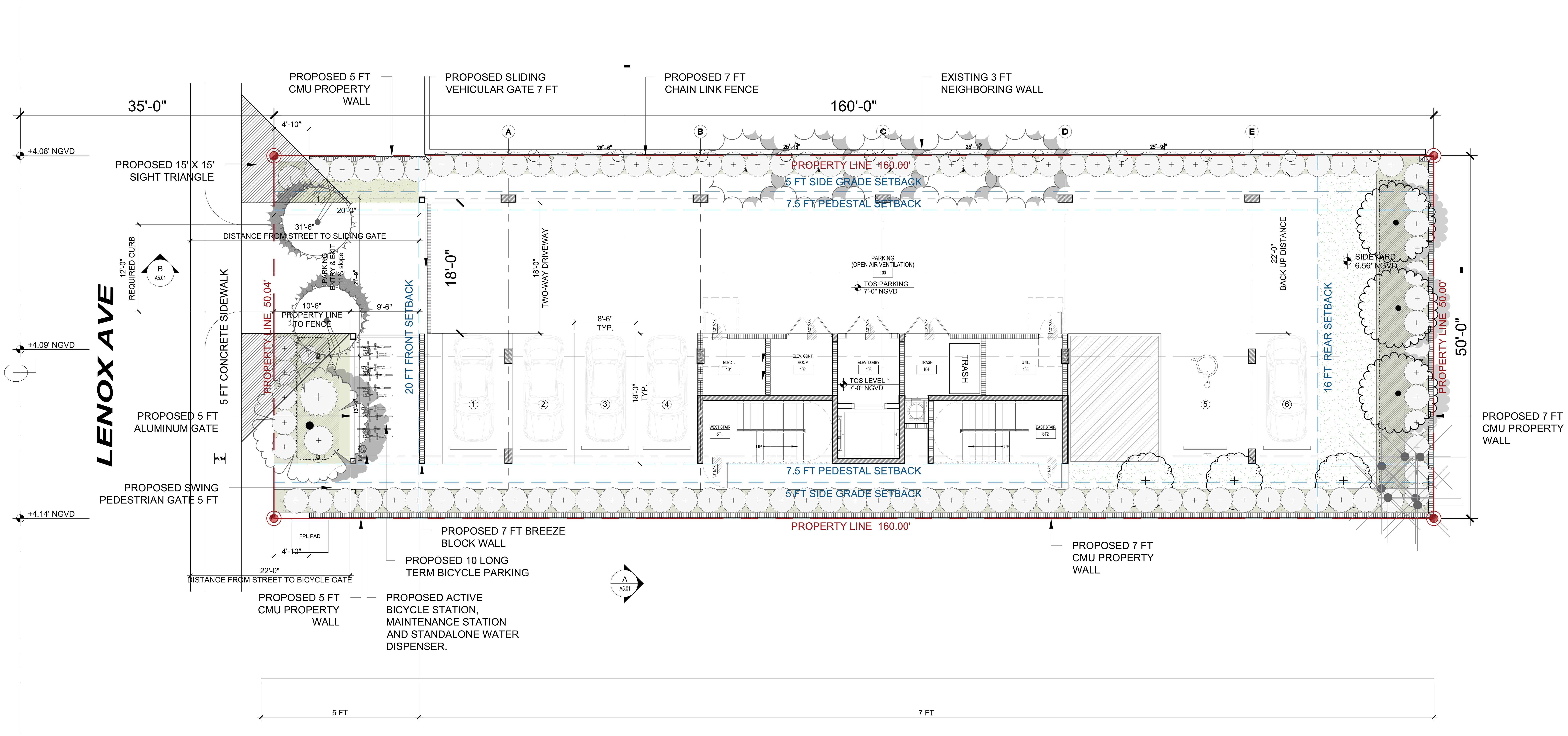
ATTACHMENT A
SITE PLAN

04/19/2024



1 SITE PLAN
SCALE: 1/8" = 1'-0"

Rev.	Date	Rev.	Date

HISTORIC PRESERVATION BOARD

FIRST SUBMITTAL

RESIDENTIAL

1525 LENOX AVE
MIAMI, FLORIDA 33139

Owner:
PRIVATE

Landscape Architect
VDF Vincent Filigenzi Design
888 Biscayne Blvd,
Miami, Florida 33132 USA
Tel: +1 (305) 766 5004
Email: vincent@vincentfiligenzi.com

Consultant:
Name:
Address:
Address:
Tel:
Email:

Consultant:
Name:
Address:
Address:
Tel:
Email:

Consultant:
Name:
Address:
Address:
Tel:
Email:

Architect:
Kobi Karp Architecture and Interior Design, Inc.
571 NW 28th St
Miami, Florida 33127 USA
Tel: +1(305) 573 1818
Fax: +1(305) 573 3766

KOBI KARP
Lic. # AR0012578

KOBI KARP

SITE PLAN

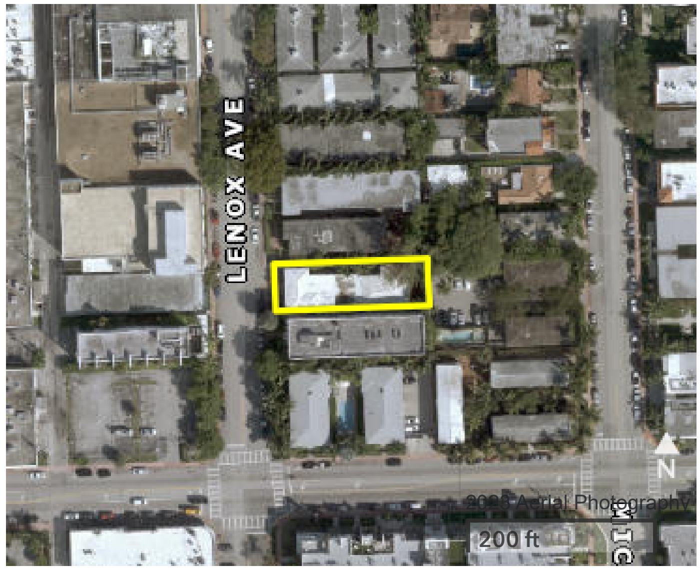
Date	04/12/24	Sheet No.
Scale	AS MENTIONED	A2.01
Project	2334	

OFFICE OF THE PROPERTY APPRAISER

Summary Report

Generated On: 01/17/2024

PROPERTY INFORMATION	
Folio	02-3234-151-0001 **(Reference)**
Property Address	0 , FL
Owner	REFERENCE ONLY
Mailing Address	
Primary Zone	3900 MULTI-FAMILY - 38-62 U/A
Primary Land Use	0000 REFERENCE FOLIO
Beds / Baths /Half	0 / 0 / 0
Floors	0
Living Units	0
Actual Area	0 Sq.Ft
Living Area	0 Sq.Ft
Adjusted Area	0 Sq.Ft
Lot Size	0 Sq.Ft
Year Built	0



ASSESSMENT INFORMATION			
Year	**2023**	**2022**	**2021**
Land Value	$0	$0	$0
Building Value	$0	$0	$0
Extra Feature Value	$0	$0	$0
Market Value	$0	$0	$0
Assessed Value	$0	$0	$0

TAXABLE VALUE INFORMATION			
Year	**2023**	**2022**	**2021**
COUNTY			
Exemption Value	$0	$0	$0
Taxable Value	$0	$0	$0
SCHOOL BOARD			
Exemption Value	$0	$0	$0
Taxable Value	$0	$0	$0
CITY			
Exemption Value	$0	$0	$0
Taxable Value	$0	$0	$0
REGIONAL			
Exemption Value	$0	$0	$0
Taxable Value	$0	$0	$0

BENEFITS INFORMATION				
Benefit	**Type**	**2023**	**2022**	**2021**

Note: Not all benefits are applicable to all Taxable Values (i.e. County, School Board, City, Regional).

SHORT LEGAL DESCRIPTION
LINCOLN MEWS CONDO
LINCOLN SUB PB 9-69
LOT 17 BLK 64
LOT SIZE 8000 SQ FT
F/A/U 02-3234-002-1680

SALES INFORMATION			
Previous Sale	**Price**	**OR Book-Page**	**Qualification Description**

APPENDIX B
ITE EXCERPTS

TRIP GENERATION ANALYSIS
1525 LENOX AVENUE RESIDENTIAL DEVELOPMENT

DAILY

Land Use	ITE Code	Size	Trip Generation Rate	In	Out	Total Trips In	Total Trips Out	Total Trips Total
Existing Uses Multifamily Housing (Low-Rise)	220	6 DU	T = 6.74 (X)	50%	50%	20	20	40
Proposed Uses Multifamily Housing (Low-Rise)	220	6 DU	T = 6.74 (X)	50%	50%	20	20	40
					Difference	**0**	**0**	**0**

MORNING PEAK HOUR

Land Use	ITE Code	Size	Trip Generation Rate	In	Out	Total Trips In	Total Trips Out	Total Trips Total
Existing Uses Multifamily Housing (Low-Rise)	220	6 DU	T = 0.40 (X)	24%	76%	1	2	3
Proposed Uses Multifamily Housing (Low-Rise)	220	6 DU	T = 0.40 (X)	24%	76%	1	2	3
					Difference	**0**	**0**	**0**

AFTERNOON PEAK HOUR

Land Use	ITE Code	Size	Trip Generation Rate	In	Out	Total Trips In	Total Trips Out	Total Trips Total
Existing Uses Multifamily Housing (Low-Rise)	220	6 DU	T = 0.51 (X)	63%	37%	2	1	3
Proposed Uses Multifamily Housing (Low-Rise)	220	6 DU	T = 0.51 (X)	63%	37%	2	1	3
					Difference	**0**	**0**	**0**

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

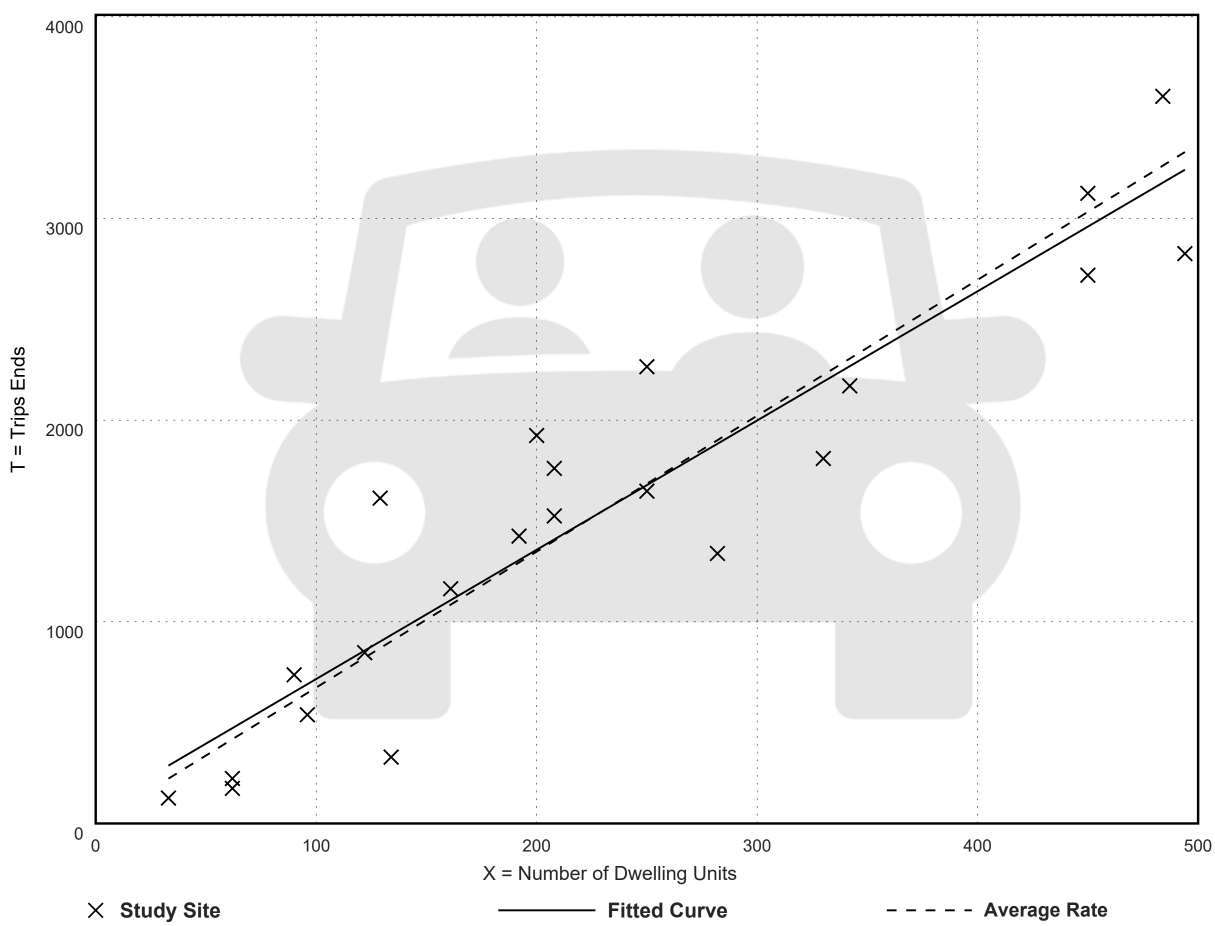
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 22
Avg. Num. of Dwelling Units: 229
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
6.74	2.46 - 12.50	1.79

Data Plot and Equation



Fitted Curve Equation: T = 6.41(X) + 75.31 **R^2= 0.86**

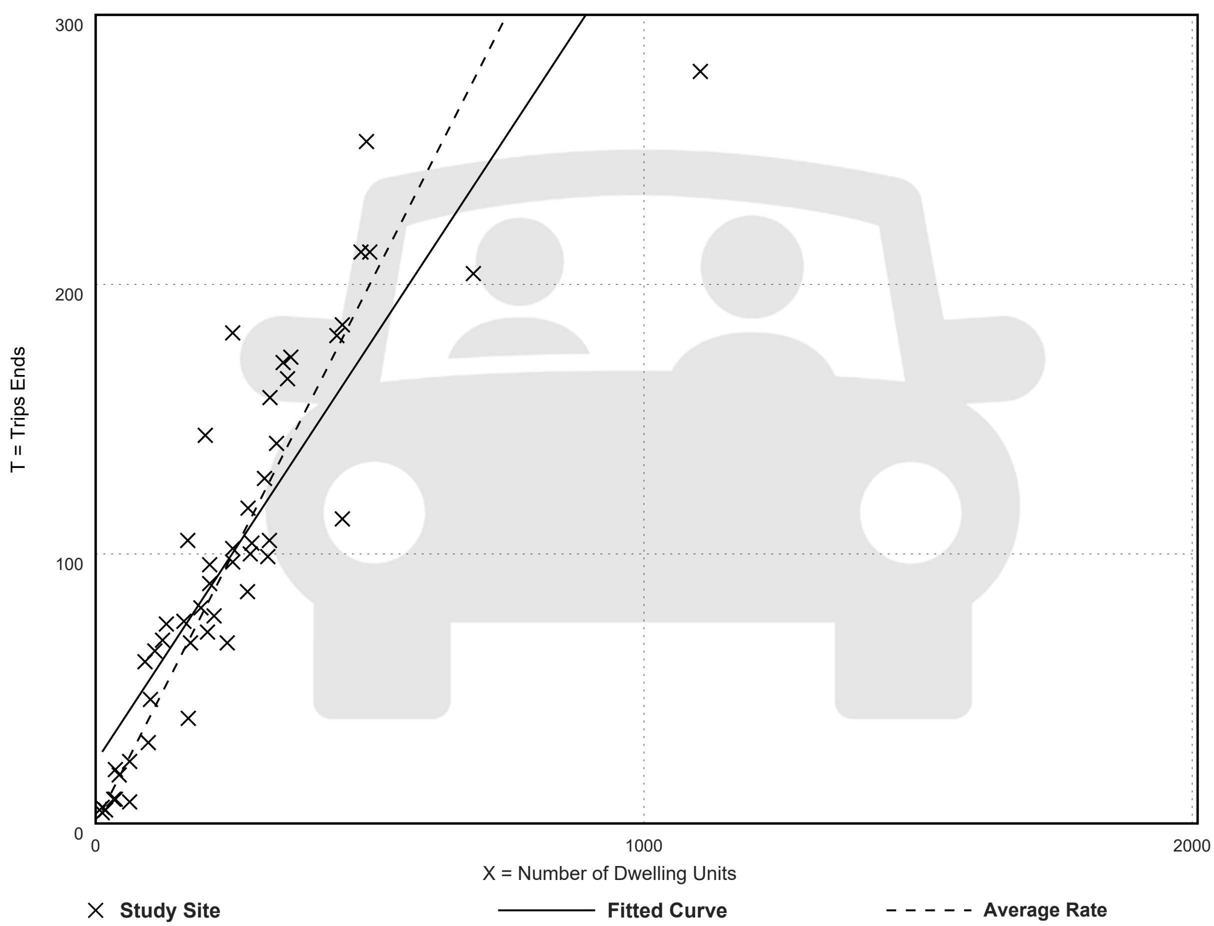
Multifamily Housing (Low-Rise)
Not Close to Rail Transit (220)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 49
Avg. Num. of Dwelling Units: 249
Directional Distribution: 24% entering, 76% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.40	0.13 - 0.73	0.12

Data Plot and Equation



Fitted Curve Equation: T = 0.31(X) + 22.85

R^2= 0.79

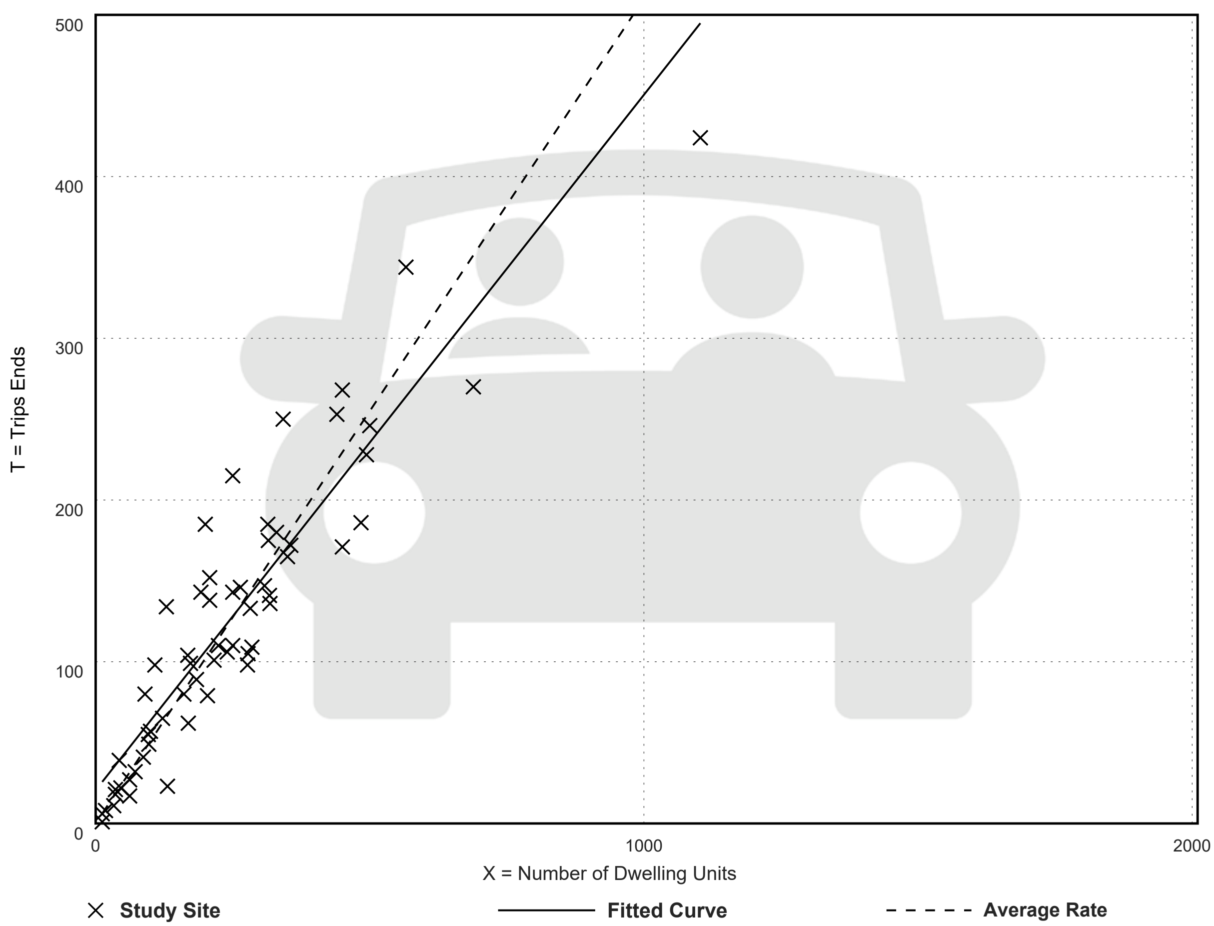
Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 59
Avg. Num. of Dwelling Units: 241
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.51	0.08 - 1.04	0.15

Data Plot and Equation



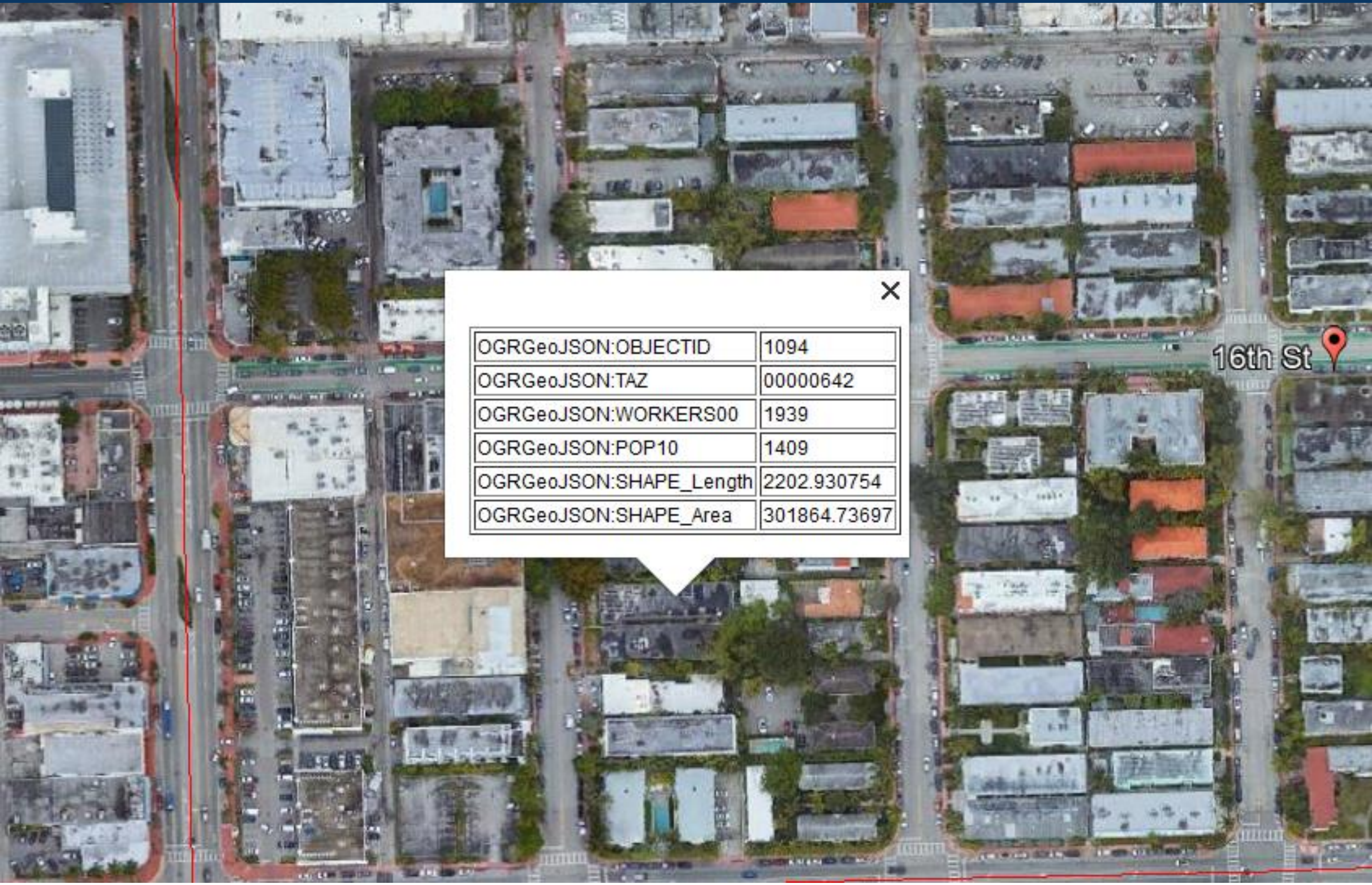
Fitted Curve Equation: T = 0.43(X) + 20.55 **R^2= 0.84**

APPENDIX C
TRAFFIC & DISTRIBUTION DATA

Miami-Dade 2015 Base Year Direction Trip Distribution Summary											
TAZ of Origin		Trips / Percent	Cardinal Directions								Total Trips
County TAZ	Regional TAZ		NNE	ENE	ESE	SSE	SSW	WSW	WNW	NNW	
625	3525	Trips	610	160	-	557	431	1,317	679	1,035	4,961
625	3525	Percent	12.7	3.3	-	11.6	9.0	27.5	14.2	21.6	
626	3526	Trips	122	-	-	-	2,090	2,277	1,198	2,942	9,399
626	3526	Percent	1.4	-	-	-	24.2	26.4	13.9	34.1	
627	3527	Trips	279	-	-	-	2,051	2,578	845	1,965	8,061
627	3527	Percent	3.6	-	-	-	26.6	33.4	11.0	25.5	
628	3528	Trips	298	-	49	79	984	902	332	679	3,579
628	3528	Percent	9.0	-	1.5	2.4	29.6	27.2	10.0	20.5	
629	3529	Trips	1,374	549	344	1,656	1,708	3,707	1,668	2,101	14,261
629	3529	Percent	10.5	4.2	2.6	12.6	13.0	28.3	12.7	16.0	
630	3530	Trips	952	-	210	347	1,696	2,375	794	1,114	8,135
630	3530	Percent	12.7	-	2.8	4.6	22.7	31.7	10.6	14.9	
631	3531	Trips	255	-	-	-	1,215	1,471	440	1,030	4,651
631	3531	Percent	5.8	-	-	-	27.6	33.4	10.0	23.4	
632	3532	Trips	309	-	-	-	1,242	1,751	750	635	4,880
632	3532	Percent	6.6	-	-	-	26.5	37.4	16.0	13.5	
633	3533	Trips	310	-	-	-	1,181	1,428	750	730	4,590
633	3533	Percent	7.0	-	-	-	26.9	32.5	17.1	16.6	
634	3534	Trips	1,502	112	240	837	1,718	1,928	976	1,727	9,998
634	3534	Percent	16.6	1.2	2.7	9.3	19.0	21.3	10.8	19.1	
635	3535	Trips	779	-	-	-	2,021	1,994	952	1,411	8,010
635	3535	Percent	10.9	-	-	-	28.2	27.9	13.3	19.7	
636	3536	Trips	1,041	-	-	686	1,152	2,072	911	1,071	7,384
636	3536	Percent	15.0	-	-	9.9	16.6	29.9	13.1	15.4	
637	3537	Trips	323	31	87	217	126	601	303	290	1,987
637	3537	Percent	16.4	1.6	4.4	11.0	6.4	30.4	15.3	14.7	
638	3538	Trips	152	35	87	86	114	218	162	126	999
638	3538	Percent	15.5	3.6	8.9	8.7	11.6	22.3	16.5	12.9	
639	3539	Trips	825	281	277	1,089	131	1,364	796	599	5,721
639	3539	Percent	15.4	5.2	5.2	20.3	2.4	25.4	14.9	11.2	
640	3540	Trips	344	247	868	104	43	685	405	274	3,053
640	3540	Percent	11.6	8.3	29.2	3.5	1.5	23.1	13.6	9.2	
641	3541	Trips	1,051	1,714	291	723	309	1,572	1,188	916	8,356
641	3541	Percent	13.5	22.1	3.7	9.3	4.0	20.3	15.3	11.8	
642	3542	Trips	1,849	1,404	115	1,263	457	2,697	1,962	1,518	12,299
642	3542	Percent	16.4	12.5	1.0	11.2	4.1	23.9	17.4	13.5	
643	3543	Trips	1,747	551	-	965	479	2,595	1,554	1,715	10,383
643	3543	Percent	18.2	5.7	-	10.1	5.0	27.0	16.2	17.9	
644	3544	Trips	2,022	-	-	-	2,250	4,141	2,585	2,646	15,224
644	3544	Percent	14.8	-	-	-	16.5	30.4	19.0	19.4	
645	3545	Trips	1,268	-	-	-	907	1,498	1,720	1,351	7,018
645	3545	Percent	18.8	-	-	-	13.5	22.2	25.5	20.0	
646	3546	Trips	986	-	156	520	250	1,081	1,094	1,181	5,470
646	3546	Percent	18.7	-	3.0	9.9	4.7	20.5	20.8	22.4	
647	3547	Trips	350	103	114	165	66	354	359	408	1,979
647	3547	Percent	18.2	5.4	5.9	8.6	3.5	18.5	18.7	21.2	
648	3548	Trips	1,027	434	254	401	48	903	1,001	514	4,747
648	3548	Percent	22.4	9.5	5.5	8.8	1.0	19.7	21.9	11.2	
649	3549	Trips	754	192	184	230	41	612	743	427	3,320
649	3549	Percent	23.7	6.0	5.8	7.2	1.3	19.2	23.3	13.4	
650	3550	Trips	45	80	104	0	14	155	304	133	850
650	3550	Percent	5.4	9.6	12.4	0.0	1.6	18.5	36.5	16.0	

Miami-Dade 2045 Cost Feasible Plan Direction Trip Distribution Summary											
TAZ of Origin		Trips / Percent	Cardinal Directions								Total Trips
County TAZ	Regional TAZ		NNE	ENE	ESE	SSE	SSW	WSW	WNW	NNW	
625	3525	Trips	515	114	-	541	802	1,791	829	1,096	5,972
625	3525	Percent	9.1	2.0	-	9.5	14.1	31.5	14.6	19.3	
626	3526	Trips	66	-	-	-	2,417	3,260	1,417	2,993	11,237
626	3526	Percent	0.7	-	-	-	23.8	32.1	14.0	29.5	
627	3527	Trips	174	-	-	-	2,276	3,212	1,138	1,885	9,055
627	3527	Percent	2.0	-	-	-	26.2	37.0	13.1	21.7	
628	3528	Trips	238	-	23	101	1,053	1,266	390	660	4,028
628	3528	Percent	6.4	-	0.6	2.7	28.2	33.9	10.5	17.7	
629	3529	Trips	1,686	621	373	1,692	1,801	6,032	2,362	2,490	18,425
629	3529	Percent	9.9	3.6	2.2	9.9	10.6	35.4	13.9	14.6	
630	3530	Trips	888	-	326	303	1,717	3,876	1,515	1,553	11,277
630	3530	Percent	8.7	-	3.2	3.0	16.9	38.1	14.9	15.3	
631	3531	Trips	296	-	-	-	1,351	2,360	838	1,324	6,591
631	3531	Percent	4.8	-	-	-	21.9	38.3	13.6	21.5	
632	3532	Trips	343	-	-	-	1,500	2,647	1,390	1,098	7,499
632	3532	Percent	4.9	-	-	-	21.5	37.9	19.9	15.7	
633	3533	Trips	368	-	-	-	1,052	1,986	859	841	5,391
633	3533	Percent	7.2	-	-	-	20.6	38.9	16.8	16.5	
634	3534	Trips	1,404	80	149	773	1,637	2,733	1,332	1,712	10,593
634	3534	Percent	14.3	0.8	1.5	7.9	16.7	27.8	13.6	17.4	
635	3535	Trips	566	-	-	-	1,311	2,266	1,228	1,254	7,246
635	3535	Percent	8.5	-	-	-	19.8	34.2	18.5	18.9	
636	3536	Trips	1,066	-	-	607	978	3,045	1,398	1,193	8,805
636	3536	Percent	12.9	-	-	7.3	11.8	36.8	16.9	14.4	
637	3537	Trips	468	44	144	315	198	868	501	309	2,865
637	3537	Percent	16.5	1.6	5.1	11.1	6.9	30.5	17.6	10.9	
638	3538	Trips	127	33	78	94	79	401	285	185	1,342
638	3538	Percent	9.9	2.6	6.1	7.3	6.2	31.3	22.2	14.5	
639	3539	Trips	944	303	253	1,068	176	2,395	1,085	905	7,569
639	3539	Percent	13.2	4.3	3.6	15.0	2.5	33.6	15.2	12.7	
640	3540	Trips	119	74	216	10	30	177	136	147	1,166
640	3540	Percent	13.1	8.2	23.7	1.1	3.4	19.4	14.9	16.2	
641	3541	Trips	1,145	1,056	206	569	242	2,378	1,724	1,142	9,066
641	3541	Percent	13.5	12.5	2.4	6.7	2.9	28.1	20.4	13.5	
642	3542	Trips	1,701	1,196	113	964	433	3,470	2,140	1,631	12,324
642	3542	Percent	14.6	10.3	1.0	8.3	3.7	29.8	18.4	14.0	
643	3543	Trips	1,884	580	-	1,133	631	3,768	2,190	2,157	13,183
643	3543	Percent	15.3	4.7	-	9.2	5.1	30.5	17.7	17.5	
644	3544	Trips	1,948	-	-	-	2,227	5,534	3,264	3,082	17,780
644	3544	Percent	12.1	-	-	-	13.9	34.5	20.3	19.2	
645	3545	Trips	1,314	-	-	-	844	1,661	2,170	1,703	8,075
645	3545	Percent	17.1	-	-	-	11.0	21.6	28.2	22.1	
646	3546	Trips	1,025	-	125	496	263	1,741	1,656	1,299	6,976
646	3546	Percent	15.5	-	1.9	7.5	4.0	26.4	25.1	19.7	
647	3547	Trips	296	122	96	109	79	582	661	405	2,490
647	3547	Percent	12.6	5.2	4.1	4.6	3.4	24.8	28.1	17.3	
648	3548	Trips	943	278	128	313	73	1,525	1,351	576	5,397
648	3548	Percent	18.2	5.4	2.5	6.0	1.4	29.4	26.0	11.1	
649	3549	Trips	643	120	121	216	43	873	952	508	3,661
649	3549	Percent	18.5	3.4	3.5	6.2	1.3	25.1	27.4	14.6	
650	3550	Trips	60	71	65	8	14	279	312	136	969
650	3550	Percent	6.4	7.5	6.9	0.9	1.5	29.5	33.0	14.4	

Miami-Dade County GIS Open Data



Traffic Analysis Zones 2015

Prepared by National Data & Surveying Services

VOLUME

Lenox Ave N/O 15th St

Day: Tuesday
Date: 1/9/2024

City: Miami Beach
Project #: FL24_140007_001

DAILY TOTALS	NB	SB	EB	WB	Total
	1,618	1,636	0	0	3,254

15-Minutes Interval

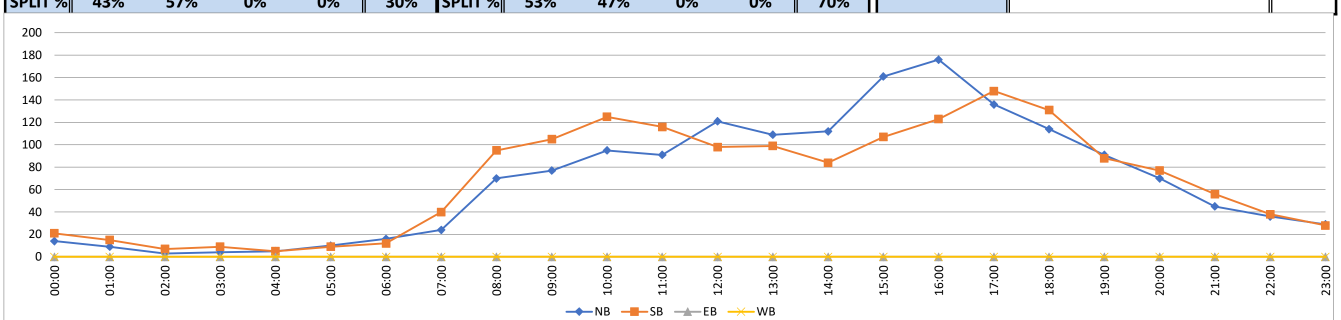
TIME	NB	SB	EB	WB	TOTAL	TIME	NB	SB	EB	WB	TOTAL
0:00	5	6			11	12:00	29	29			58
0:15	4	4			8	12:15	35	26			61
0:30	2	9			11	12:30	37	22			59
0:45	3	2			5	12:45	20	21			41
1:00	6	7			13	13:00	23	29			52
1:15	1	5			6	13:15	24	21			45
1:30	1	2			3	13:30	32	23			55
1:45	1	1			2	13:45	30	26			56
2:00	1	2			3	14:00	19	29			48
2:15	0	2			2	14:15	32	20			52
2:30	2	3			5	14:30	35	16			51
2:45	0	0			0	14:45	26	19			45
3:00	0	2			2	15:00	28	24			52
3:15	2	0			2	15:15	37	24			61
3:30	2	5			7	15:30	50	25			75
3:45	0	2			2	15:45	46	34			80
4:00	2	1			3	16:00	42	27			69
4:15	2	3			5	16:15	45	39			84
4:30	0	0			0	16:30	44	21			65
4:45	1	1			2	16:45	45	36			81
5:00	0	1			1	17:00	41	40			81
5:15	0	3			3	17:15	38	43			81
5:30	4	2			6	17:30	34	34			68
5:45	6	3			9	17:45	23	31			54
6:00	1	5			6	18:00	23	35			58
6:15	2	1			3	18:15	32	44			76
6:30	4	1			5	18:30	39	20			59
6:45	9	5			14	18:45	20	32			52
7:00	6	4			10	19:00	31	25			56
7:15	3	8			11	19:15	26	20			46
7:30	5	11			16	19:30	17	18			35
7:45	10	17			27	19:45	17	25			42
8:00	13	20			33	20:00	16	19			35
8:15	15	18			33	20:15	15	28			43
8:30	20	22			42	20:30	21	10			31
8:45	22	35			57	20:45	18	20			38
9:00	18	27			45	21:00	15	11			26
9:15	19	25			44	21:15	13	25			38
9:30	23	27			50	21:30	7	9			16
9:45	17	26			43	21:45	10	11			21
10:00	18	31			49	22:00	11	14			25
10:15	21	30			51	22:15	5	12			17
10:30	30	36			66	22:30	10	6			16
10:45	26	28			54	22:45	10	6			16
11:00	28	21			49	23:00	12	7			19
11:15	17	29			46	23:15	6	9			15
11:30	24	28			52	23:30	7	7			14
11:45	22	38			60	23:45	4	5			9
TOTALS	418	559	0	0	977	TOTALS	1200	1077	0	0	2277
SPLIT %	43%	57%	0%	0%	30%	SPLIT %	53%	47%	0%	0%	70%

Hourly Intervals

TIME		NB	SB	EB	WB	TOTAL
00:00	01:00	14	21			35
01:00	02:00	9	15			24
02:00	03:00	3	7			10
03:00	04:00	4	9			13
04:00	05:00	5	5			10
05:00	06:00	10	9			19
06:00	07:00	16	12			28
07:00	08:00	24	40			64
08:00	09:00	70	95			165
09:00	10:00	77	105			182
10:00	11:00	95	125			220
11:00	12:00	91	116			207
12:00	13:00	121	98			219
13:00	14:00	109	99			208
14:00	15:00	112	84			196
15:00	16:00	161	107			268
16:00	17:00	176	123			299
17:00	18:00	136	148			284
18:00	19:00	114	131			245
19:00	20:00	91	88			179
20:00	21:00	70	77			147
21:00	22:00	45	56			101
22:00	23:00	36	38			74
23:00	00:00	29	28			57

STATISTICS

	NB	SB	EB	WB	TOTAL
Peak Period	00:00	to	12:00		
Volume	418	559			977
Peak Hour	10:15	10:00			10:00
Peak Volume	105	125			220
Peak Hour Factor	0.875	0.868			0.833
Peak Period	12:00	to	00:00		
Volume	1200	1077			2277
Peak Hour	15:30	16:45			16:15
Peak Volume	183	153			311
Peak Hour Factor	0.915	0.890			0.926
Peak Period	07:00	to	09:00		
Volume	94	135			229
Peak Hour	8:00	8:00			8:00
Peak Volume	70	95			165
Peak Hour Factor	0.795	0.679			0.724
Peak Period	16:00	to	18:00		
Volume	312	271			583
Peak Hour	16:00	16:45			16:15
Peak Volume	176	153			311
Peak Hour Factor	0.978	0.890			0.926



2022 PEAK SEASON FACTOR CATEGORY REPORT - REPORT TYPE: ALL
CATEGORY: 8700 MIAMI-DADE NORTH

MOCF: 0.96

WEEK	DATES	SF	PSCF
1	01/01/2022 - 01/01/2022	1.06	1.10
2	01/02/2022 - 01/08/2022	1.04	1.08
3	01/09/2022 - 01/15/2022	1.02	1.06
4	01/16/2022 - 01/22/2022	1.01	1.05
5	01/23/2022 - 01/29/2022	1.00	1.04
6	01/30/2022 - 02/05/2022	0.98	1.02
7	02/06/2022 - 02/12/2022	0.97	1.01
* 8	02/13/2022 - 02/19/2022	0.96	1.00
* 9	02/20/2022 - 02/26/2022	0.96	1.00
*10	02/27/2022 - 03/05/2022	0.96	1.00
*11	03/06/2022 - 03/12/2022	0.96	1.00
*12	03/13/2022 - 03/19/2022	0.96	1.00
*13	03/20/2022 - 03/26/2022	0.96	1.00
*14	03/27/2022 - 04/02/2022	0.96	1.00
*15	04/03/2022 - 04/09/2022	0.96	1.00
*16	04/10/2022 - 04/16/2022	0.95	0.99
*17	04/17/2022 - 04/23/2022	0.96	1.00
*18	04/24/2022 - 04/30/2022	0.96	1.00
*19	05/01/2022 - 05/07/2022	0.97	1.01
*20	05/08/2022 - 05/14/2022	0.97	1.01
21	05/15/2022 - 05/21/2022	0.98	1.02
22	05/22/2022 - 05/28/2022	0.99	1.03
23	05/29/2022 - 06/04/2022	0.99	1.03
24	06/05/2022 - 06/11/2022	1.00	1.04
25	06/12/2022 - 06/18/2022	1.01	1.05
26	06/19/2022 - 06/25/2022	1.01	1.05
27	06/26/2022 - 07/02/2022	1.01	1.05
28	07/03/2022 - 07/09/2022	1.02	1.06
29	07/10/2022 - 07/16/2022	1.02	1.06
30	07/17/2022 - 07/23/2022	1.02	1.06
31	07/24/2022 - 07/30/2022	1.02	1.06
32	07/31/2022 - 08/06/2022	1.01	1.05
33	08/07/2022 - 08/13/2022	1.01	1.05
34	08/14/2022 - 08/20/2022	1.01	1.05
35	08/21/2022 - 08/27/2022	1.03	1.07
36	08/28/2022 - 09/03/2022	1.04	1.08
37	09/04/2022 - 09/10/2022	1.05	1.09
38	09/11/2022 - 09/17/2022	1.07	1.11
39	09/18/2022 - 09/24/2022	1.05	1.09
40	09/25/2022 - 10/01/2022	1.03	1.07
41	10/02/2022 - 10/08/2022	1.01	1.05
42	10/09/2022 - 10/15/2022	0.99	1.03
43	10/16/2022 - 10/22/2022	1.00	1.04
44	10/23/2022 - 10/29/2022	1.01	1.05
45	10/30/2022 - 11/05/2022	1.01	1.05
46	11/06/2022 - 11/12/2022	1.02	1.06
47	11/13/2022 - 11/19/2022	1.03	1.07
48	11/20/2022 - 11/26/2022	1.04	1.08
49	11/27/2022 - 12/03/2022	1.05	1.09
50	12/04/2022 - 12/10/2022	1.05	1.09
51	12/11/2022 - 12/17/2022	1.06	1.10
52	12/18/2022 - 12/24/2022	1.04	1.08
53	12/25/2022 - 12/31/2022	1.02	1.06

* PEAK SEASON

AM Peak Hour Volumes

Project: 1525 LENOX AVENUE RESIDENTIAL DEVELOPMENT

Intersection	Road	Direction	Movement	AM PEAK 2024 Existing Volumes	AM PEAK 2027 No Build Volumes	AM PEAK Site Trip Distribution	AM PEAK Site Trips	AM PEAK 2027 Build Volumes	
(1) Lenox Avenue & Between 16th and 15th Street	Between 16th and 15th Street	Eastbound	EBL	0	0		0	0	Int 1
			EBT	0	0		0	0	
			EBR	0	0		0	0	
			Approach	0	0		0	0	
		Westbound	WBL	0	0	(41%)	1	1	
			WBT	0	0		0	0	
			WBR	0	0	(59%)	1	1	
			Approach	0	0	(100%)	2	2	
	Lenox Avenue	Northbound	NBL	0	0		0	0	
			NBT	74	75		0	75	
			NBR	0	0	41%	0	0	
			Approach	74	75	41%	0	75	
		Southbound	SBL	0	0	59%	1	1	
			SBT	101	103		0	103	
			SBR	0	0		0	0	
			Approach	101	103	59%	1	104	

PM Peak Hour Volumes

Project: 1525 LENOX AVENUE RESIDENTIAL DEVELOPMENT

Intersection	Road	Direction	Movement	PM PEAK 2024 Existing Volumes	PM PEAK 2027 No Build Volumes	PM PEAK Site Trip Distribution	PM PEAK Site Trips	PM PEAK 2027 Build Volumes	
(1) Lenox Avenue & Between 16th and 15th Street	Between 16th and 15th Street	Eastbound	EBL	0	0		0	0	Int 1
			EBT	0	0		0	0	
			EBR	0	0		0	0	
			Approach	0	0		0	0	
		Westbound	WBL	0	0	(41%)	0	0	
			WBT	0	0		0	0	
			WBR	0	0	(59%)	1	1	
			Approach	0	0	(100%)	1	1	
	Lenox Avenue	Northbound	NBL	0	0		0	0	
			NBT	187	191		0	191	
			NBR	0	0	41%	1	1	
			Approach	187	191	41%	1	192	
		Southbound	SBL	0	0	59%	1	1	
			SBT	162	165		0	165	
			SBR	0	0		0	0	
			Approach	162	165	59%	1	166	

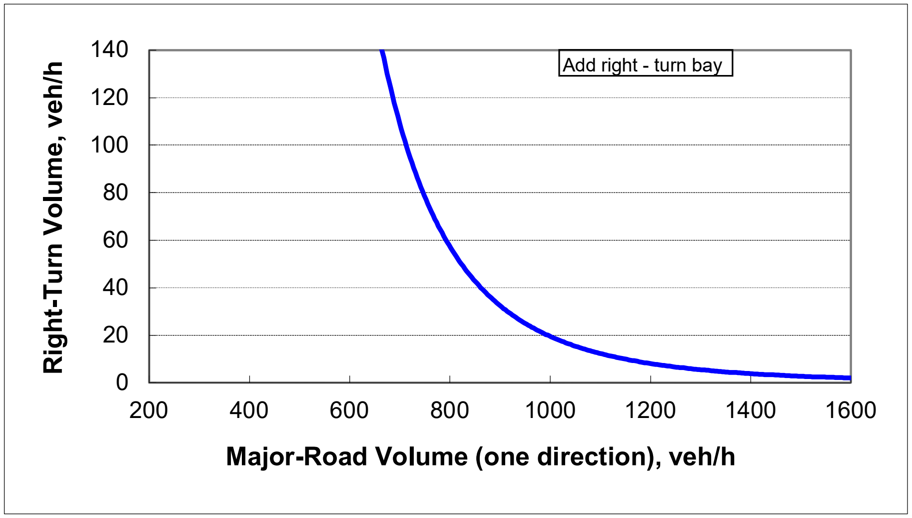
Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadw ay
Variable	**Value**
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	75
Right-turn volume, veh/h:	0

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	5152303
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



Data Source: NCHRP 457 Evaluation of Intersection Improvements

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

Right Turn Lane Warrant
Analyst: JSP
Date: January 2024
Analysis Year: 2024 PM
Job#: 300335101

Intersection:
N/S: Lenox Avenue
E/W: Site Driveway
Northbound Right Turn

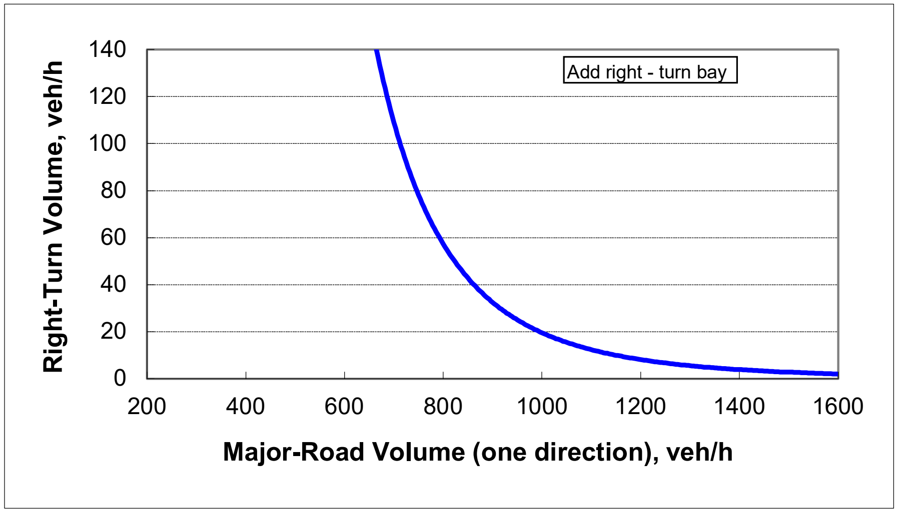
Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadw ay
Variable	**Value**
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	192
Right-turn volume, veh/h:	1

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	55550
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



Data Source: NCHRP 457 Evaluation of Intersection Improvements

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

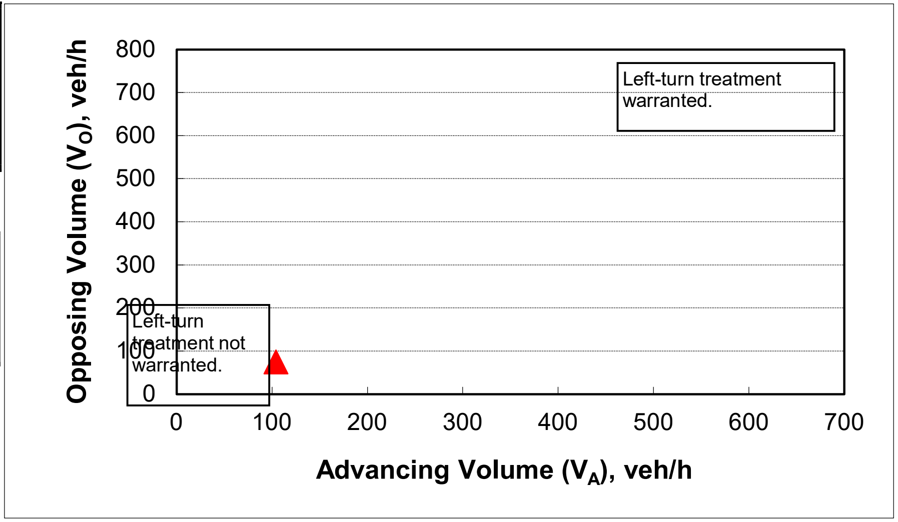
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	104
Opposing volume (V_O), veh/h:	75

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1811
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

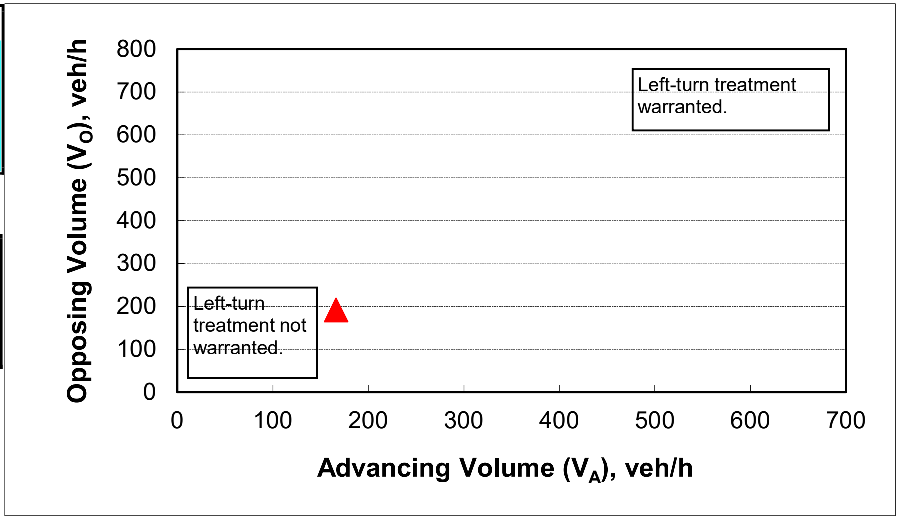
Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	166
Opposing volume (V_O), veh/h:	192



OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1996
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

ATTACHMENT D
QUEUEING ANALYSIS

QUEUING ANALYSIS 1525 LENOX AVENUE RESIDENTIAL DEVELOPMENT

Estimated Service Time

Entrance Type	Time (min)
Visitor/Resident	2.00
Resident Only	1.00

Peak Hour Trip Generation

Ingress Type	Inbound
Residents	2
Visitors	0
Total	2

Afternoon Peak Hour Driveway Queuing Analysis

Peak Hour Arrival Rate (veh/hr): **2**

Probablity of Back-up on Adjacent Street: **5%**

Service Time (min): **1.00**

N	Q	q	r	Q_m	M
1	60	2	0.0333	0.0333	**0.0**

Table of Q_m Values

r	N=1	2	3	4	6	8	10
0.1	0.1000	0.0182	0.0037	0.0008	0.0000	0.0000	0.0000
0.2	0.2000	0.0666	0.0247	0.0093	0.0015	0.0002	0.0000
0.3	0.3000	0.1385	0.0700	0.0370	0.0111	0.0036	0.0011
0.4	0.4000	0.2286	0.1411	0.0907	0.0400	0.0185	0.0088
0.5	0.5000	0.3333	0.2368	0.1739	0.0991	0.0591	0.0360
0.6	0.6000	0.4501	0.3548	0.2870	0.1965	0.1395	0.1013
0.7	0.7000	0.5766	0.4923	0.4286	0.3359	0.2706	0.2218
0.8	0.8000	0.7111	0.6472	0.5964	0.5178	0.4576	0.4093
0.9	0.9000	0.8526	0.8172	0.7878	0.7401	0.7014	0.6687
1.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

* ITE Transportation and Development Table 8.11

Visitor versus Resident Trip Generation Calculation

Highest Ingress	2
Percent Visitors	0%
Number of Total Visitor Peak Hour Inbound	0
Number of Total Residents Peak Hour Inbound	2

Visitor Entrance Assignment Breakdown

Entrance No.	Percentage	Assignment
1	100%	0
	Total	0

Resident Entrance Assignment Breakdown

Entrance No.	Percentage	Assignment
1	100%	2
N/A		
	Total	2

Required queuing storage equation:

$$M = \frac{\ln(0.05) - \mathrm{Ln}(Q_m)}{\mathrm{Ln}\ \rho} - 1$$

where:

N = Number of Lanes

Q = Average Service Rate (veh/hr)

q = Peak Hour Arrival Rate (veh/hr)

r = Coefficient of Utiliation (q/NQ)

Q_m = ITE table value of relationship between queue length, number of attendants and utilization factor (ITE Transportation and Land Development Table 8.11

M = Queue length which is exceeded 5% of the time (veh)

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

Langan Engineering and Environmental Services, Inc.
110 E. Broward Boulevard, Suite 1500
Fort Lauderdale, Florida 33301

Fiji at the Oasis (Homestead, Florida)
Resident Entrance Gate - Remote Control
Afternoon Peak Hour

File Name : 2019-09-18 fiji visitor data
Site Code : 00000222
Start Date : 9/18/2019
Page No : 1

Ln.	No.	Joined Queue	Released From Queue	Delay
1	4	3:30:52 PM	3:30:53 PM	1
1	5	3:32:26 PM	3:32:28 PM	2
1	6	3:32:38 PM	3:32:39 PM	1
1	7	3:34:09 PM	3:34:11 PM	2
1	8	3:35:11 PM	3:35:12 PM	1
1	9	3:40:46 PM	3:40:48 PM	2
1	10	3:43:04 PM	3:43:06 PM	2
1	11	3:43:42 PM	3:43:43 PM	1
1	12	3:44:30 PM	3:44:33 PM	3
1	13	3:45:17 PM	3:45:19 PM	2
1	14	3:47:18 PM	3:47:20 PM	2
1	15	3:50:58 PM	3:50:59 PM	1
1	16	3:52:00 PM	3:52:02 PM	2
1	17	3:52:40 PM	3:52:41 PM	1
1	18	3:52:59 PM	3:53:01 PM	2
1	19	3:54:52 PM	3:54:55 PM	3
1	20	3:58:18 PM	3:58:20 PM	2
1	21	3:59:03 PM	3:59:07 PM	4
1	22	3:59:22 PM	3:59:25 PM	3
1	23	3:59:56 PM	3:59:59 PM	3
1	24	4:00:38 PM	4:00:40 PM	2
1	25	4:01:15 PM	4:01:18 PM	3
1	26	4:01:29 PM	4:01:32 PM	3
1	27	4:01:51 PM	4:01:55 PM	4
1	28	4:03:34 PM	4:03:37 PM	3
1	29	4:04:47 PM	4:04:51 PM	4
1	30	4:05:38 PM	4:05:41 PM	3
1	31	4:07:59 PM	4:08:02 PM	3
1	32	4:10:42 PM	4:10:45 PM	3
1	33	4:11:48 PM	4:11:51 PM	3
1	34	4:12:04 PM	4:12:07 PM	3
1	35	4:13:02 PM	4:13:06 PM	4
1	36	4:13:23 PM	4:13:27 PM	4
1	37	4:14:18 PM	4:14:22 PM	4
1	38	4:14:50 PM	4:14:53 PM	3
1	39	4:16:01 PM	4:16:05 PM	4
1	40	4:16:18 PM	4:16:23 PM	5
1	41	4:16:25 PM	4:16:27 PM	2
1	42	4:16:32 PM	4:16:36 PM	4
1	43	4:18:49 PM	4:18:51 PM	2
1	44	4:19:14 PM	4:19:17 PM	3
1	45	4:20:19 PM	4:20:23 PM	4
1	46	4:20:28 PM	4:20:32 PM	4
1	47	4:20:52 PM	4:20:55 PM	3
1	48	4:21:16 PM	4:21:20 PM	4
1	49	4:21:58 PM	4:22:02 PM	4
1	50	4:22:08 PM	4:22:11 PM	3
1	51	4:22:23 PM	4:22:28 PM	5
1	52	4:22:45 PM	4:22:48 PM	3
1	53	4:23:02 PM	4:23:05 PM	3
1	54	4:23:10 PM	4:23:14 PM	4
1	55	4:23:42 PM	4:23:45 PM	3
1	56	4:23:50 PM	4:23:53 PM	3
1	57	4:26:25 PM	4:26:28 PM	3
1	58	4:26:31 PM	4:26:33 PM	2
1	59	4:27:33 PM	4:27:36 PM	3
1	60	4:27:37 PM	4:27:40 PM	3
1	61	4:29:54 PM	4:29:58 PM	4
1	62	4:30:41 PM	4:30:44 PM	3

Langan Engineering and Environmental Services, Inc.
110 E. Broward Boulevard, Suite 1500
Fort Lauderdale, Florida 33301

File Name : 2019-09-18 fiji visitor data
Site Code : 00000222
Start Date : 9/18/2019

Ln.	No.	Joined Queue	Released From Queue	Delay
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1	64	4:32:37 PM	4:32:39 PM	2
1	65	4:33:41 PM	4:33:44 PM	3
1	66	4:34:43 PM	4:34:46 PM	3
1	67	4:36:57 PM	4:36:59 PM	2
1	68	4:37:07 PM	4:37:10 PM	3
1	69	4:40:33 PM	4:40:35 PM	2
1	70	4:42:14 PM	4:42:17 PM	3
1	71	4:46:14 PM	4:46:17 PM	3
1	72	4:47:50 PM	4:47:54 PM	4
1	73	4:47:56 PM	4:47:58 PM	2
1	74	4:48:15 PM	4:48:18 PM	3
1	75	4:48:28 PM	4:48:30 PM	2
1	76	4:49:27 PM	4:49:29 PM	2
1	77	4:49:31 PM	4:49:33 PM	2
1	78	4:51:53 PM	4:51:55 PM	2
1	79	4:53:00 PM	4:53:03 PM	3
1	80	4:53:11 PM	4:53:14 PM	3
1	81	4:53:53 PM	4:53:56 PM	3
1	82	4:54:42 PM	4:54:45 PM	3
1	83	4:55:13 PM	4:55:17 PM	4
1	84	4:55:45 PM	4:55:48 PM	3
1	85	4:57:01 PM	4:57:03 PM	2
1	86	4:59:20 PM	4:59:23 PM	3
1	87	5:04:54 PM	5:04:56 PM	2
1	88	5:05:01 PM	5:05:04 PM	3
1	89	5:05:44 PM	5:05:47 PM	3
1	90	5:05:59 PM	5:06:02 PM	3
1	91	5:07:57 PM	5:08:00 PM	3
1	92	5:08:27 PM	5:08:30 PM	3
1	93	5:09:34 PM	5:09:37 PM	3
1	94	5:09:56 PM	5:09:59 PM	3
1	95	5:11:14 PM	5:11:17 PM	3
1	96	5:11:20 PM	5:11:23 PM	3
1	97	5:11:53 PM	5:11:55 PM	2
1	98	5:13:07 PM	5:13:10 PM	3
1	99	5:13:13 PM	5:13:15 PM	2
1	100	5:13:20 PM	5:13:23 PM	3
1	101	5:14:32 PM	5:14:34 PM	2
1	102	5:14:57 PM	5:15:01 PM	4
1	103	5:16:49 PM	5:16:51 PM	2
1	104	5:16:56 PM	5:16:59 PM	3
1	105	5:17:38 PM	5:17:41 PM	3
1	106	5:18:04 PM	5:18:07 PM	3
1	107	5:18:10 PM	5:18:12 PM	2
1	108	5:18:15 PM	5:18:17 PM	2
1	109	5:19:04 PM	5:19:06 PM	2
1	110	5:21:28 PM	5:21:31 PM	3
1	111	5:21:45 PM	5:21:48 PM	3
1	112	5:23:12 PM	5:23:16 PM	4
1	113	5:25:16 PM	5:25:18 PM	2
1	114	5:25:22 PM	5:25:24 PM	2
1	115	5:28:34 PM	5:28:37 PM	3
1	116	5:31:28 PM	5:31:31 PM	3
1	117	5:31:48 PM	5:31:51 PM	3
1	118	5:32:17 PM	5:32:20 PM	3
1	119	5:33:06 PM	5:33:11 PM	5
1	120	5:33:19 PM	5:33:21 PM	2
1	121	5:33:27 PM	5:33:31 PM	4
1	122	5:34:39 PM	5:34:42 PM	3
1	123	5:34:46 PM	5:34:50 PM	4

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110 E. Broward Boulevard, Suite 1500
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File Name : 2019-09-18 fiji visitor data
Site Code : 00000222
Start Date : 9/18/2019

Ln.	No.	Joined Queue	Released From Queue	Delay
1	124	5:34:59 PM	5:35:01 PM	2
1	125	5:35:07 PM	5:35:09 PM	2
1	126	5:36:00 PM	5:36:02 PM	2
1	127	5:37:06 PM	5:37:09 PM	3
1	128	5:37:28 PM	5:37:31 PM	3
1	129	5:38:20 PM	5:38:23 PM	3
1	130	5:40:10 PM	5:40:13 PM	3
1	131	5:41:05 PM	5:41:08 PM	3
1	132	5:41:56 PM	5:41:58 PM	2
1	133	5:42:00 PM	5:42:02 PM	2
1	134	5:42:05 PM	5:42:07 PM	2
1	135	5:42:10 PM	5:42:12 PM	2
1	136	5:43:36 PM	5:43:38 PM	2
1	137	5:44:08 PM	5:44:13 PM	5
1	138	5:45:45 PM	5:45:47 PM	2
1	139	5:46:44 PM	5:46:47 PM	3
1	140	5:46:54 PM	5:46:57 PM	3
1	141	5:48:51 PM	5:48:53 PM	2
1	142	5:48:56 PM	5:48:59 PM	3
1	143	5:49:06 PM	5:49:09 PM	3
1	144	5:49:47 PM	5:49:50 PM	3
1	145	5:50:20 PM	5:50:23 PM	3
1	146	5:50:31 PM	5:50:33 PM	2
1	147	5:50:35 PM	5:50:38 PM	3
1	148	5:50:40 PM	5:50:43 PM	3
1	149	5:50:49 PM	5:50:51 PM	2
1	150	5:50:56 PM	5:51:00 PM	4
1	151	5:51:12 PM	5:51:15 PM	3
1	152	5:52:01 PM	5:52:03 PM	2
1	153	5:52:44 PM	5:52:46 PM	2
1	154	5:52:49 PM	5:52:51 PM	2
1	155	5:53:00 PM	5:53:02 PM	2
1	156	5:53:09 PM	5:53:11 PM	2
1	157	5:53:41 PM	5:53:43 PM	2
1	158	5:53:45 PM	5:53:47 PM	2
1	159	5:54:33 PM	5:54:34 PM	1
1	160	5:54:43 PM	5:54:45 PM	2
1	161	5:55:38 PM	5:55:41 PM	3
1	162	5:55:48 PM	5:55:52 PM	4
1	163	5:55:59 PM	5:56:03 PM	4
1	164	5:56:22 PM	5:56:25 PM	3
1	165	5:56:28 PM	5:56:31 PM	3
1	166	5:59:04 PM	5:59:07 PM	3
1	167	5:59:10 PM	5:59:13 PM	3
1	168	5:59:55 PM	5:59:57 PM	2
1	169	6:01:22 PM	6:01:23 PM	1
1	170	6:01:26 PM	6:01:28 PM	2
1	171	6:02:46 PM	6:02:49 PM	3

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Fort Lauderdale, Florida 33301

File Name : 2019-09-18 fiji visitor data
Site Code : 00000222
Start Date : 9/18/2019

Summary Information:

3:30:00 PM - 6:03:00 PM	Resident Entrance
Total Vehicle Count:	168
Delayed Vehicle Count:	168
Through Vehicle Count:	0
Average Stopped Time:	2.76
Maximum Stopped Time:	5
Min. Secs. for Delay:	0
Average Queue:	0.05
Queue Density:	1.00
Maximum Queue:	1
Delay in Vehicle Hour:	0.05
Total Delay:	464

Langan Engineering and Environmental Services, Inc.
110 E. Broward Boulevard, Suite 1500
Fort Lauderdale, Florida 33301

Fiji at the Oasis (Homestead, Florida)
Call Box Visitor Entrance
Afternoon Peak Hour

File Name : 2019-09-18 fiji visitor data
Site Code : 00000222
Start Date : 9/18/2019

L n.	No.	Joined Queue	Released From Queue	Delay
2	1	3:30:32 PM	3:31:34 PM	62
2	2	3:33:14 PM	3:33:59 PM	45
2	3	3:34:17 PM	3:34:23 PM	14
2	4	3:36:21 PM	3:36:37 PM	16
2	5	3:41:05 PM	3:41:07 PM	18
2	6	3:44:35 PM	3:44:42 PM	21
2	7	3:44:50 PM	3:44:58 PM	16
2	8	3:50:28 PM	3:50:51 PM	23
2	9	3:58:42 PM	3:58:56 PM	14
2	10	3:59:51 PM	4:00:36 PM	45
2	11	4:01:49 PM	4:02:07 PM	18
2	12	4:02:15 PM	4:02:30 PM	15
2	13	4:04:32 PM	4:04:45 PM	13
2	14	4:04:55 PM	4:05:04 PM	16
2	15	4:05:08 PM	4:05:32 PM	24
2	16	4:05:51 PM	4:06:06 PM	15
2	17	4:07:39 PM	4:07:52 PM	13
2	18	4:09:12 PM	4:09:47 PM	35
2	19	4:14:33 PM	4:14:45 PM	12
2	20	4:18:09 PM	4:18:19 PM	14
2	21	4:25:44 PM	4:26:10 PM	26
2	22	4:27:17 PM	4:27:32 PM	15
2	23	4:27:42 PM	4:28:02 PM	20
2	24	4:28:48 PM	4:29:04 PM	16
2	25	4:32:21 PM	4:32:34 PM	13
2	26	4:35:47 PM	4:36:05 PM	18
2	27	4:37:59 PM	4:38:55 PM	56
2	28	4:40:47 PM	4:41:01 PM	14
2	29	4:55:52 PM	4:56:06 PM	14
2	30	5:09:46 PM	5:10:02 PM	16
2	31	5:14:55 PM	5:15:24 PM	29
2	32	5:20:01 PM	5:20:15 PM	14
2	33	5:22:05 PM	5:22:35 PM	30
2	34	5:25:25 PM	5:25:38 PM	13
2	35	5:27:26 PM	5:27:52 PM	26
2	36	5:28:31 PM	5:28:59 PM	28
2	37	5:31:33 PM	5:31:56 PM	23
2	38	5:34:05 PM	5:34:23 PM	18
2	39	5:36:41 PM	5:37:13 PM	32
2	40	5:40:24 PM	5:40:38 PM	14
2	41	5:40:44 PM	5:41:01 PM	17
2	42	5:46:41 PM	5:46:52 PM	11

Summary Information:

3:30:00 PM - 6:00:00 PM	Visitor Entrance
Total Vehicle Count:	42
Delayed Vehicle Count:	42
Through Vehicle Count:	0
Average Stopped Time:	21.71
Maximum Stopped Time:	62
Min. Secs. for Delay:	0
Average Queue:	0.10
Queue Density:	1.00
Maximum Queue:	1
Delay in Vehicle Hour:	0.11
Total Delay:	912

INSTITUTE
OF
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Transportation and Land Development

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APPLICATIONS OF QUEUEING ANALYSIS

Providing an adequate and well-defined storage area for drive-thru traffic is particularly critical, especially at fast-food restaurants and drive-thru bank facilities where queues can, and do, become quite long. Waiting vehicles should be stored on private property clear of driveways so that traffic back-up does not interfere with movement on the arterial street. At fast-food restaurants, the menu board should be installed upstream of the service window to permit drive-thru customers to place their orders prior to their arrival at the service window. Preparation of their order can then begin before they reach the service window, thus minimizing their time at the service window. A well-defined storage area for the waiting traffic should be located so that the waiting vehicles do not block or impede the movement of driveway traffic.

Where a single service position is involved, the situation is referred to as a *single-channel problem*. *Multiple-channel problems* arise when two or more service positions are available. Such problems commonly arise with bank tellers (indoor as well as drive-in windows), entrances and exits at large parking lots and garages, at passenger pick-up areas at transit stations and taxi stands, truck terminals or loading/unloading areas, supermarket checkout counters, telephone calls, building entrances, and transit-station turnstiles. The assumptions of Poisson arrivals and negative exponential service time are commonly acceptable and used for both single- and multiple-channel problems. Thurgood [11] found these assumptions to be representative of drive-in facilities.

Customers arriving randomly at a drive-in facility may enter into service immediately or may have to enter the queue until they can be served. Waiting lines occur whenever the immediate demand for service exceeds the current capacity of the facility providing that service.

Basic Notation and Terminology

The following notation is employed throughout this section:

n = number of customers in the drive-in system

M = number of customers in the queue waiting to be served (number of customers in the system minus the number being served)

$P(n)$ = steady-state probability that exactly n customers are in the queueing system

$P(0)$ = probability that zero vehicles are in the queueing system

N = number of parallel service positions

q = mean average arrival rate of vehicles into the system (vehicles/hour)

Q = mean average service rate per service position (vehicles/hour/position)

Avg (t) = $^{60}/_{Q}$ = mean service time expressed in minutes per vehicle

ρ = $^{q}/_{NQ}$ = coefficient of utilization

$E(m)$ = expected (average) number of customers in the system

$E(n)$ = expected (average) number of customers waiting in the queue

$E(t)$ = expected (average) waiting time in system (includes service time)

$E(w)$ = expected (average) waiting time in queue (excludes service time)

The equations employed in the analysis of queueing problems are given in Table 8-10.

Jones, Woods, and Thurgood [4] have developed a graph (Figure 8-6) for determining the probability that there will be no customers in the system—values for $P(0)$. They also developed graphs for determining the average number of waiting customers (Figure 8-7), the average waiting time (Figure 8-8), and average queue length (Figure 8-9). These figures avoid the necessity to perform the time-consuming, although simple, queueing-analysis calculations. See pp. 228–30.

TABLE 8-10
Queueing System Equations

Equation Number	*Variable*	*Equation*
(8-1)	Coefficient of utilization	$\rho = \dfrac{q}{NQ}$
(8-2)	Probability of no customers in the system	$P(0) = \left[\sum_{n=0}^{N-1} \dfrac{\left(\frac{q}{Q}\right)^n}{n!} + \dfrac{\left(\frac{q}{Q}\right)^N}{N!(1-\rho)}\right]^{-1}$
(8-3)	Mean number in the queue	$E(m) = \left[\dfrac{\rho\left(\frac{q}{Q}\right)^N}{N!(1-\rho)^2}\right]P(0)$
(8-4)	Mean number in the system	$E(n) = E(m) + \dfrac{q}{Q}$
(8-5)	Mean wait time in queue (hours)	$E(w) = \dfrac{E(m)}{q}$
(8-6)	Mean time in the system (hours)	$E(t) = E(w) + \dfrac{1}{Q}$ $= E(w) + \text{Avg}(t)$
(8-7)	Proportion of customers who wait	$P[E(w) > 0] = \left[\dfrac{\left(\frac{q}{Q}\right)^N}{N!(1-\rho)}\right]P(0)$
(8-8)	Probability of a queue exceeding a length M	$P(x > M) = (\rho^{N+1})P[E(w) > 0]$
(8-9a)	Queue storage required	$M = \left[\dfrac{\ln P(x > M) - \ln E(w) > 0}{\ln \rho}\right] - 1$
(8-9b)*	Queue storage required	$M = \left[\dfrac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$

*Q_M is a statistic which is a function of the utilization rate and the number of service channels (service positions); see Table 8-11. The table of Q_M values and use of Equation (8-9b) greatly simplifies the calculations compared to those using Equations (8-9a).

Use of the equations and the graphs may be illustrated by the following example of a drive-in bank.

Conditions:

Number of drive-in windows, $N = 3$
Demand on the system, $q = 70$
Service capacity per channel, $Q = 28.6$ for an average service time, Avg (t) = 2.1 minutes

Solution Using Graphs:

- Coefficient of utilization = 70/(3)(28.6) = 0.816
- Probability that there are customers waiting in the system, Figure 8-6: $P(0) = 0.05$
- Expected average number of customers waiting in the queue, Figure 8-7: $E(m)/N = 1.0$; and the average number $E(m) = (3)(1.0) = 3$

location, a 5% probability of back-up onto the adjacent street is judged to be acceptable. Demand on the system for design is expected to be 110 vehicles in a 45-minute period. Average service time was expected to be 2.2 minutes. Is the queue storage adequate?

Such problems can be quickly solved using Equation (8–9b) given in Table 8-10 and repeated below for convenience.

$$M = \left[\frac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$$

where:

M = queue length which is exceeded p percent of the time
N = number of service channels (drive-in positions)
Q = service rate per channel (vehicles per hour)
$\rho = \dfrac{\text{demand rate}}{\text{service rate}} = \dfrac{q}{NQ}$ = utilization factor
q = demand rate on the system (vehicles per hour)
Q_M = tabled values of the relationship between queue length, number of channels, and utilization factor (see Table 8.11)

TABLE 8-11
Table of Q_M Values

	$N = 1$	2	3	4	6	8	10
0.0	0.0000	0.0000	0.0000	0.0000			
0.1	.1000	.0182	.0037	.0008	.0000	0.0000	0.0000
.2	.2000	.0666	.0247	.0096	.0015	.0002	.0000
.3	.3000	.1385	.0700	.0370	.0111	.0036	.0011
.4	.4000	.2286	.1411	.0907	.0400	.0185	.0088
.5	.5000	.3333	.2368	.1739	.0991	.0591	.0360
.6	.6000	.4501	.3548	.2870	.1965	.1395	.1013
.7	.7000	.5766	.4923	.4286	.3359	.2706	.2218
.8	.8000	.7111	.6472	.5964	.5178	.4576	.4093
.9	.9000	.8526	.8172	.7878	.7401	.7014	.6687
1.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

$\rho = \dfrac{q}{NQ} = \dfrac{\text{arrival rate, total}}{(\text{number of channels})(\text{service rate per channel})}$

N = number of channels (service positions)

Solution

Step 1: $Q = \dfrac{60 \text{ min/hr}}{2.2 \text{ min/service}} = 27.3$ services per hour

Step 2: $q = (110 \text{ veh}/45 \text{ min}) \times (60 \text{ min/hr}) = 146.7$ vehicles per hour

Step 3: $\rho = \dfrac{q}{NQ} = \dfrac{146.7}{(6)(27.3)} = 0.8956$

Step 4: $Q_M = 0.7303$ by interpolation between 0.8 and 0.9 for $N = 6$ from the table of Q_M values (see Table 8-11).

Step 5: The acceptable probability of the queue, M, being longer than the storage, 18 spaces in this example, was stated to be 5%. $P(x > M) = 0.05$, and:

$$M = \left[\frac{\ln 0.05 - \ln 0.7303}{\ln 0.8956}\right] - 1 = \left[\frac{-2.996 - (-0.314)}{-0.110}\right] - 1$$

$$= 24.38 - 1 = 23.38, \text{ say 23 vehicles.}$$

The number of vehicles in the queue would be expected to exceed 23 more than 5% of the time. Since the site plan will accommodate a queue of 18 vehicles, the storage is not sufficient for the conditions stated.

It is important to realize that, for any $P\ (x > M)$ value, the queue length required increases very rapidly for values of $\rho > 0.85$ (see Figure 8-9). When $\rho > 1.0$, the solution is indeterminate and the queue length theoretically becomes infinite.

Analysis of Service Times. In many instances it is effective to demonstrate that a proposed design not only is inadequate to store vehicles waiting for service but will result in unacceptable wait times as well. The necessary equations are given in Table 8-10.

For purposes of checking computations it is convenient to know that the limit of $P(0)$, as the number of channels approaches infinity (in practical terms when $N > 10$), is:

$$\lim_{N \to \infty} P(0) = e^{-\lambda} \qquad \text{where } \lambda = q/Q$$

Drive-In Bank Example: Under the site-development approval requirements, representatives of a bank presented a site plan for the construction of a new bank having three service positions. Information provided by bank officials and observations at other local banks provided the following data:

- Expected average arrival rate during the design hour (4:30–5:30 p.m. on Fridays) = 70 vehicles per hour (vph)
- Average service time per customer = 2.1 minutes

Does the site plan provide for sufficient storage to accommodate all vehicles arriving 95% of the time?

$$q = 70 \text{ vph arrival rate}$$

$$Q = \frac{60 \text{ minutes per hour}}{2.1 \text{ minutes per service}} = 28.6 \text{ vph service rate}$$

$$\rho = \frac{70}{(3)(28.6)} = 0.816$$

$$\frac{q}{Q} = \frac{70}{28.6} = 2.45$$

$$Q_M = 0.674 \text{ by interpolation from Table 8-11}$$

$$P(x > M) = 1.00 - 0.95 = 0.05$$

By Equation (8-9b)

$$M = \left[\frac{\ln 0.05 - \ln 0.674}{\ln 0.816}\right] - 1 = \left[\frac{-2.996 - (-0.396)}{-0.203}\right] - 1 = 11.8, \text{ say } 12$$

Thus, it would be necessary to store 12 vehicles, exclusive of the three service positions, in order to accommodate the arriving vehicles 95% of the time; or alternatively, to have waiting vehicles extending back into the adjacent street no more than 5% of the time between 4:30 and 5:30 p.m. on Fridays. Since the site plan provides for six spaces, the site plan as submitted is inadequate and should be disapproved.

A solution to the problem would be to increase the storage, or if this is not possible add a service position in order to reduce the average service time.

Addition of a service position would reduce the number of storage spaces needed to three (three storage plus four service positions)—assuming the same arrival rate and service time:

$$M = \left[\frac{\ln 0.05 - \ln 0.301}{\ln 0.612}\right] - 1 = 2.7, \text{ say } 3$$

A redesign to provide four service positions would have the additional benefit of substantially reducing the expected waiting time (from over 4 minutes to less than $\frac{1}{2}$ minute) for the bank customers using the drive-in windows:

With Three Service Positions:

$$q = 70 \text{ vph}$$

$$Q = 28.6 \text{ vph}$$

$$\frac{q}{Q} = 2.45$$

$$\rho = \frac{70}{(3)(28.6)} = 0.816$$

$$P(0) = \left[\frac{(2.45)^0}{0!} + \frac{(2.45)^1}{1!} + \frac{(2.45)^2}{2!} + \frac{(2.45)^3}{3!\left[1 - \left(\frac{2.45}{3}\right)\right]}\right]^{-1}$$

$$= [1 + 2.45 + 3.00 + 13.37]^{-1} = 0.0505$$

$$E(m) = \left[\frac{(0.816)\left(\frac{70}{28.6}\right)^3}{3!(1 - 0.816)^2}\right]0.0505 = 2.97$$

$$E(n) = 2.97 + 70.28.6 = 5.42$$

2.45

$$E(t) = \frac{2.97}{70} = 0.0424 \text{ hours or } 2.55 \text{ minutes}$$

$$E(w) = 0.0424 + \frac{1}{28.6} = 0.0774 \text{ hours or } 4.64 \text{ minutes}$$

With Four Service Positions:

$$q = 70 \text{ vph}$$

$$Q = 28.6 \text{ vph}$$

$$\frac{q}{Q} = 2.45$$

$$\rho = \frac{70}{(4)(28.6)} = 0.612$$

$$P(0) = \left[\frac{(2.45)^0}{0!} + \frac{(2.45)^1}{1!} + \frac{(2.45)^2}{2!} + \frac{(2.45)^3}{3!} + \frac{(2.45)^4}{4!\left[1 - \left(\frac{2.45}{4}\right)\right]}\right]^{-1}$$

$$= 0.0783$$

$$E(m) = \left[\frac{(0.612)(2.45)^4}{4!(1 - 0.612)^2}\right]0.0783 = 0.48$$

$$E(n) = 0.48 + 2.45 = 2.93$$

$$E(t) = 0.007 + \frac{1}{28.6} = 0.042 \text{ hours or } 2.51 \text{ minutes}$$

$$E(w) = \frac{0.48}{70} = 0.007 \text{ hours or } 0.41 \text{ minutes}$$

However, the service time would increase somewhat unless an additional teller were also added. Nevertheless, an increase to 2.5 minutes, or more, would still reduce the storage space required and result in better service (less time in the system). Besides, time spent being served is less irritating to the customer than an equal time spent waiting.

Conversion of a Residence. An existing single-family residence was situated on a 2.5-acre tract fronting on the major north–south arterial in the urbanizing fringe of a metropolitan area of 100,000 population. The 85th percentile speed exceeded 50 mph; however, it was anticipated that the speed limit would be reduced to 45 mph as further urbanization occurred.

Requests for rezoning from single-family residential to general commercial had received negative recommendations from the Planning and Zoning Commission and denied by the City Council. Nevertheless, the fact that changing conditions in the vicinity of the site were making the property less desirable as a single-family residence was generally recognized. Therefore, when an application was submitted for a Conditional Use Permit to establish a private school using the existing residence for classrooms, the Planning and Zoning Commission was very favorably disposed to the request. The applicant provided the following information prior to the public hearing.

1. The completed application for a conditional use
2. A statement that the intended use was for a Montessori school using the existing structure
3. A site plan as required for all proposed development, other than single-family and duplex residential development, before a building permit will be issued for a new structure and for remodeling of an existing one

The following information was presented at the public hearing by the applicant:

1. At least 40 students would be enrolled before any change would be made in the site circulation.
2. Eighty percent of the students were expected to be picked up within a 20-minute period—a substantial additional fee was to be charged for children picked up more than 30 minutes after school.
3. A strong parent–school relationship was intended, so that average pick-up time of at least 2 minutes and visits of 5 minutes or longer would not be unusual.

The following were agreed upon at the public hearing:

1. The probability of vehicles backing up onto the main lane of the major arterial should be negligible, less than 1%.
2. The site plan, with no change in the circulation pattern, would provide for four service positions and three storage positions.

Based upon these conditions, the following analysis was performed using Equation (8-9b):

$$M = 3$$
$$N = 4$$
$$Q = 60 \text{ minutes per hour} \div 2 \text{ minutes per service} = 30 \text{ vph}$$
$$q = (40 \text{ students})(80\% \text{ in 20 minutes})\left(\frac{60}{20}\right) = 96 \text{ vph}$$
$$\rho = \frac{96}{(4)(30)} = 0.8000$$
$$P(x > 3) = 0.01 \text{ (a 1\% chance of vehicles backing up onto the arterial)}$$
$$Q_M = 0.8585, \text{ from Table 8-11}$$
$$3 = \left[\frac{\ln P(x > 3) - \ln 0.5964}{\ln 0.8000}\right] - 1$$
$$3 = \left[\frac{\ln P(x > 3) - (-0.5168)}{-0.2231}\right] - 1$$

Then,

$$\ln P(x > 3) = (4)(-0.2231) - 0.5168 = -1.4092$$

and

$$P(x > 3) = e^{-1.4092} = 0.244 \text{ or } 24\%$$

Thus, the calculated probability that the queue could back up onto the arterial is 24% (given the stated conditions), which is considerably greater than the acceptable probability of less than 1%, and the application was denied. The Planning and Zoning Commission suggested various compromises of redesign of the site and issuance of a conditional use permit for a school (under the ordinance, a school can be located in any zoning district by condition) with the condition that the maximum enrollment would not exceed 24 students, which is the number necessary to achieve a value of $P(x > 3) < 0.01$. All such proposals were rejected by the applicant. The site was subsequently rezoned to the Administrative and Professional District (a restricted office district) and is now being used as a dentist's office.

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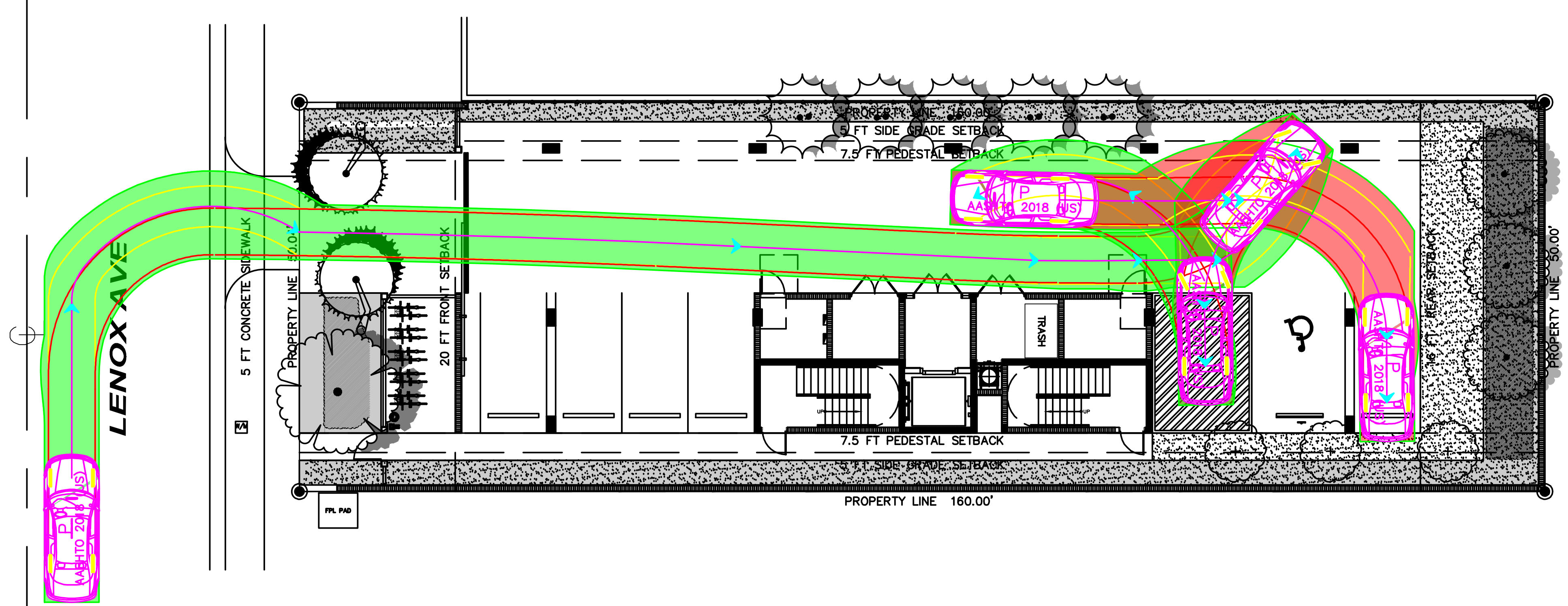
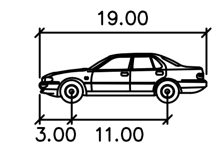
10. The Traffic Institute, Northwestern University, short course notes.
11. Thurgood, Glen S., "The Application of Stochastic Queueing Theory in the Development of Suggested Traffic Design Guidelines for Drive-In Service Facilities," doctoral dissertation, Texas A&M University, December 1975.

ATTACHMENT E
MANEUVERABILITY ANALYSIS PLANS





P

	feet
Width	: 7.00
Track	: 6.00
Lock to Lock Time	: 6.0
Steering Angle	: 31.6

20 0 5 10 20

SCALE: 1" = 20'

LANGAN

Project No. 300335101

LANGAN
Langan Engineering and Environmental Services, Inc.
1221 Brickell Ave, Suite 1800
Miami, FL 33131
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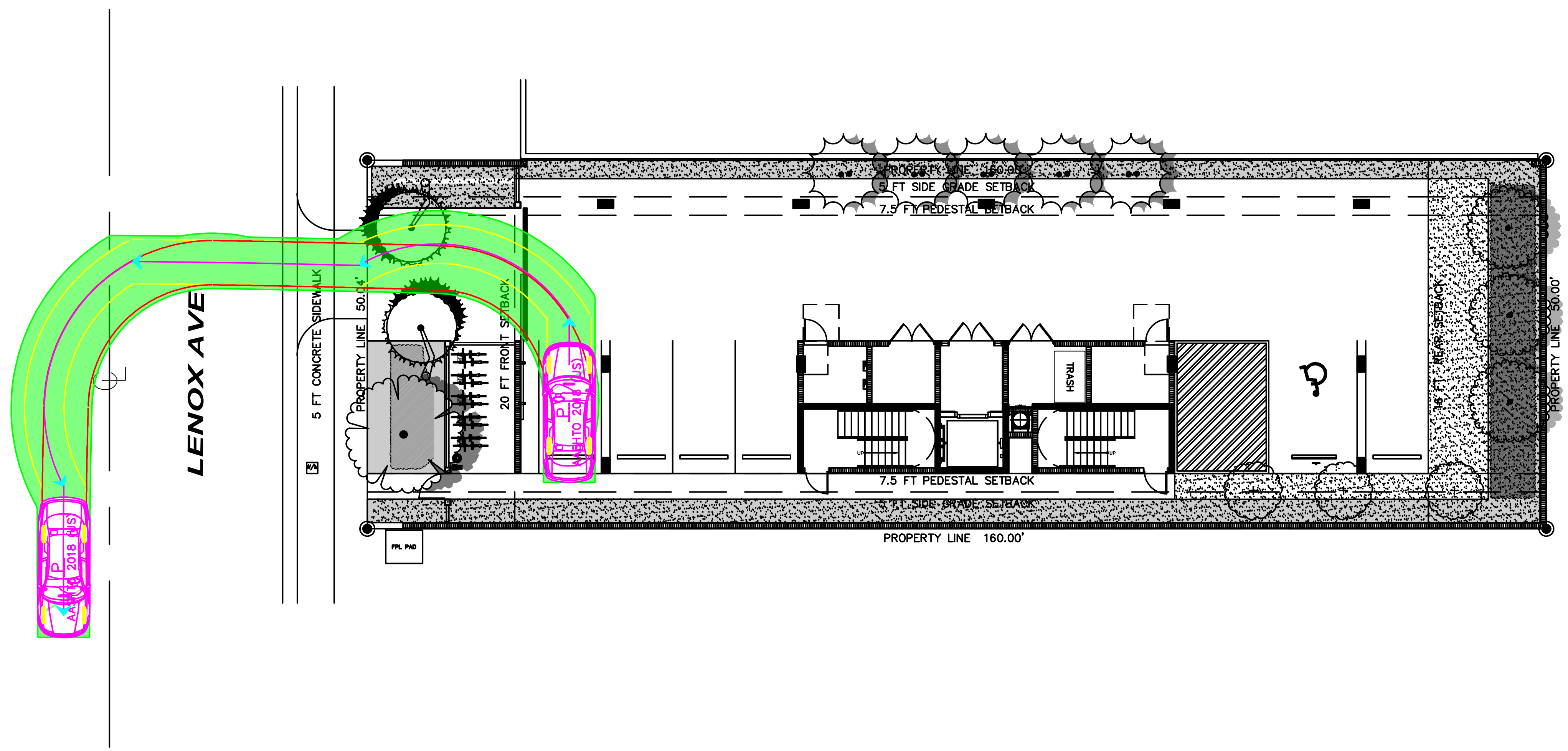
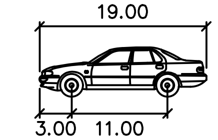
FBPE Registry No. 00006601/LB8172/LB8198

Project	Drawing Title	Project No.	Drawing No.
1525 LENOX AVENUE MIAMI BEACH MIAMI-DADE COUNTY FLORIDA	INGRESS MANEUVERABILITY FIGURE	300335101 Date: JANUARY 2024 Drawn By: JSP Checked By: MGP	1

Date: 1/19/2024 Time: 11:29 User: jpark Style Table: Langan.stb Layout: 1 Document Code: 300335101-0201-KT101-0101





P

	feet
Width	: 7.00
Track	: 6.00
Lock to Lock Time	: 6.0
Steering Angle	: 31.6

20 0 5 10 20

SCALE: 1" = 20'

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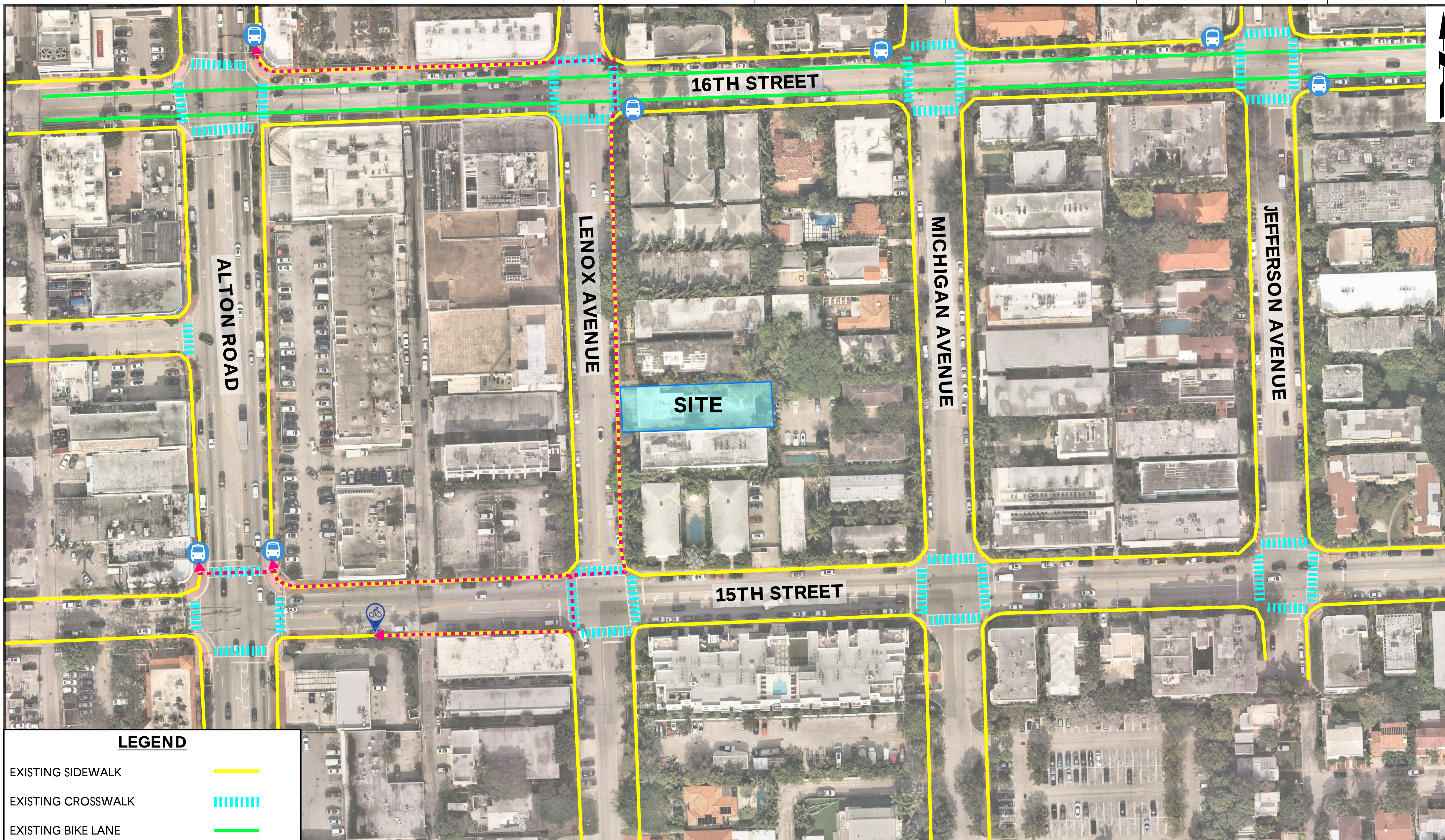
Project	Drawing Title	Project No.	Drawing No.
1525 LENOX AVENUE MIAMI BEACH MIAMI-DADE COUNTY FLORIDA	EGRESS MANEUVERABILITY FIGURE	300335101 Date: JANUARY 2024 Drawn By: JSP Checked By: MGP	2

Attachment F
Multimodal Evaluation



LEGEND

- EXISTING SIDEWALK
- EXISTING CROSSWALK
- EXISTING BIKE LANE
- PEDESTRIAN ROUTE
- EXISTING BUS STOP
- EXISTING CITI BIKE STATION

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FBPE Registry No. 00006601/LB8172/LB8198

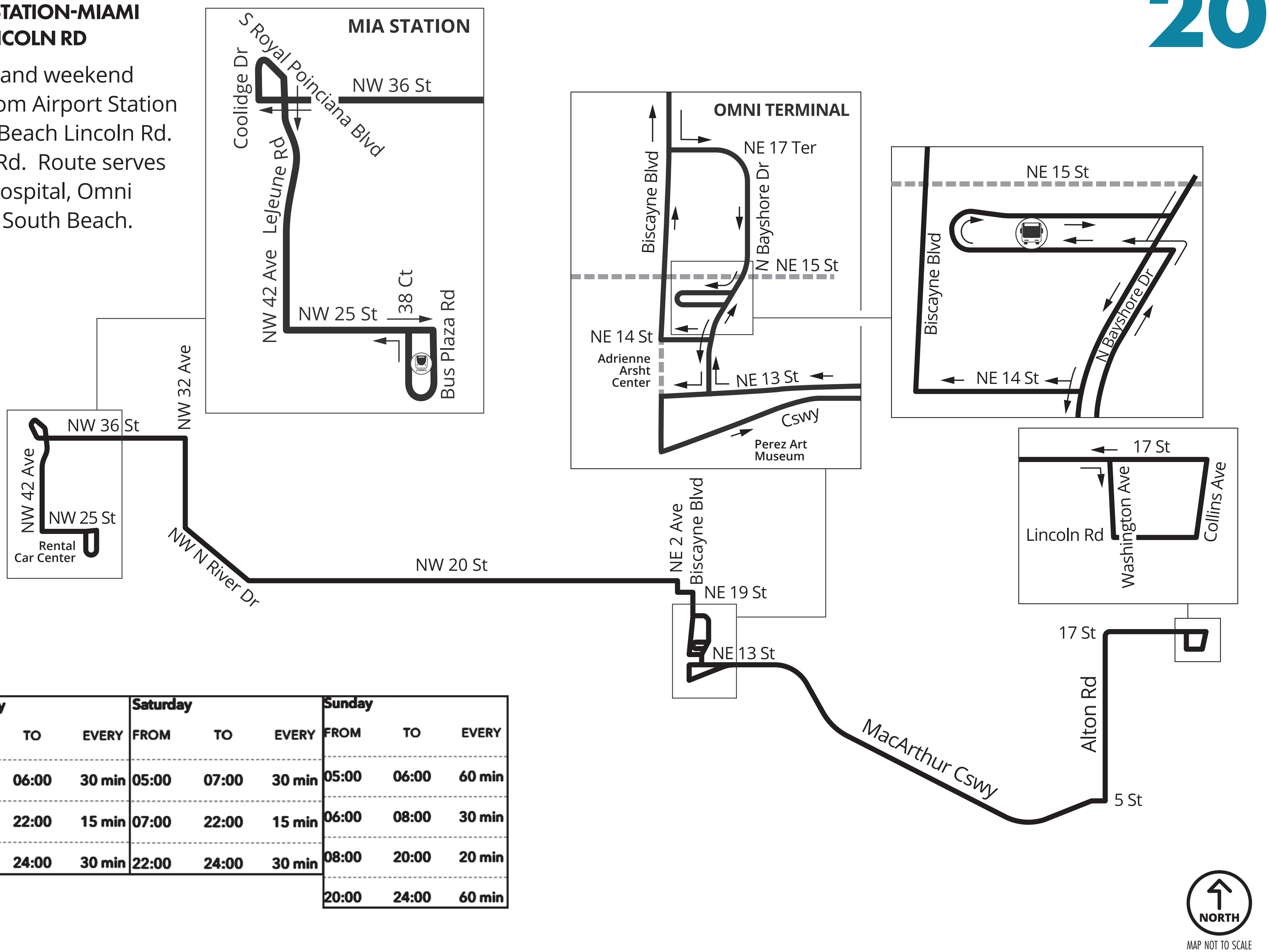
Project	1525 LENOX AVENUE MIAMI BEACH MIAMI-DADE COUNTY FLORIDA
Drawing Title	PEDESTRIAN ACCESS FIGURE
Project No.	300335101
Date	JANUARY 2024
Drawn By	JSP
Checked By	MGP
Drawing No.	4

Project No. 300335101

ROUTE 20

AIRPORT STATION-MIAMI BEACH LINCOLN RD

Weekday and weekend service from Airport Station to Miami Beach Lincoln Rd. via Alton Rd. Route serves Jackson Hospital, Omni Terminal, South Beach.



Weekday

FROM	TO	EVERY
04:00	06:00	30 min
06:00	22:00	15 min
22:00	24:00	30 min

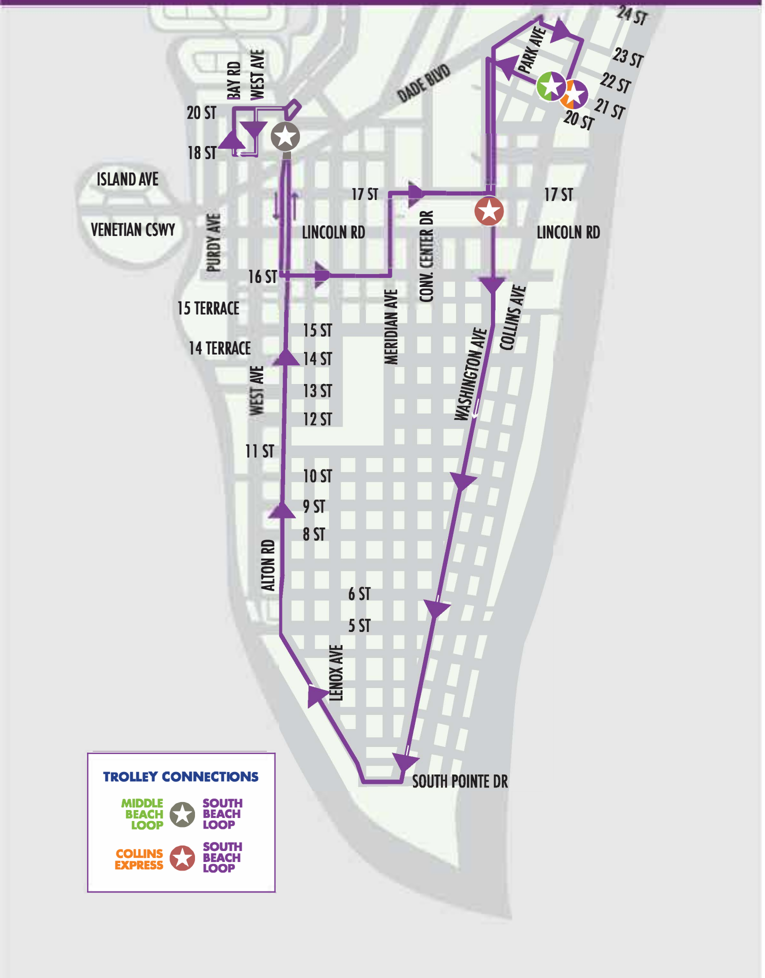
Saturday

FROM	TO	EVERY
05:00	07:00	30 min
07:00	22:00	15 min
22:00	24:00	30 min

Sunday

FROM	TO	EVERY
05:00	06:00	60 min
06:00	08:00	30 min
08:00	20:00	20 min
20:00	24:00	60 min

SOUTH BEACH LOOP - A
Clockwise



SOUTH BEACH LOOP - B
Counter Clockwise