1940 Bay Drive

Miami Beach, Florida 33141

prepared for:

1940 Apartments LLC

traffic report

TRAFTECH ENGINEERING, INC.

September 2023

TRAFTECH ENGINEERING, INC.

1940 Bay Drive
c/o Monika H. Entin, Esq.
7950 NW 53rd Street, Suite 337
Miami, Florida 33166

September 29, 2023

Re: 1940 Bay Drive – Traffic Statement

Dear Monika:

Traf Tech Engineering, Inc. has prepared this traffic statement in connection with the proposed re-development of an existing two-story residential apartment complex consisting of 23 units. The site is located at 1940 Bay Drive in the City of Miami Beach, Miami-Dade County, Florida (refer to Figure 1). The existing residential development will be replaced with a 5-story, 12-unit residential development. The proposed site plan for the project is contained in Attachment A. This traffic report addresses the following topics:

- Trip Generation/Distribution
- Driveway Assignment
- Need for Turn Lanes
- Entry Gates/Queuing
- Valet Service
- Parking and Deliveries
- Transportation Demand Management

Trip Generation and Trip Distribution

A trip generation comparison analysis was performed for the site using the trip generation equations published in the Institute of Transportation Engineer's (ITE) *Trip Generation Manual (11th Edition)*. The trip generation analyses were undertaken for daily, AM peak hour, and PM peak hour conditions.

According to ITE's *Trip Generation Manual (11th Edition)*, the trip generation equations used for the analyses are presented below (refer to Attachment B):

Multifamily Housing – Low Rise (ITE Land Use 220)

Daily Trips

T = 6.74 (X)
Where T = average daily vehicle trip ends and X = number of units

AM Peak Hour

T = 0.40 (X) with 24% inbound and 76% outbound
Where T = AM peak hour trip ends and X = number of units

PM Peak Hour

T = 0.51 (X) with 63% inbound and 37% outbound
Where T = PM peak hour trip ends and X = number of units

Multifamily Housing – Mid Rise (ITE Land Use 221)

Daily Trips

T = 4.54 (X)
Where T = average daily vehicle trip ends and X = number of units

AM Peak Hour

T = 0.37 (X) with 23% inbound and 77% outbound
Where T = AM peak hour trip ends and X = number of units

PM Peak Hour

T = 0.39 (X) with 61% inbound and 39% outbound
Where T = PM peak hour trip ends and X = number of units

Using the above-listed trip generation equations from the ITE document, a trip generation comparison analysis was undertaken for the 1940 Bay Drive project. The results of this effort are documented in Tables 1 and 2. As shown in the table, the 12-unit residential development is projected to generate approximately 54 daily trips, approximately four (4) AM peak hour trips and approximately five (5) trips during the typical afternoon peak. When compared against the existing 23-unit development at the site, the proposed project will reduce trips from Normandy Isle.

TABLE 1
Trip Generation Summary (Existing Use)
1940 Bay Drive

			AM Peak Hour			PM Peak Hour		
Land Use	**Size**	**Daily Trips**	**Total Trips**	**Inbound**	**Outbound**	**Total Trips**	**Inbound**	**Outbound**
Multifamily Low Rise (LUC 220)	23 units	155	9	2	7	12	8	4
External Trips		**155**	**9**	**2**	**7**	**12**	**8**	**4**

Source: ITE Trip Generation Manual (11th Edition)

TABLE 2
Trip Generation Summary (Proposed Use)
1940 Bay Drive

			AM Peak Hour			PM Peak Hour		
Land Use	**Size**	**Daily Trips**	**Total Trips**	**Inbound**	**Outbound**	**Total Trips**	**Inbound**	**Outbound**
Multifamily Mid Rise (LUC 221)	12 units	54	4	1	3	5	3	2
External Trips		**54**	**4**	**1**	**3**	**5**	**3**	**2**

Source: ITE Trip Generation Manual (11th Edition)

		AM Peak Hour			PM Peak Hour		
Difference	**Daily Trips**	**Total Trips**	**Inbound**	**Outbound**	**Total Trips**	**Inbound**	**Outbound**
Proposed - Existing	**-101**	**-5**	**-1**	**-4**	**-7**	**-5**	**-2**

The trip distribution and traffic assignment for the project's peak trips was based on Miami-Dade County's Cardinal Distribution information for the study area. Table 3 summarizes the County's cardinal distribution data for Traffic Analysis Zone 625, which is applicable to the project site from the latest SERPM data published by Miami-Dade County (refer to Attachment C).

TABLE 3
Project Trip Distribution
TAZ #625 for 1940 Bay Drive

Year	Movement							
	NNE	ENE	ESE	SSE	SSW	WSW	WNW	NNW
2015	12.7%	3.3%	0.0%	11.6%	9.0%	27.5%	14.2%	21.6%
2045	9.1%	2.0%	0.0%	9.5%	14.1%	31.5%	14.6%	19.3%
2026*	11.4%	2.8%	0.0%	10.8%	10.9%	29.0%	14.3%	20.8%

*Notes: * Interpolated Values*

Source: Miami-Dade County (2015 & 2045 SERPM)

Due to the small trips associated with the proposed 12-unit development, the following traffic assignment was assumed for the 1940 Bay Drive project:

- 70% to/from the northwest via Bay Drive
- 30% to and from the southeast via Bay Drive

Driveway Assignment

As shown in the site plan contained in Attachment A, access to the project will be provided via one inbound-only driveway and one outbound-only driveway. Figure 2 presents the AM and PM peak hour traffic volumes at the two access driveways.

Need for Turn Lanes

Based on the projected driveway volumes, an exclusive right-turn lane or left-turn lane are not warranted on Bay Drive.

Entry Gates and Queuing

Entry gates are proposed at the entrance to the east and west parking garages, as shown on the site plan. The distance between the west parking garage gate and the right-of-way line is approximately 40 feet (sufficient to accommodate two (2) vehicles.

A queuing analysis was conducted for the entry gate. The access to the east and west parking garages is proposed to be controlled by a gate system and transponder. Residents will have a vehicle card reader to operate the gate in order to minimize delays and queues. Visitors will not be allowed to use the gated entrance (they will use the nine on-street parking spaces). The queuing analysis was based on the following assumptions:

- During the peak inbound period (PM), three inbound vehicles are anticipated. All three vehicles were assumed to use the west parking garage.

- Several gate systems will be available for this project. Depending on the gate system implemented, the time to open the gate could vary between 3 and 12 seconds. For purposes of this evaluation, 12 seconds were assumed, for a service rate of 300 vehicle per hour.

Using the above assumptions, a queuing of one (1) vehicle is anticipated. Since the west garage gate is located approximately 40 feet from the property line, traffic entering the site will not spill onto Bay Drive. Attachment D includes a description of the queuing analysis and calculation details.

Valet Service

Valet service is not contemplated for this project.

Parking and Deliveries

Within the frontage of the 1940 Bay Drive residential development, there are 18 90-degree on-street parking spaces. These parking spaces are currently being used by the tenants of the 23 residential units located within the site. With the proposed redevelopment project, nine (9) on-street parking spaces will remain and nine (9) will be eliminated to provide access to the proposed parking garage for the future 12 residential units. Within the parking garage, there will be

a total of 24 off-street parking spaces. Hence, the proposed 12-unit development will result in more parking for future tenants and visitors than currently existing along the frontage of the 1940 Bay Drive site.

Coordination with the City of Miami Beach Parking Department will be held during the development of this project regarding the elimination of nine (9) on-street parking spaces.

Deliveries will occur on the one-way (eastbound) internal aisle between the entrance and exit driveways.

Transportation Demand Management

The project should incorporate the following strategies intended to reduce the use of private automobile:

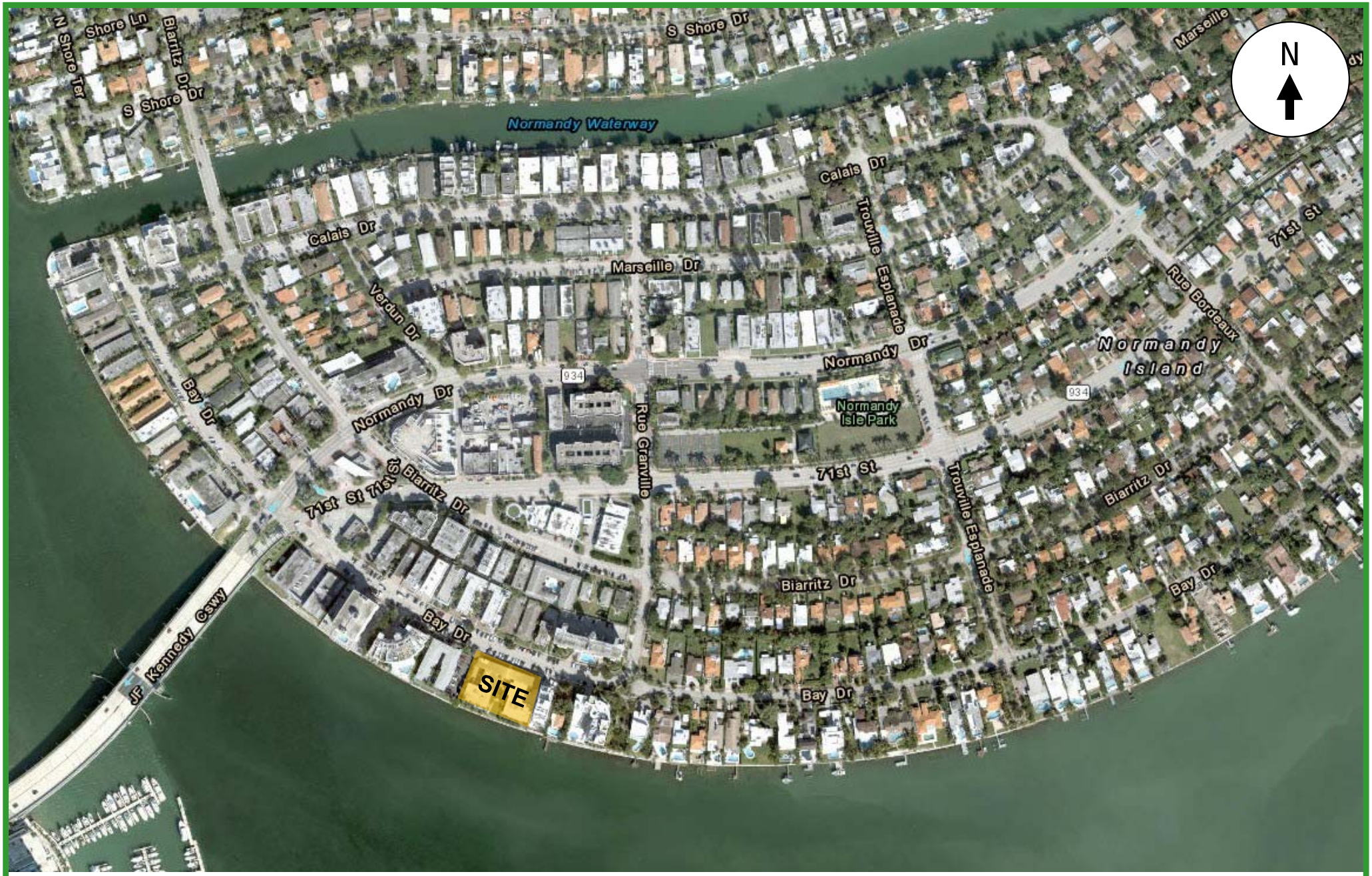
- Transit information pamphlets including public transportation routes, schedules and maps should be provided at the lobby of the residential building.
- Designated bicycle parking in the parking garage.
- Wide (5-8 feet) hallways and elevators that can accommodate bicycles.
- Safe pedestrian connectivity to the existing sidewalk located on the south side of Bay Drive.

Please give me a call if you have any questions.

Sincerely,

TRAF TECH ENGINEERING, INC.

Joaquin E. Vargas, P.E.
Senior Transportation Engineer

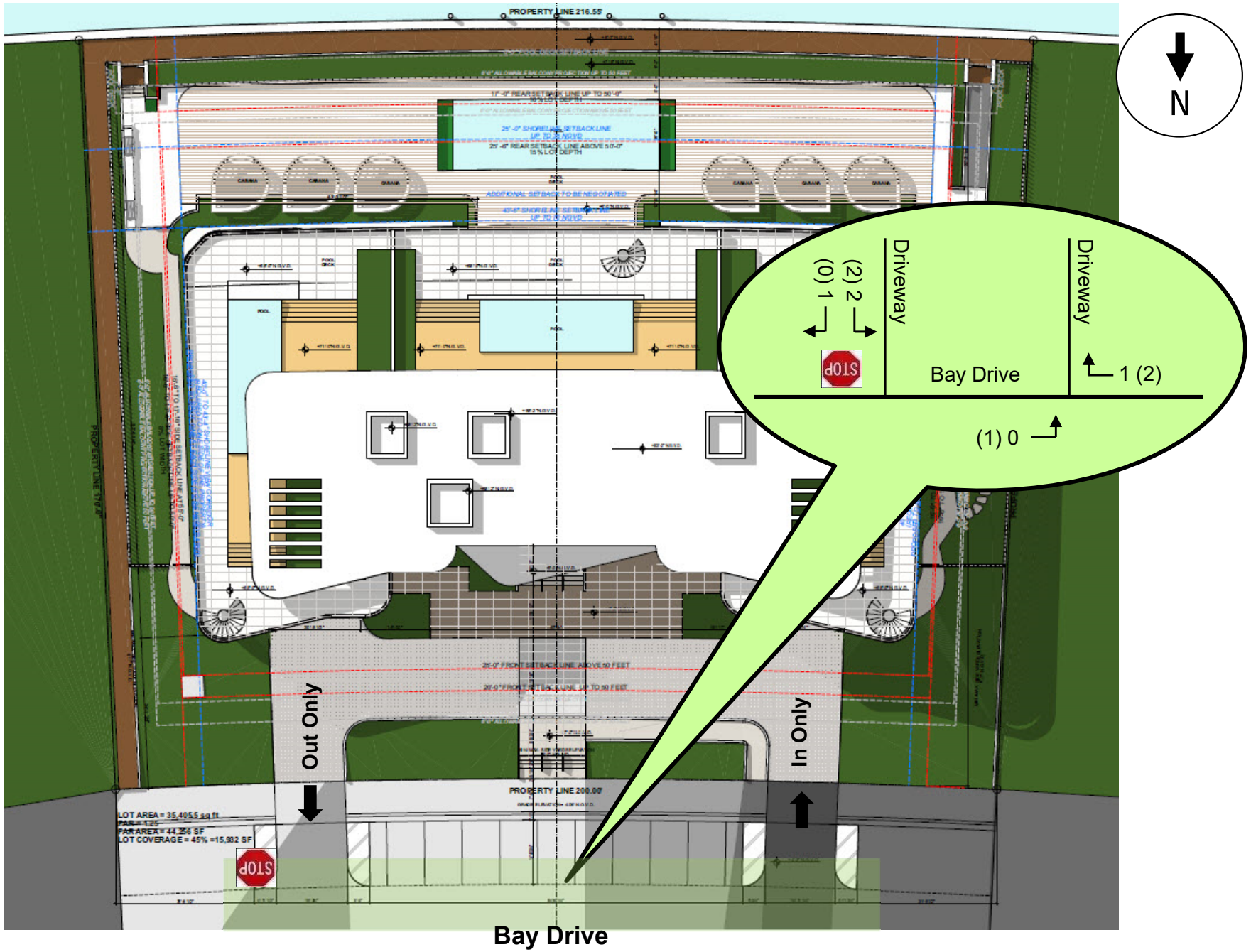


TRAFTECH ENGINEERING, INC.

Project Location Map

FIGURE 1

1940 Bay Drive
Miami Beach, Florida



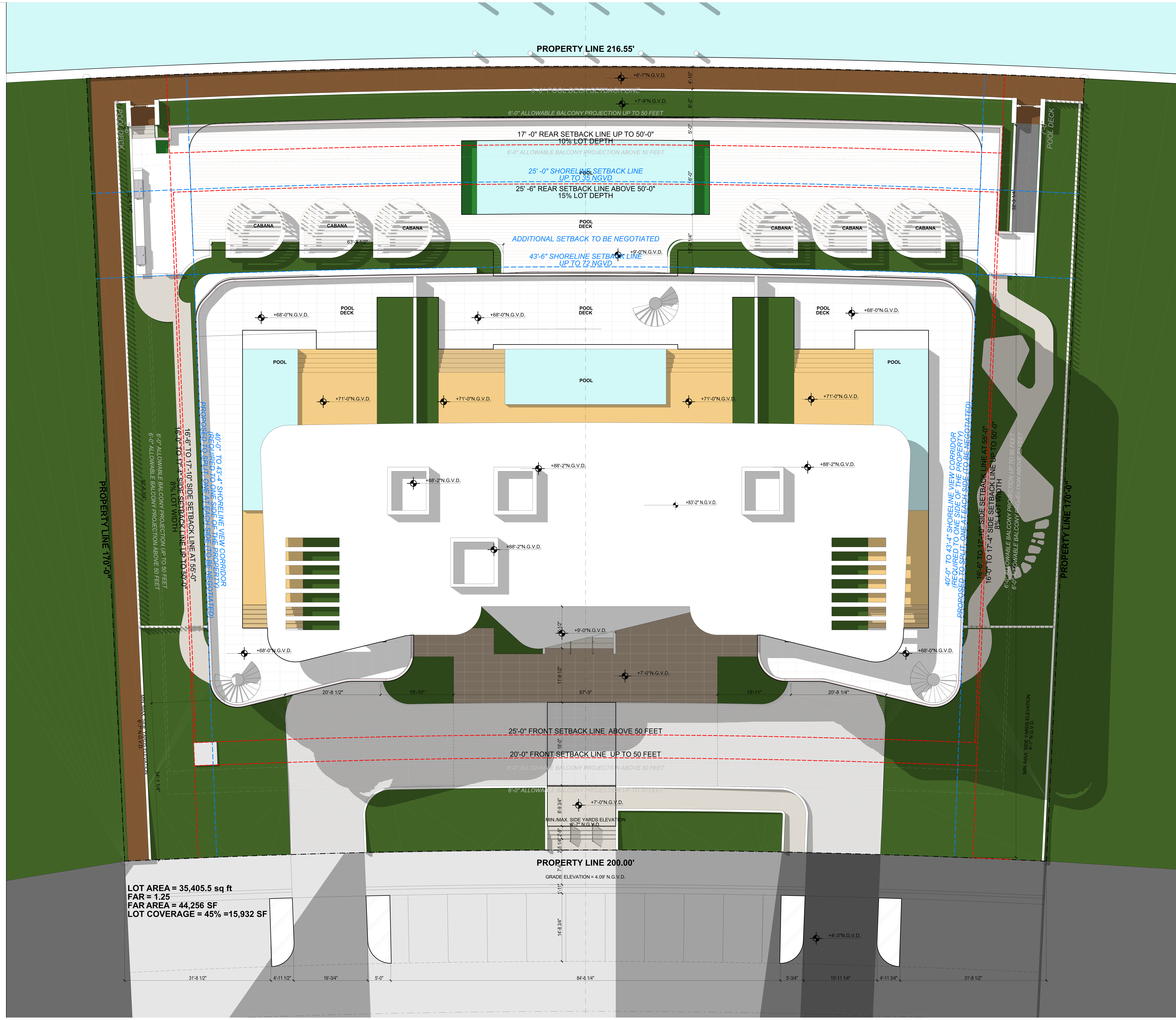
TRAFTECH ENGINEERING, INC.

Traffic Assignment

FIGURE 2
1940 Bay Drive
Miami Beach, Florida

ATTACHMENT A

Site Plan for 1940 Bay Drive



1 Axonometry
SCALE: 1/8" = 1'-0"

NOT FOR CONSTRUCTION

revuelta
architecture international

Miami
Santiago, Chile

revuelta-architecture.com

Project

1940 Bay Drive

#Site Address1
#Site City, #Site State #Site Postcode

Revisions

Owner Information

#Client Company

#Client Address1
#Client Address2
#Client City, #Client State #Client Postcode

#Client Phone Number

Consultant

Luis O. Revuelta
AR-0007972

#Project Status

Date
9/5/2023

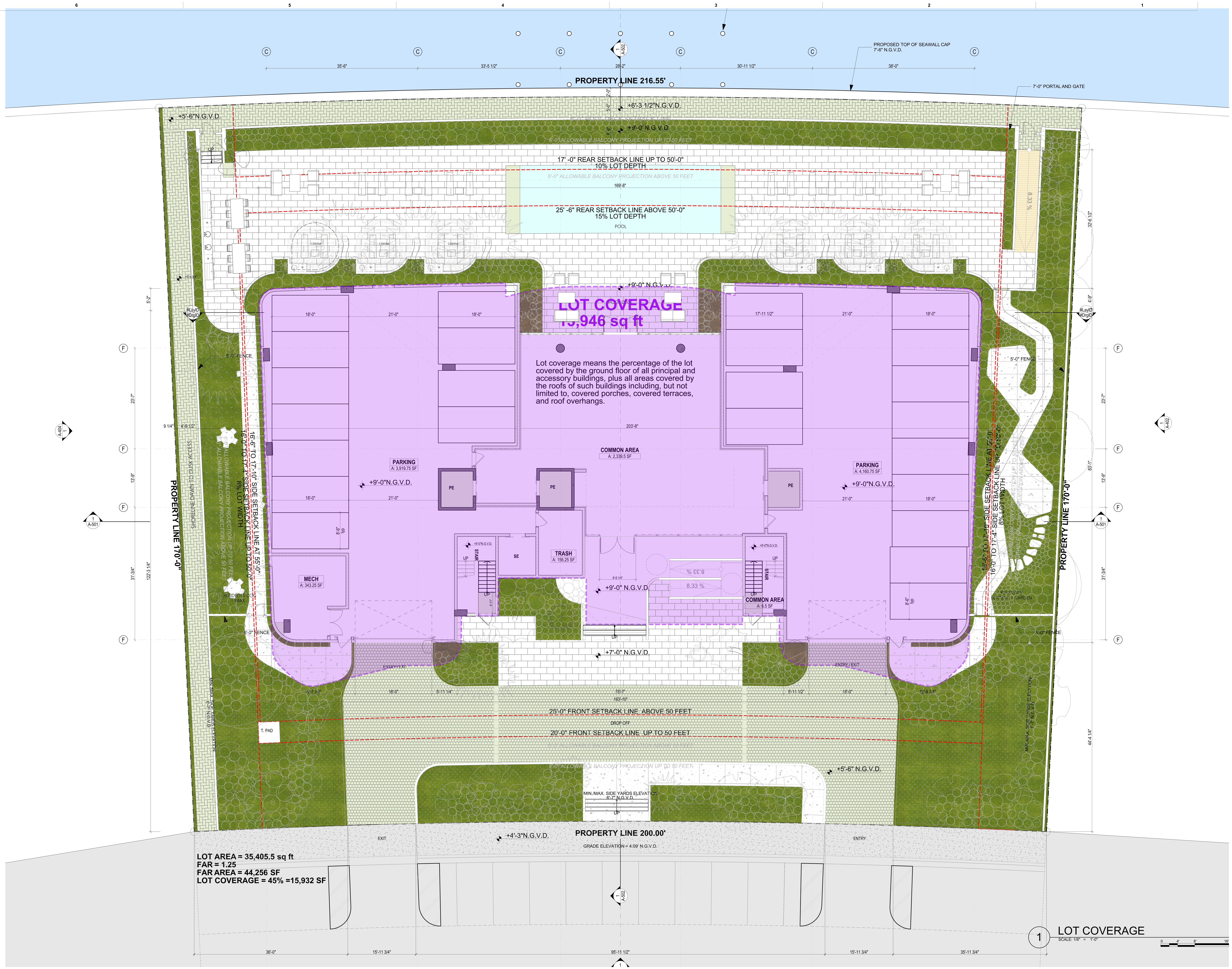
Scale
AS SHOWN

Project No.
2133

Sheet Name
SITE PLAN

Sheet No.
A-007

NOT FOR CONSTRUCTION


PROPOSED TOP OF SEAWALL CAP
7'-6" N.G.V.D.
35'-6"
33'-5 1/2"
28'-2"
30'-11 1/2"
38'-0"
PROPERTY LINE 216.55'
7'-0" PORTAL AND GATE
+6'-3 1/2"N.G.V.D.
+5'-6"N.G.V.D.
+9'-0 N.G.V.D.
6'-0" ALLOWABLE BALCONY PROJECTION UP TO 50 FEET
17' -0" REAR SETBACK LINE UP TO 50'-0"
10% LOT DEPTH
6'-0" ALLOWABLE BALCONY PROJECTION ABOVE 50 FEET
169'-8"
25' -6" REAR SETBACK LINE ABOVE 50'-0"
15% LOT DEPTH
POOL
8.33 %
+9'-0" N.G.V.D.
LOT COVERAGE
15,946 sq ft
Lot coverage means the percentage of the lot covered by the ground floor of all principal and accessory buildings, plus all areas covered by the roofs of such buildings including, but not limited to, covered porches, covered terraces, and roof overhangs.
203'-8"
COMMON AREA
A: 2,339.5 SF
PARKING
A: 3,919.75 SF
PARKING
A: 4,160.75 SF
+9'-0"N.G.V.D.
+9'-0"N.G.V.D.
PE
PE
PE
MECH
A: 343.25 SF
SE
TRASH
A: 156.25 SF
STAIR
STAIR
COMMON AREA
A: 6.5 SF
UP
+9'-0" N.G.V.D.
8.33 %
5'-0" FENCE
5'-0" FENCE
PROPERTY LINE 170'-0"
PROPERTY LINE 170'-0"
16'-6" TO 17'-10" SIDE SETBACK LINE AT 55'-0"
16'-0" TO 17'-4" SIDE SETBACK LINE UP TO 50'-0"
8% LOT WIDTH
16'-6" TO 17'-10" SIDE SETBACK LINE AT 55'-0"
16'-0" TO 17'-4" SIDE SETBACK LINE UP TO 50'-0"
8% LOT WIDTH
+7'-0" N.G.V.D.
ENTRY / EXIT
ENTRY / EXIT
18'-9"
5'-11 1/4"
78'-7"
5'-11 1/2"
18'-6"
25'-0" FRONT SETBACK LINE ABOVE 50 FEET
DROP-OFF
20'-0" FRONT SETBACK LINE UP TO 50 FEET
T. PAD
6' ALLOWABLE BALCONY PROJECTION UP TO 50 FEET
+5'-6" N.G.V.D.
MIN./MAX. SIDE YARDS ELEVATION
6'-7" N.G.V.D.
UP
PROPERTY LINE 200.00'
+4'-3"N.G.V.D.
GRADE ELEVATION = 4.09' N.G.V.D.
EXIT
ENTRY
36'-0"
15'-11 3/4"
95'-11 1/2"
15'-11 3/4"
35'-11 3/4"

LOT AREA = 35,405.5 sq ft
FAR = 1.25
FAR AREA = 44,256 SF
LOT COVERAGE = 45% =15,932 SF

1 LOT COVERAGE
SCALE: 1/8" = 1'-0"

revuelta
architecture
international

Miami
Santiago, Chile

revuelta-architecture.com

2950 SW 27TH AVE.
SUITE 110
MIAMI, FL 33133

T. 305.590.5000
F. 305.590.5040

Project

1940 Bay Drive
#Site Address1
#Site City, #Site State #Site Postcode

Revisions

Owner Information

#Client Company
#Client Address1
#Client Address2
#Client City, #Client State #Client Postcode

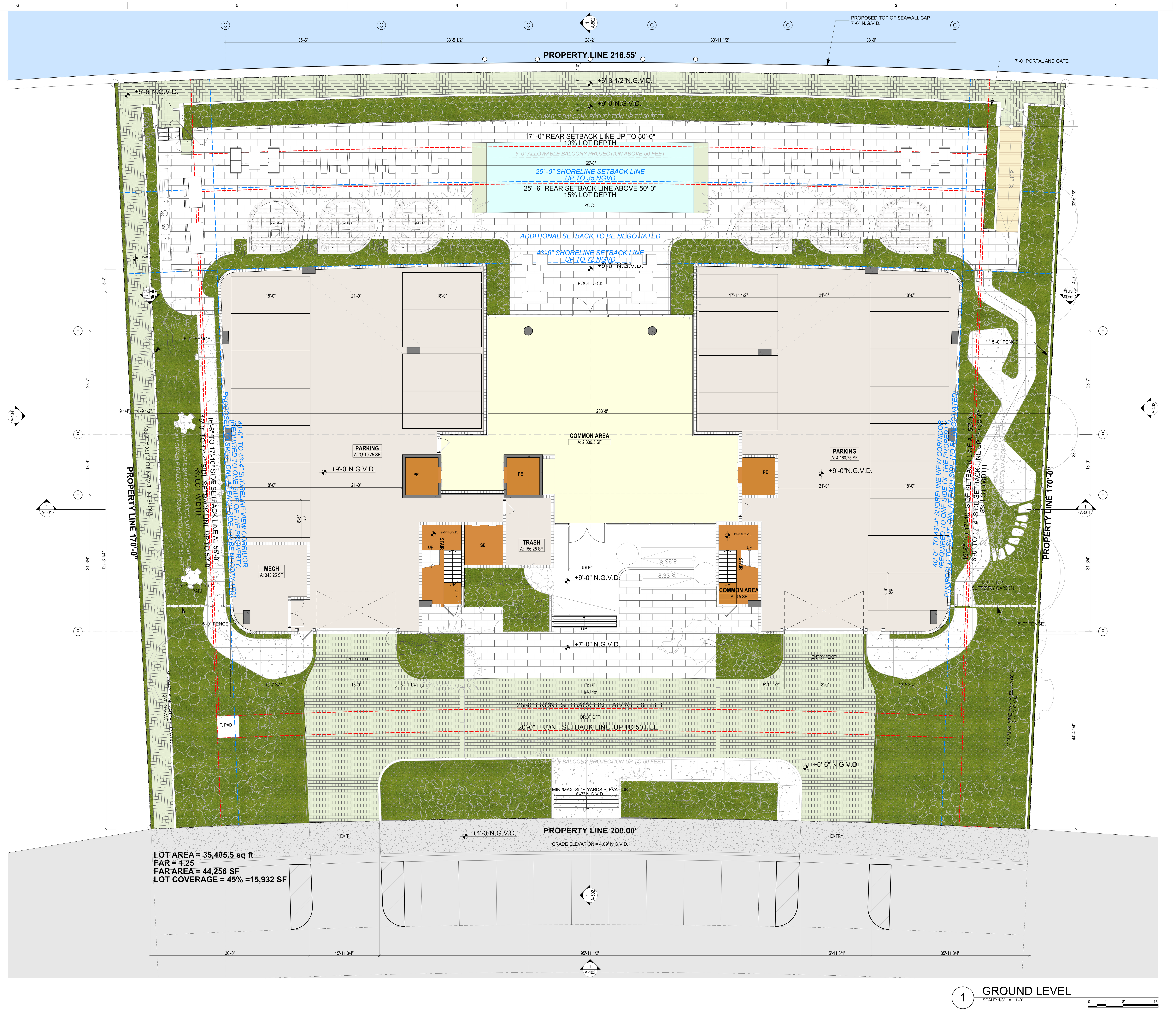
#Client Phone Number

Consultant

Luis O. Revuelta
AR-0007972

#Project Status

Date
9/5/2023
Scale
AS SHOWN
Project No.
2133
Sheet Name
LOT COVERAGE
Sheet No.
A-008


PROPOSED TOP OF SEAWALL CAP 7'-6" N.G.V.D.
PROPERTY LINE 216.55'
7'-0" PORTAL AND GATE
+5'-6" N.G.V.D.
+6'-3 1/2" N.G.V.D.
+9'-0" N.G.V.D.
6'-0" ALLOWABLE BALCONY PROJECTION UP TO 50 FEET
17' -0" REAR SETBACK LINE UP TO 50'-0"
10% LOT DEPTH
6'-0" ALLOWABLE BALCONY PROJECTION ABOVE 50 FEET
25' -0" SHORELINE SETBACK LINE
UP TO 35 NGVD
25' -6" REAR SETBACK LINE ABOVE 50'-0"
15% LOT DEPTH
POOL
ADDITIONAL SETBACK TO BE NEGOTIATED
43'-6" SHORELINE SETBACK LINE
UP TO 72 NGVD
POOL DECK
8.33 %
5'-0" FENCE
COMMON AREA
A: 2,339.5 SF
PARKING
A: 3,919.75 SF
PARKING
A: 4,160.75 SF
+9'-0" N.G.V.D.
PE
SE
TRASH
A: 156.25 SF
MECH
A: 343.25 SF
STAIR
UP
COMMON AREA
A: 6.5 SF
PROPERTY LINE 170'-0"
SHORELINE DRAWN TO DUSK ACCESS
16'-6" TO 17'-10" SIDE SETBACK LINE AT 55'-0"
16'-0" TO 17'-4" SIDE SETBACK LINE UP TO 50'-0"
8% LOT WIDTH
40'-0" TO 43'-4" SHORELINE VIEW CORRIDOR
(REQUIRED TO ONE SIDE OF THE PROPERTY)
PROPOSED TO SPLIT ON EACH SIDE (TO BE NEGOTIATED)
ALLOWABLE BALCONY PROJECTION UP TO 50 FEET
+7'-0" N.G.V.D.
ENTRY / EXIT
25'-0" FRONT SETBACK LINE ABOVE 50 FEET
DROP OFF
20'-0" FRONT SETBACK LINE UP TO 50 FEET
T. PAD
6'-0" ALLOWABLE BALCONY PROJECTION UP TO 50 FEET
+5'-6" N.G.V.D.
MIN./MAX. SIDE YARDS ELEVATION 6'-7" N.G.V.D.
EXIT
ENTRY
+4'-3" N.G.V.D.
PROPERTY LINE 200.00'
GRADE ELEVATION = 4.09' N.G.V.D.
LOT AREA = 35,405.5 sq ft
FAR = 1.25
FAR AREA = 44,256 SF
LOT COVERAGE = 45% =15,932 SF
1 GROUND LEVEL
SCALE: 1/8" = 1'-0"

revuelta
architecture
international

Miami
Santiago, Chile

revuelta-architecture.com

2950 SW 27TH AVE.
SUITE 110
MIAMI, FL 33133
T. 305.590.5000
F. 305.590.5040

Project

1940 Bay Drive
#Site Address1
#Site City, #Site State #Site Postcode

Revisions

Owner Information

#Client Company
#Client Address1
#Client Address2
#Client City, #Client State #Client Postcode
#Client Phone Number

Consultant

Luis O. Revuelta
AR-0007972

#Project Status

Date
9/5/2023
Scale
AS SHOWN
Project No.
2133
Sheet Name
1ST FLOOR PLAN
Sheet No.
A-100

ATTACHMENT B

ITE Trip Generation Rates for
LUC 220 (Low Rise) and LUC 221(Mid Rise)

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

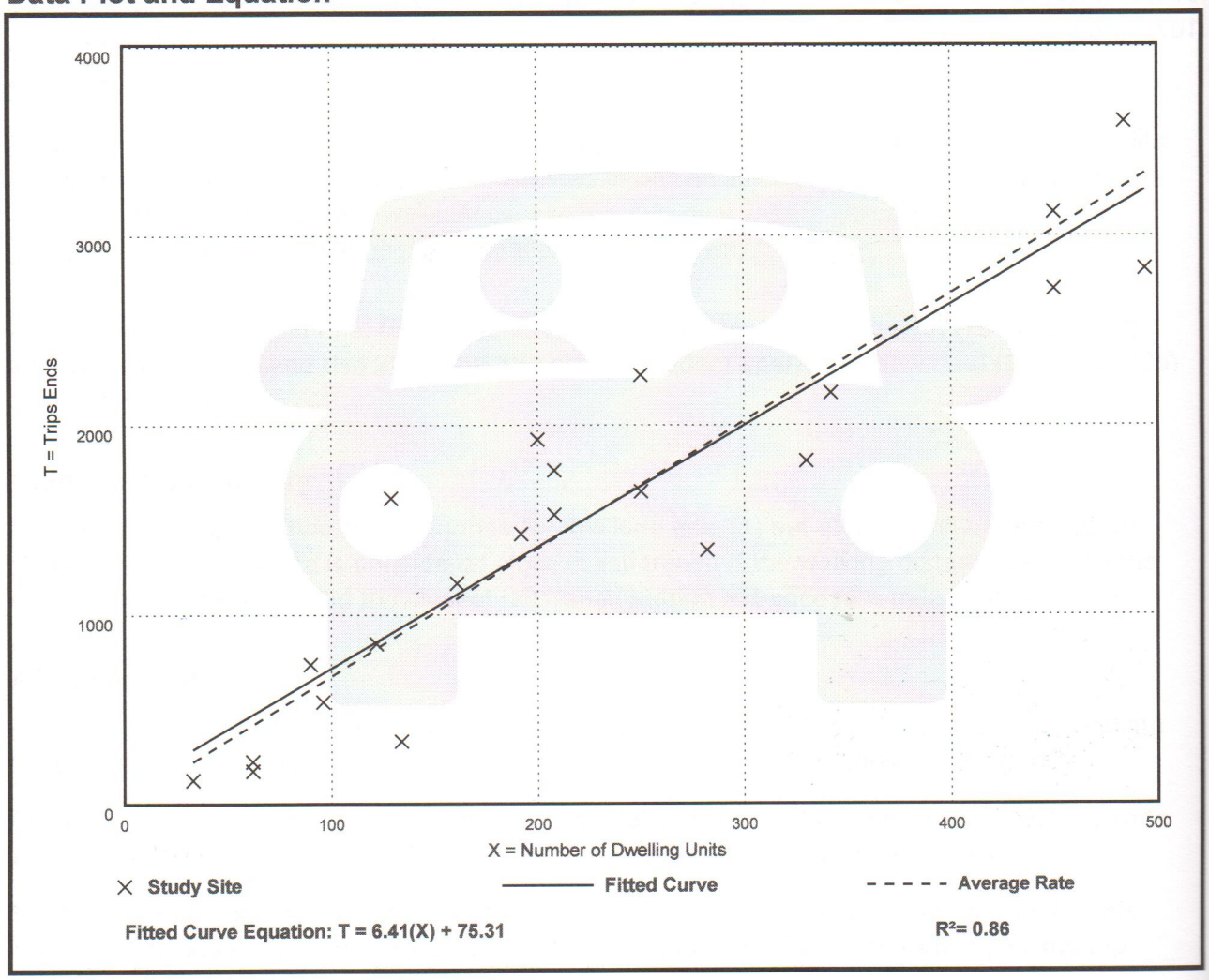
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

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

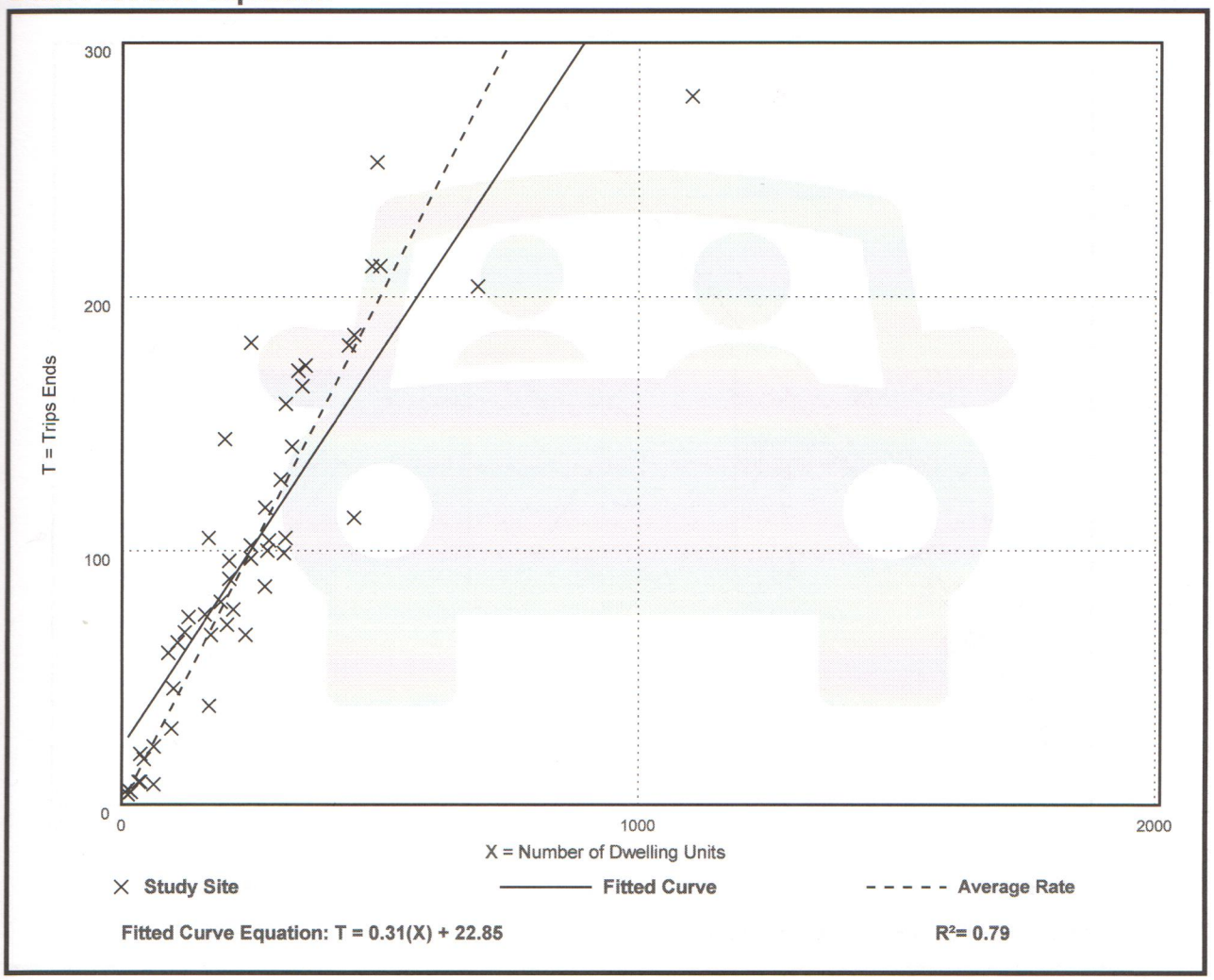
Multifamily Housing (Low-Rise)
Not Close to Rail Transit (220)

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

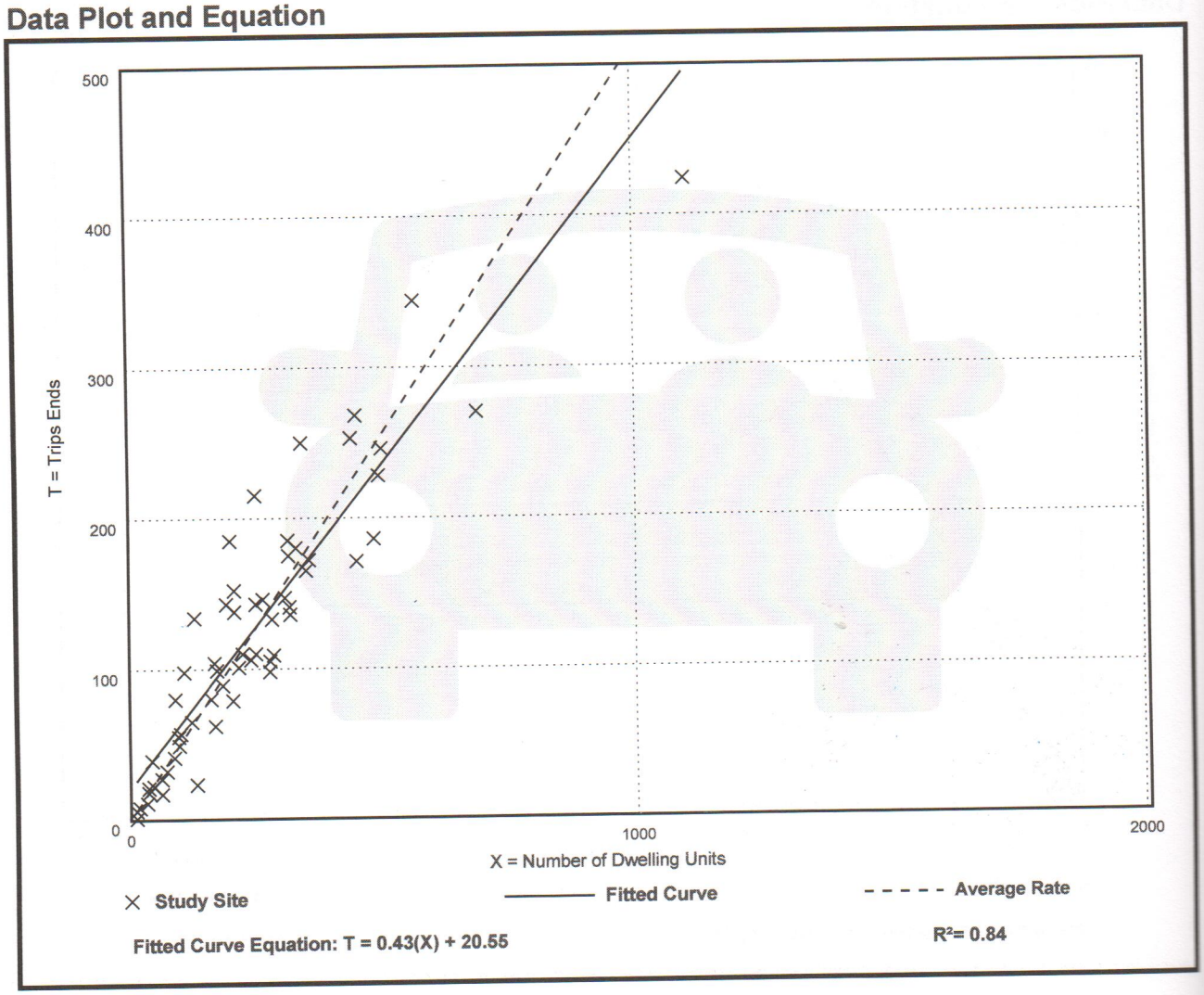
Multifamily Housing (Low-Rise)
Not Close to Rail Transit (220)

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



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

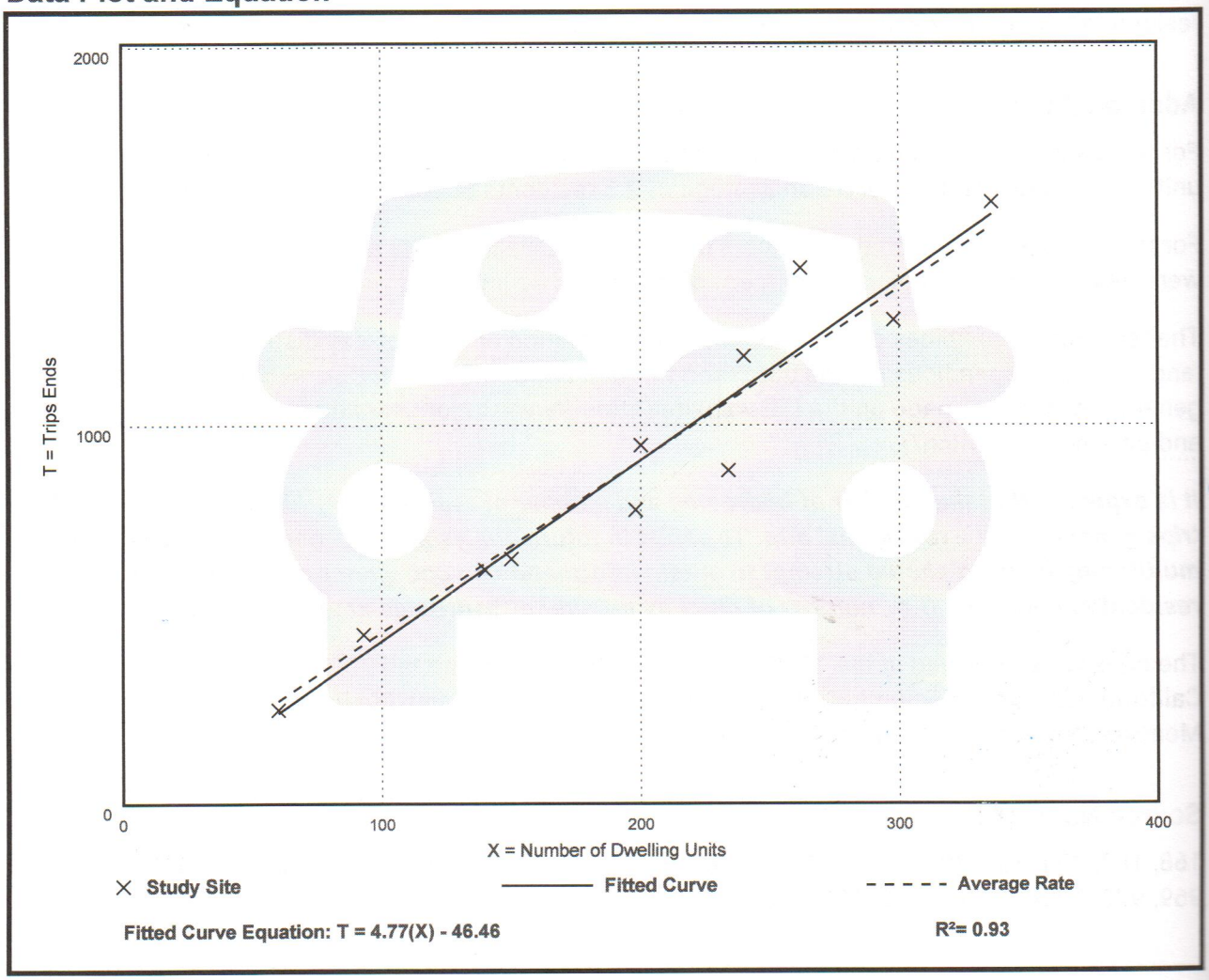
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 11
Avg. Num. of Dwelling Units: 201
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
4.54	3.76 - 5.40	0.51

Data Plot and Equation



Fitted Curve Equation: T = 4.77(X) - 46.46

R^2= 0.93

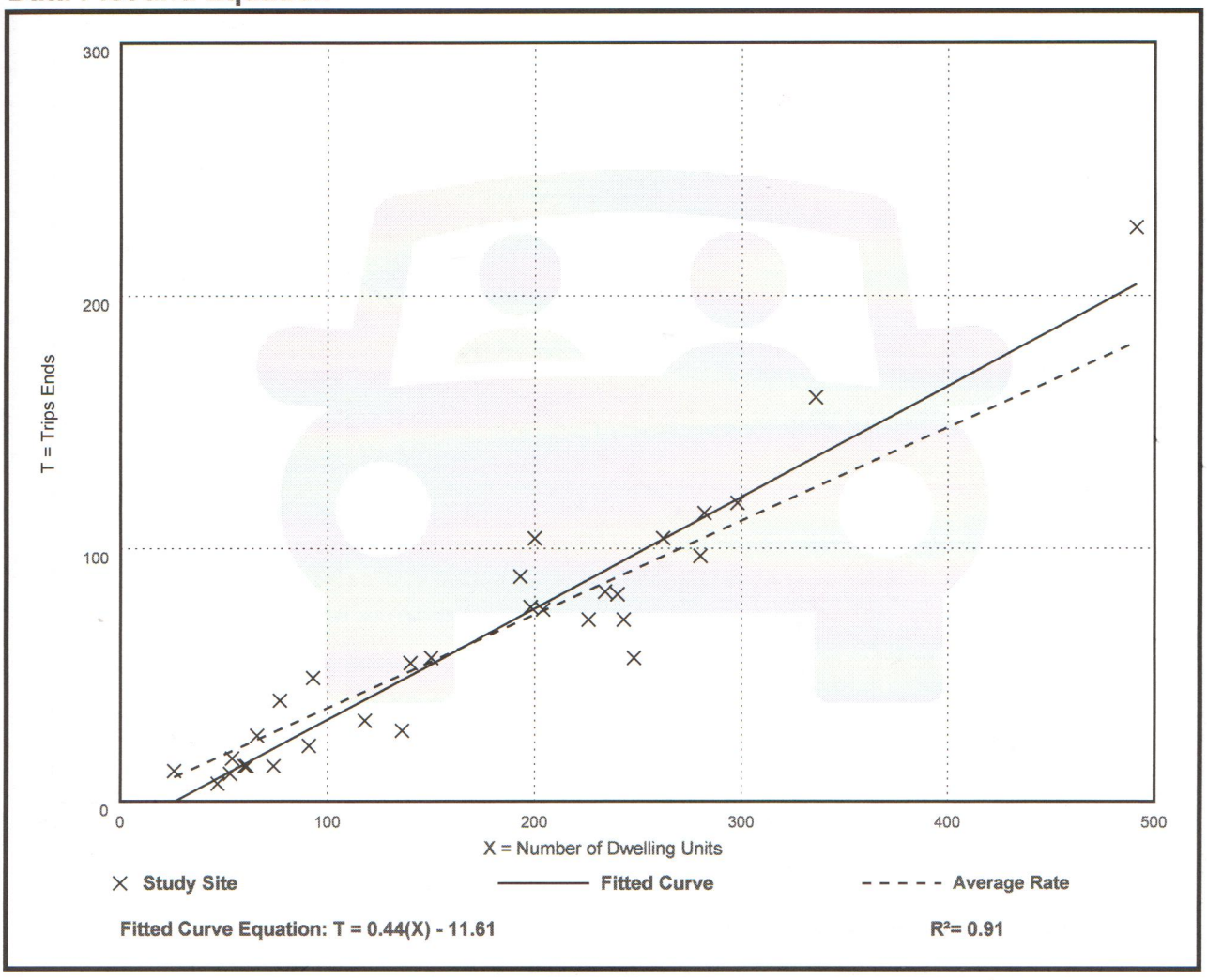
Multifamily Housing (Mid-Rise)
Not Close to Rail Transit (221)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 30
Avg. Num. of Dwelling Units: 173
Directional Distribution: 23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

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

Data Plot and Equation



Fitted Curve Equation: T = 0.44(X) - 11.61

R^2= 0.91

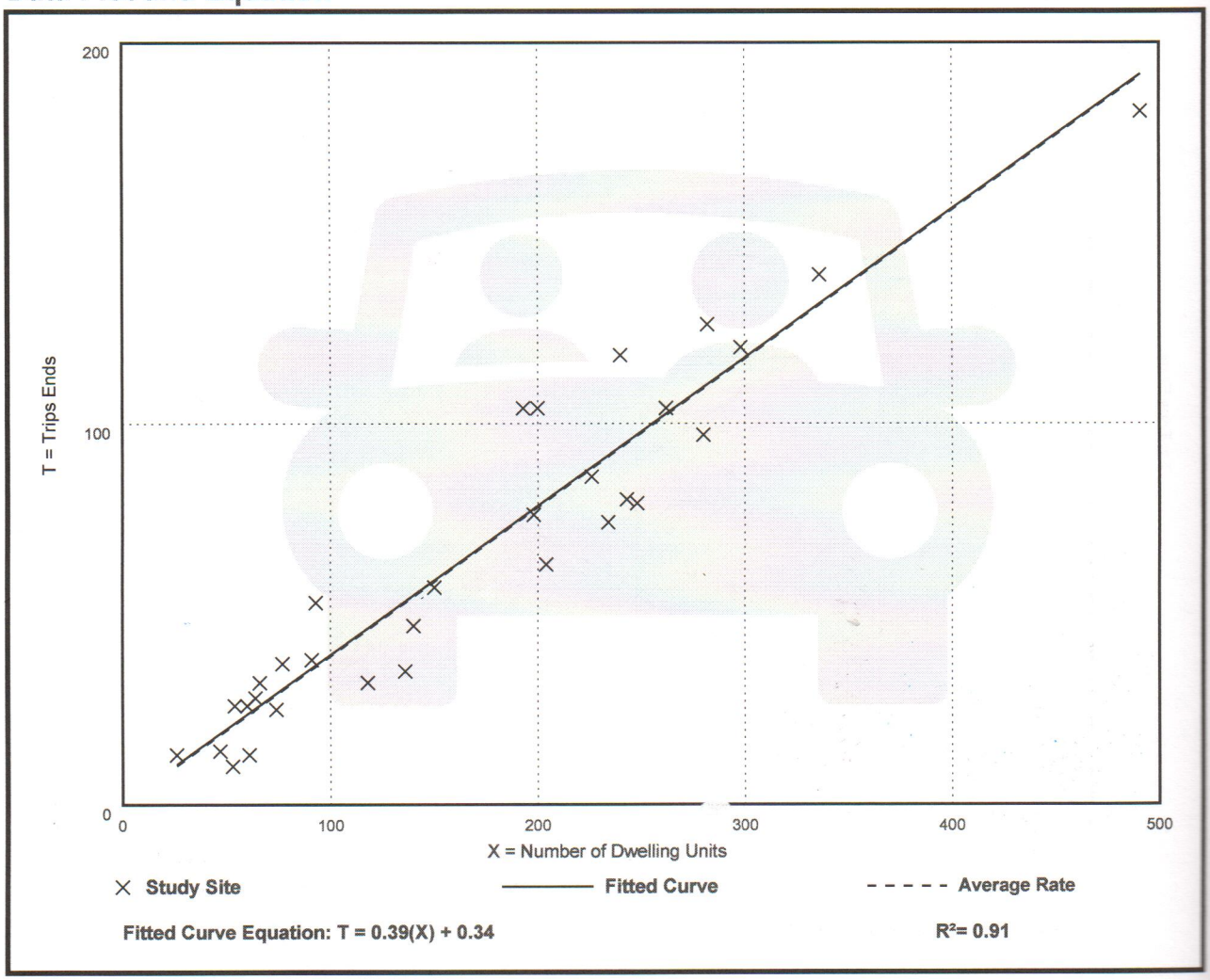
Multifamily Housing (Mid-Rise)
Not Close to Rail Transit (221)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 31
Avg. Num. of Dwelling Units: 169
Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

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

Data Plot and Equation



Fitted Curve Equation: T = 0.39(X) + 0.34

R^2= 0.91

ATTACHMENT C

Cardinal Distribution Data Base

MIAMI-DADE TRANSPORTATION PLANNING ORGANIZATION

2045 LRTP SUPPORTING DOCUMENTS

DIRECTIONAL TRIP DISTRIBUTION REPORT

SEPTEMBER 2019

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	

ATTACHMENT D

Queuing Analysis

Queueing Analysis - PM Peak Hour

M= Queue length which is exceeded *p* percent of the time

$$M = \left[\frac{lnP(x>M) - lnQ_M}{\ln \rho}\right] \text{-1} \qquad \text{where} \qquad lnP(x > M) = ln0.05$$

N= Number of service channels

Q= Service rate per channel (vph)

ρ= Demand rate/Service rate

$$\rho = \frac{q}{NQ}$$

q = Demand rate on the system (vph)

Q_M= Value obtained from Table 8.11 (refer to next page)

Gate Location- Residents Only				
Q=	300	vph		
q =	3	vph		
N=	1			
ρ=	0.0100			
Q_M=	0.0100			
M=	-1.34949	≈	1	vehicle

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

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

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:

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

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