

STONEFIELD

April 25, 2019

Planning Board
Borough of Middlesex
1200 Mountain Avenue
Middlesex, NJ 08846

**RE: Supplemental Traffic Assessment
Proposed School Bus Parking, Storage, and Maintenance Facility
Block 249, Lots 1 & 2
930 Lincoln Boulevard
Borough of Middlesex, Middlesex County, New Jersey
SE&D Job No. S-19054**

Dear Board Members:

Stonefield Engineering and Design, LLC ("Stonefield") has prepared this supplemental analysis to examine the potential traffic and parking impacts of the proposed school bus parking, storage, and maintenance facility on the adjacent roadway network. The subject property is located along the southerly side of Lincoln Boulevard east of its intersection with South Lincoln Avenue in the Borough of Middlesex, Middlesex County, New Jersey. The subject property is designated as Block 249, Lots 1 and 2 as depicted on the Borough of Middlesex Tax Map. The site location is shown on appended **Figure 1**. Per discussion with the Board's Traffic Engineer, John Jahr, PTP, TSOS, turning movement counts were conducted and Level of Service/Capacity analyses were prepared to identify the traffic impacts associated with the proposed development.

2019 Existing Condition

2019 Existing Traffic Volumes

Manual turning movement counts were collected during the weekday morning and weekday afternoon/evening time periods to evaluate existing traffic conditions and identify the specific hours when traffic activity on the adjacent roadways is at a maximum and could be potentially impacted by the development of the site. Turning movement counts were collected at the intersection of Lincoln Boulevard and South Lincoln Avenue on Thursday, April 18, 2019, from 6:30 a.m. to 9:00 a.m. and from 2:00 p.m. to 7:00 p.m.

The study time periods were chosen as they are representative of the peak periods of both the adjacent roadway network and the proposed development. The traffic volume data was collected and analyzed to identify the design peak hour in accordance with HCM and ITE guidelines. Based on the review of the count data the weekday morning peak hour occurred from 7:30 a.m. to 8:30 a.m. and the weekday evening peak hour occurred from 4:00 p.m. to 5:00 p.m. The Technical Appendix contains a summary of the turning movement count data. The 2019 Existing weekday morning and weekday evening peak-hour volumes are summarized on appended **Figure 2**.

2019 Existing LOS/Capacity Analysis

A Level of Service (LOS) and Volume/Capacity analysis was conducted for the 2019 Existing Condition during the weekday morning and weekday evening peak hours at the study intersection. Under the Existing Condition, the turning movements at the unsignalized intersection of Lincoln Boulevard and South Lincoln Avenue are calculated to operate at Level of Service B or better during each of the peak hours studied.

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2021 No-Build Condition

Background Growth

The 2019 Existing Condition traffic volume data was grown to a future horizon year of 2021, which is a conservative estimate for when the proposed school bus parking, storage, and maintenance facility is expected to be fully constructed. In accordance with industry guidelines, the existing traffic volumes at the study intersection were increased by 1.25% annually for two (2) years. The 1.25% background growth rate was obtained from the New Jersey Department of Transportation (NJDOT) Annual Background Growth Rate Table.

2021 No-Build Traffic Volumes

The background growth rate was applied to the 2019 Existing Traffic Volumes to calculate the 2021 No-Build Traffic Volumes for the weekday morning and weekday evening peak hours. These volumes are summarized on appended **Figure 3**.

2021 No-Build LOS/Capacity Analysis

A Level of Service and Volume/Capacity analysis was also conducted for the 2021 No-Build Condition during the weekday morning and weekday evening peak hours at the study intersection. The turning movements at the unsignalized intersection of Lincoln Boulevard and South Lincoln Avenue are calculated to operate generally consistently with the findings of the Existing Condition during the each of the peak hours studied.

2021 Build Condition

The site-generated traffic volume of the proposed school bus parking, storage, and maintenance facility was estimated to identify the potential impacts of the project. For the purpose of this analysis, a complete project “build out” is assumed within two (2) years of the preparation of this study.

Trip Generation

Trip generation projections for the proposed school bus parking, storage, and maintenance facility were estimated based on operational and staffing details provided by Layla Transportation. Specifically, the traffic generated by the proposed development was based on the number of school buses and employee vehicles accessing the site on a daily basis. **Table I** provides the estimated number of trips entering and existing the site during the weekday morning and weekday evening peak hours and is consistent with the trip generation provided in the Traffic & Parking Assessment Letter Report prepared by our office and dated March 20, 2019.

TABLE I – PROPOSED TRIP GENERATION

Trip Type	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total
36 School Buses	0	36	36	36	0	36
36 Bus Drivers	36	0	36	0	36	36
4 Office Employees	4	0	4	0	4	4
5 Mechanics	5	0	5	0	5	5
<i>Carpool Reduction</i>	-6	0	-6	0	-6	-6
Total Site-Generated Trips	39	36	75	36	39	75

Trip Assignment/Distribution

The trips generated by the proposed development were distributed according to existing traffic patterns along Lincoln Boulevard and South Lincoln Avenue, anticipated destinations of school bus traffic in the surrounding community, and the access management plan of the site. The Site-Generated Traffic Volumes are illustrated on **Figure 4**.



2021 Build Traffic Volumes

Based on the operational characteristics of the proposed development, a portion of the site-generated traffic would likely occur outside the roadway peak hours. To provide a conservative analysis, the site-generated traffic was added to the peak hours of the roadway network. Specifically, the site-generated trips were added to the 2021 No-Build Traffic Volumes to calculate the 2021 Build Traffic Volumes and are shown on appended **Figure 5**.

2021 Build LOS/Capacity Analysis

A Level of Service and Volume/Capacity analysis was also conducted for the 2021 Build Condition during the weekday morning and weekday evening peak hours at the study intersection and proposed site driveway. **Tables 2** and **3** compare the Existing, No-Build, and Build Conditions Level of Service and delay values. The turning movements at the unsignalized intersection of Lincoln Boulevard and South Lincoln Avenue are calculated to operate at acceptable Level of Service C or better during each of the peak hours studied.

Comparative Level of Service (Delay) Tables

LINCOLN BOULEVARD & SOUTH LINCOLN AVENUE

WB (westbound) approach is the Lincoln Boulevard approach
SB (southbound) approach is the South Lincoln Avenue approach
X (n) = Level of Service (seconds of delay)

TABLE 2 – WEEKDAY MORNING PEAK HOUR

Lane Group	2019 Existing	2021 No-Build	2021 Build
WB Left/Through/Right	B (12.2)	B (12.4)	C (18.2)
SB Left/Through/Right	A (7.9)	A (7.9)	A (8.1)

TABLE 3 – WEEKDAY EVENING PEAK HOUR

Lane Group	2019 Existing	2021 No-Build	2021 Build
WB Left/Through/Right	B (13.2)	B (13.4)	C (15.6)
SB Left/Through/Right	A (8.4)	A (8.4)	A (9.3)

Parking Supply

A review was conducted of the Site Plan prepared by Amertech Engineering, Inc., dated June 8, 2018 and last revised August 9, 2018. Based on the review of the plan and conversations with the project's Engineer, the site would provide sufficient area to accommodate at least 29 additional vehicles outside of the proposed 16 striped parking spaces, for a total supply of 45 spaces. The available area for parking would be sufficient to accommodate parking for each employee of the site. The available area for on-site parking would not impact the parking or circulation operations of the school buses on the subject site.

Conclusions

This supplemental traffic assessment was prepared to examine the potential traffic and parking impacts of the proposed school bus parking, storage, and maintenance facility. The analysis findings, which have been based on industry standard guidelines, indicate that the proposed development would not have a significant impact on the traffic operations of the adjacent roadway network. The site layout would provide sufficient area to accommodate the parking demand of both employees and school buses.



Please do not hesitate to contact our office should you have any questions or comments.

Best regards,

Charles D. Olivo, PE, PP, PTOE
Stonefield Engineering and Design, LLC

John R. Corak, PE
Stonefield Engineering and Design, LLC

TECHNICAL APPENDIX

TURNING MOVEMENT COUNT DATA

Stonefield Engineering & Design, LLC

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Intersection of Lincoln Boulevard (E/W)
and South Lincoln Avenue (N/S)
Middlesex, Middlesex County, New Jersey
Thursday, April 18, 2019

File Name : S-I9054
Site Code : 00019054
Start Date : 4/18/2019
Page No : 1

Groups Printed- Auto - HV - B/SB

Start Time	Lincoln Boulevard Eastbound				Lincoln Boulevard Westbound				Stone King Driveways Northbound				South Lincoln Avenue Southbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
06:30 AM	25	0	0	25	0	4	0	4	0	0	0	0	0	0	55	55	84
06:45 AM	38	1	0	39	0	3	5	8	0	0	0	0	0	0	72	72	119
Total	63	1	0	64	0	7	5	12	0	0	0	0	0	0	127	127	203
07:00 AM	62	1	0	63	0	4	2	6	0	0	0	0	0	0	55	55	124
07:15 AM	50	0	0	50	0	1	1	2	0	0	0	0	0	0	61	61	113
07:30 AM	61	0	0	61	0	0	0	0	0	0	0	0	0	0	68	68	129
07:45 AM	75	1	0	76	0	0	7	7	0	0	0	0	2	0	105	107	190
Total	248	2	0	250	0	5	10	15	0	0	0	0	2	0	289	291	556
08:00 AM	59	2	0	61	0	3	0	3	0	0	0	0	0	0	66	66	130
08:15 AM	58	1	0	59	0	2	1	3	0	0	0	0	0	0	85	85	147
08:30 AM	50	2	0	52	0	4	1	5	0	0	0	0	1	1	67	69	126
08:45 AM	45	3	1	49	0	2	2	4	0	0	0	0	3	0	64	67	120
Total	212	8	1	221	0	11	4	15	0	0	0	0	4	1	282	287	523
*** BREAK ***																	
02:00 PM	57	2	0	59	0	1	2	3	1	0	0	1	2	0	46	48	111
02:15 PM	54	0	1	55	0	1	3	4	0	0	0	0	1	0	42	43	102
02:30 PM	70	6	0	76	0	2	0	2	0	0	0	0	1	0	53	54	132
02:45 PM	80	4	0	84	0	3	1	4	0	0	0	0	3	0	45	48	136
Total	261	12	1	274	0	7	6	13	1	0	0	1	7	0	186	193	481
03:00 PM	86	5	0	91	0	5	1	6	0	0	0	0	2	0	71	73	170
03:15 PM	80	3	0	83	0	2	0	2	0	0	0	0	1	0	66	67	152
03:30 PM	85	5	0	90	0	3	1	4	0	0	0	0	3	1	57	61	155
03:45 PM	101	7	0	108	0	4	2	6	0	0	0	0	7	0	53	60	174
Total	352	20	0	372	0	14	4	18	0	0	0	0	13	1	247	261	651
04:00 PM	110	5	0	115	0	5	6	11	0	0	0	0	7	1	63	71	197
04:15 PM	98	4	0	102	0	3	6	9	0	0	0	0	6	1	54	61	172
04:30 PM	109	5	0	114	0	1	3	4	0	0	0	0	5	0	52	57	175
04:45 PM	104	13	0	117	0	6	8	14	0	0	0	0	4	0	53	57	188
Total	421	27	0	448	0	15	23	38	0	0	0	0	22	2	222	246	732
05:00 PM	86	12	0	98	0	10	5	15	0	0	0	0	7	0	51	58	171
05:15 PM	98	2	0	100	0	9	10	19	0	0	0	0	7	0	47	54	173
05:30 PM	93	7	0	100	0	1	6	7	0	0	0	0	5	0	72	77	184
05:45 PM	96	8	0	104	0	3	8	11	0	0	0	0	6	0	46	52	167
Total	373	29	0	402	0	23	29	52	0	0	0	0	25	0	216	241	695
06:00 PM	63	8	0	71	0	7	9	16	0	0	0	0	6	0	82	88	175
06:15 PM	84	9	1	94	0	7	5	12	1	0	0	1	6	0	62	68	175
06:30 PM	73	2	0	75	0	8	4	12	0	0	0	0	5	0	49	54	141
06:45 PM	81	4	0	85	0	16	4	20	0	0	0	0	4	0	48	52	157
Total	301	23	1	325	0	38	22	60	1	0	0	1	21	0	241	262	648

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File Name : S-19054
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Start Date : 4/18/2019
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Groups Printed- Auto - HV - B/SB

	Lincoln Boulevard Eastbound				Lincoln Boulevard Westbound				Stone King Driveways Northbound				South Lincoln Avenue Southbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Grand Total	2231	122	3	2356	0	120	103	223	2	0	0	2	94	4	1810	1908	4489
Apprch %	94.7	5.2	0.1		0	53.8	46.2		100	0	0		4.9	0.2	94.9		
Total %	49.7	2.7	0.1	52.5	0	2.7	2.3	5	0	0	0	0	2.1	0.1	40.3	42.5	
Auto	2177	119	3	2299	0	117	103	220	2	0	0	2	94	4	1763	1861	4382
% Auto	97.6	97.5	100	97.6	0	97.5	100	98.7	100	0	0	100	100	100	97.4	97.5	97.6
HV	50	3	0	53	0	3	0	3	0	0	0	0	0	0	43	43	99
% HV	2.2	2.5	0	2.2	0	2.5	0	1.3	0	0	0	0	0	0	2.4	2.3	2.2
B/SB	4	0	0	4	0	0	0	0	0	0	0	0	0	0	4	4	8
% B/SB	0.2	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.2	0.2	0.2

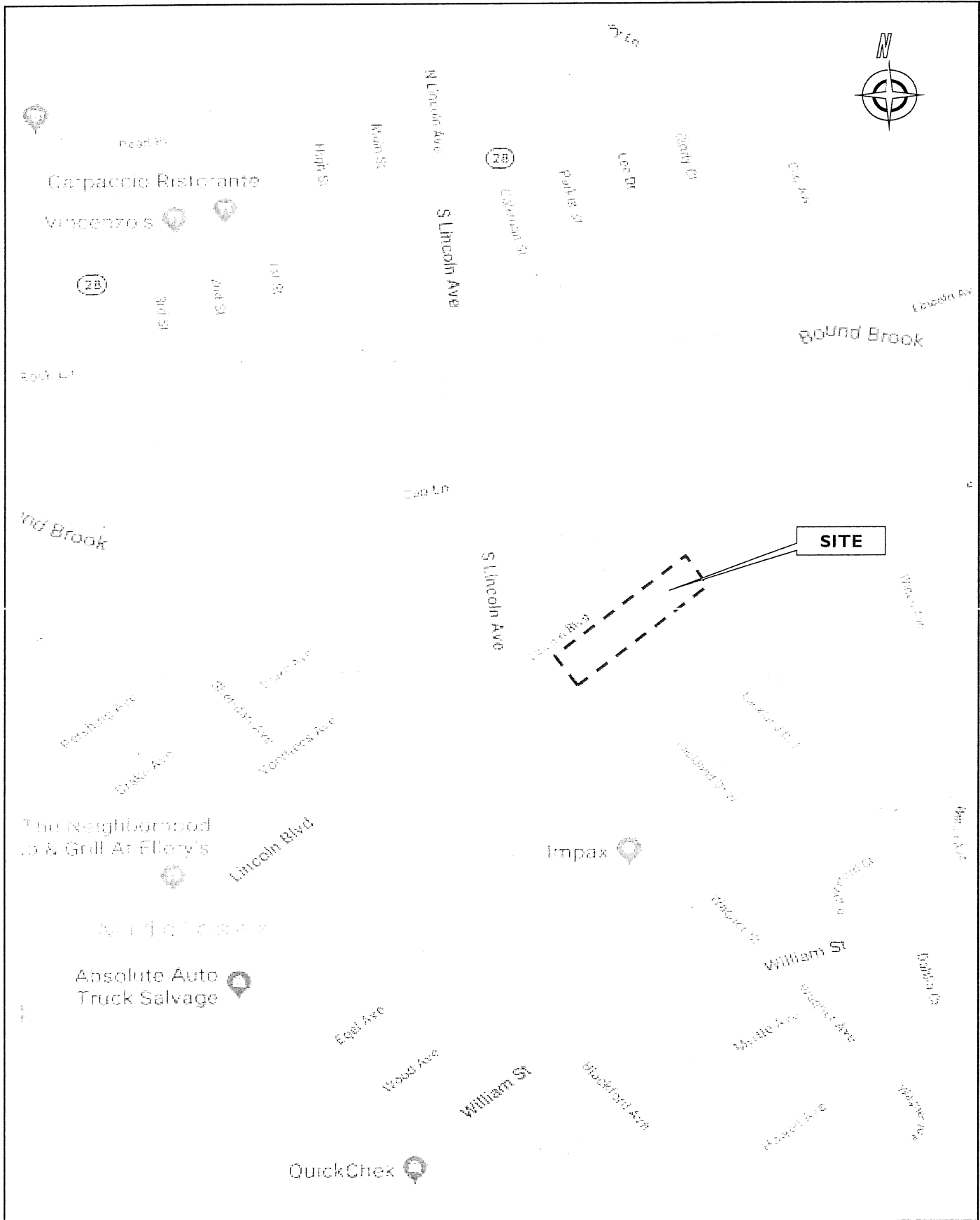
Start Time	Lincoln Boulevard Eastbound				Lincoln Boulevard Westbound				Stone King Driveways Northbound				South Lincoln Avenue Southbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 06:30 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	61	0	0	61	0	0	0	0	0	0	0	0	0	0	68	68	129
07:45 AM	75	1	0	76	0	0	7	7	0	0	0	0	2	0	105	107	190
08:00 AM	59	2	0	61	0	3	0	3	0	0	0	0	0	0	66	66	130
08:15 AM	58	1	0	59	0	2	1	3	0	0	0	0	0	0	85	85	147
Total Volume	253	4	0	257	0	5	8	13	0	0	0	0	2	0	324	326	596
% App. Total	98.4	1.6	0		0	38.5	61.5		0	0	0		0.6	0	99.4		
PHF	.843	.500	.000	.845	.000	.417	.286	.464	.000	.000	.000	.000	.250	.000	.771	.762	.784
Auto	244	3	0	247	0	4	8	12	0	0	0	0	2	0	316	318	577
% Auto	96.4	75.0	0	96.1	0	80.0	100	92.3	0	0	0	0	100	0	97.5	97.5	96.8
HV	7	1	0	8	0	1	0	1	0	0	0	0	0	0	8	8	17
% HV	2.8	25.0	0	3.1	0	20.0	0	7.7	0	0	0	0	0	0	2.5	2.5	2.9
B/SB	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
% B/SB	0.8	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0.3

Peak Hour Analysis From 12:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:00 PM

04:00 PM	110	5	0	115	0	5	6	11	0	0	0	0	7	1	63	71	197
04:15 PM	98	4	0	102	0	3	6	9	0	0	0	0	6	1	54	61	172
04:30 PM	109	5	0	114	0	1	3	4	0	0	0	0	5	0	52	57	175
04:45 PM	104	13	0	117	0	6	8	14	0	0	0	0	4	0	53	57	188
Total Volume	421	27	0	448	0	15	23	38	0	0	0	0	22	2	222	246	732
% App. Total	94	6	0		0	39.5	60.5		0	0	0		8.9	0.8	90.2		
PHF	.957	.519	.000	.957	.000	.625	.719	.679	.000	.000	.000	.000	.786	.500	.881	.866	.929
Auto	419	27	0	446	0	15	23	38	0	0	0	0	22	2	217	241	725
% Auto	99.5	100	0	99.6	0	100	100	100	0	0	0	0	100	100	97.7	98.0	99.0
HV	2	0	0	2	0	0	0	0	0	0	0	0	0	0	5	5	7
% HV	0.5	0	0	0.4	0	0	0	0	0	0	0	0	0	0	2.3	2.0	1.0
B/SB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% B/SB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

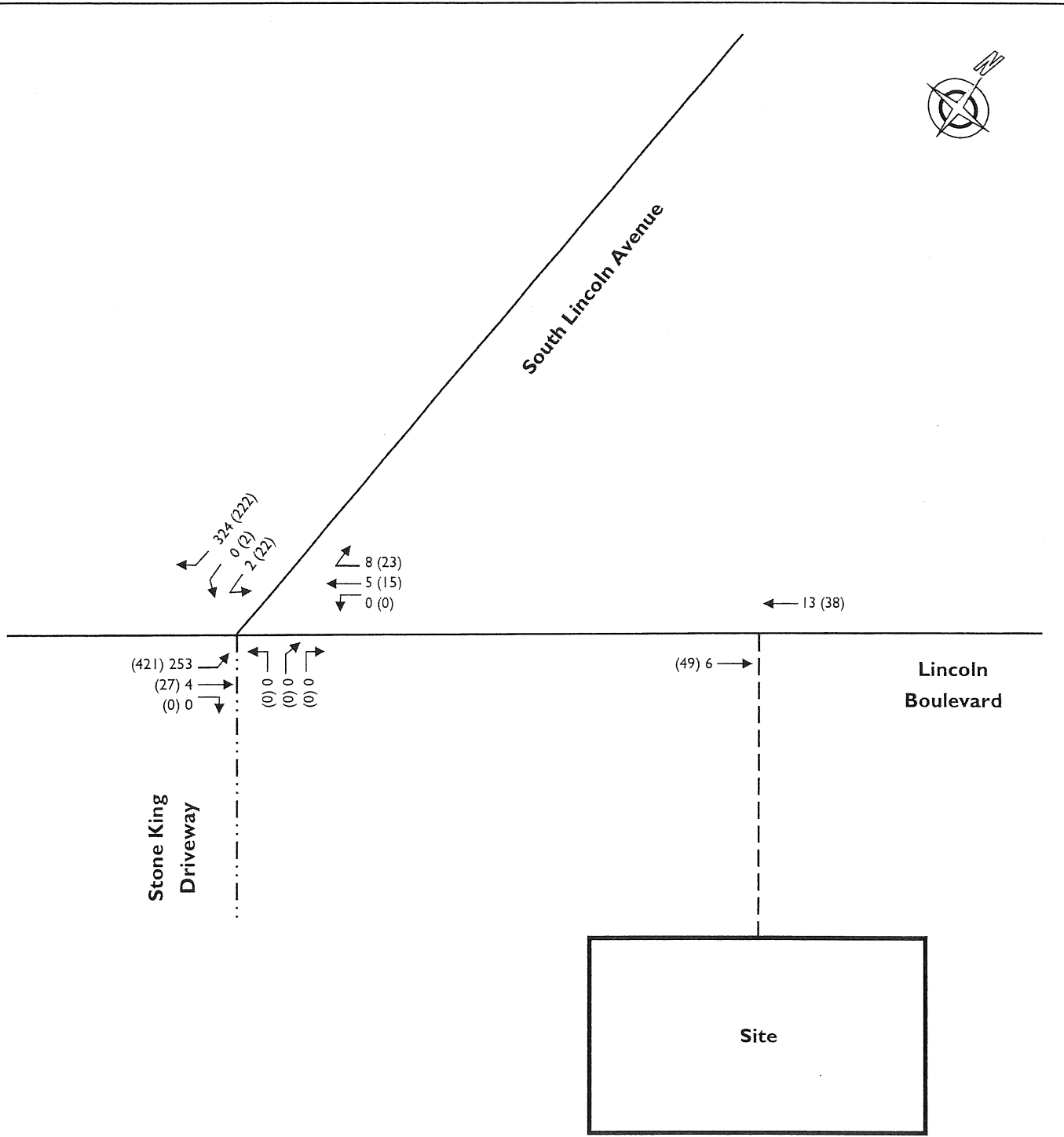
FIGURES



STONEFIELD

Proposed School Bus Facility
930 Lincoln Boulevard
Middlesex, Middlesex County, New Jersey
Traffic Assessment Report

FIGURE I
Site Location Map



LEGEND

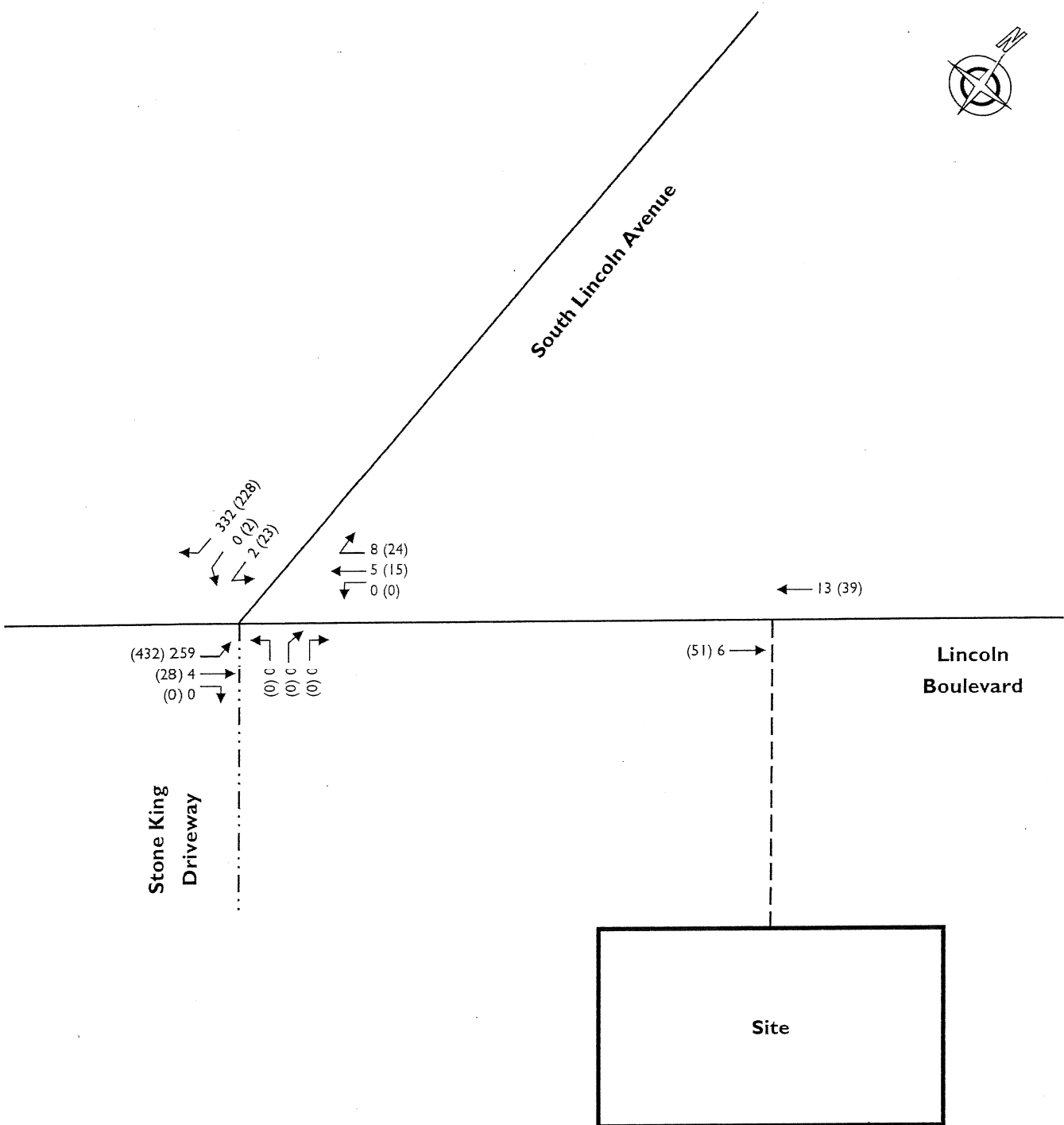
- Existing Roadway
- - - Proposed Driveway
- · - Existing Private Driveway
- ← AM (PM) Peak Hour Volumes

NOT TO SCALE

<p>STONEFIELD</p>	<p>Proposed School Bus Facility 930 Lincoln Boulevard Middlesex, Middlesex County, New Jersey Traffic Assessment Report</p>	<p>FIGURE 2 2019 Existing Traffic Volumes</p>
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South Lincoln Avenue



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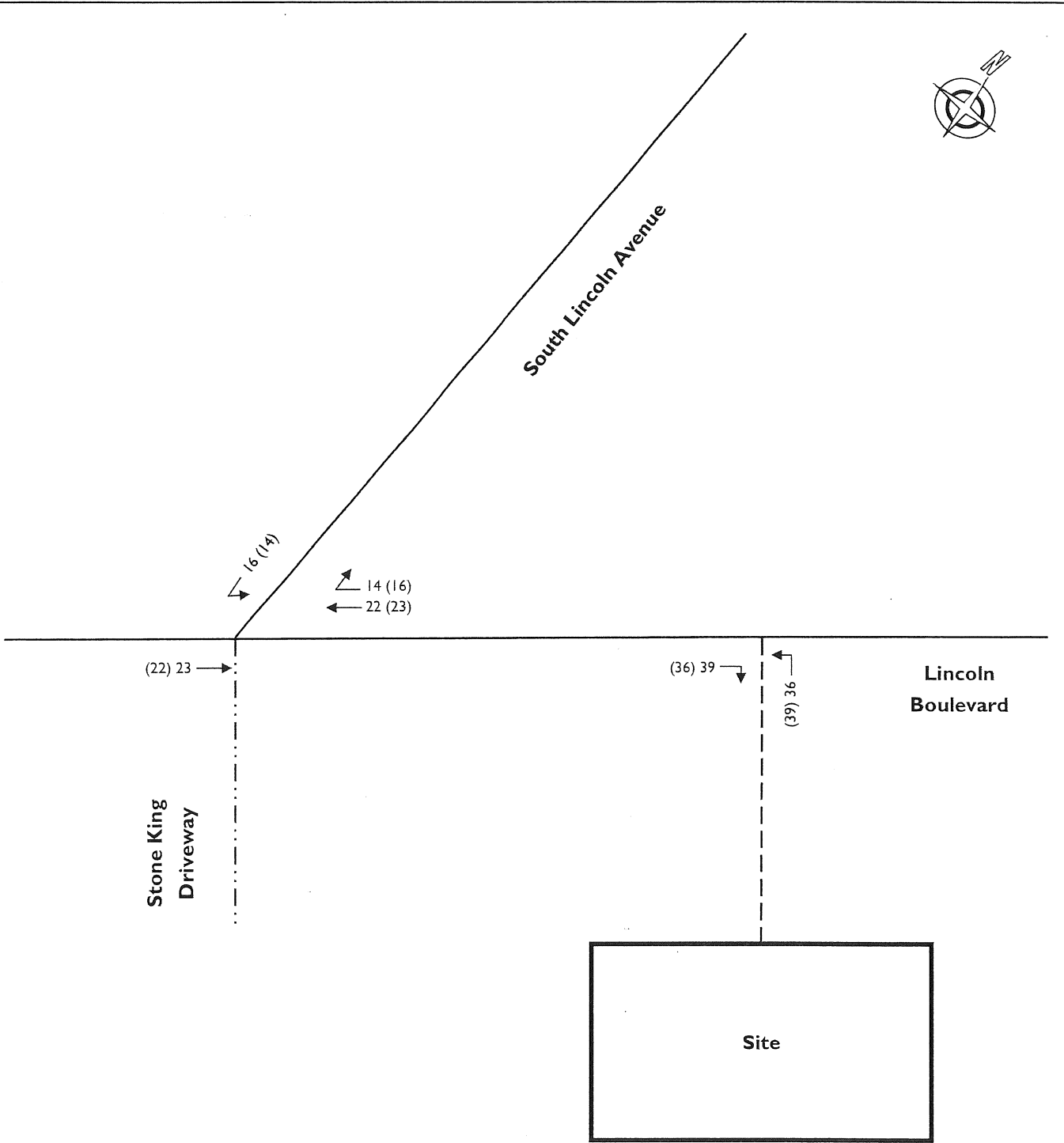
- Existing Roadway
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- ← AM (PM) Peak Hour Volumes

NOT TO SCALE

STONEFIELD

Proposed School Bus Facility
 930 Lincoln Boulevard
 Middlesex, Middlesex County, New Jersey
 Traffic Assessment Report

FIGURE 3
 2021 No-Build Traffic
 Volumes



LEGEND

- Existing Roadway
- - - Proposed Driveway
- · - Existing Private Driveway
- ← AM (PM) Peak Hour Volumes

NOT TO SCALE

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Proposed School Bus Facility
930 Lincoln Boulevard
Middlesex, Middlesex County, New Jersey
Traffic Assessment Report

FIGURE 4
"New" Site-Generated
Traffic Volumes



South Lincoln Avenue

332 (228)
 0 (2)
 18 (37)
 22 (40)
 27 (38)
 0 (0)

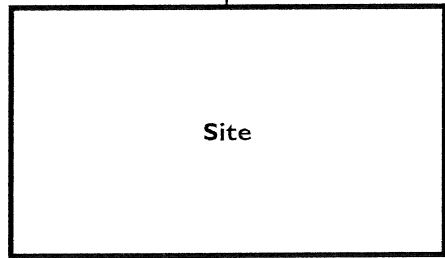
13 (39)

(432) 259
 (50) 27
 (0) 0
 (0) 0
 (0) 0
 (0) 0

(51) 6
 (36) 39
 (39) 36

Lincoln Boulevard

Stone King Driveway



Site

LEGEND

- Existing Roadway
- - - Proposed Driveway
- · - · Existing Private Driveway
- ← AM (PM) Peak Hour Volumes

NOT TO SCALE

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Proposed School Bus Facility
 930 Lincoln Boulevard
 Middlesex, Middlesex County, New Jersey
 Traffic Assessment Report

FIGURE 5
 2021 Build Traffic Volumes

CAPACITY ANALYSIS DETAIL SHEETS

HCM 6th TWSC
1: Lincoln Boulevard & South Lincoln Avenue

2019 Existing Condition
Weekday Morning Peak Hour

Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑			↓
Traffic Vol, veh/h	5	8	253	4	2	324
Future Vol, veh/h	5	8	253	4	2	324
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	20	0	4	25	0	3
Mvmt Flow	6	10	324	5	3	415

Major/Minor	Minor1	Major1	Major2	Major3	Major4	Major5
Conflicting Flow All	748	327	0	0	329	0
Stage 1	327	-	-	-	-	-
Stage 2	421	-	-	-	-	-
Critical Hdwy	6.6	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.6	-	-	-	-	-
Critical Hdwy Stg 2	5.6	-	-	-	-	-
Follow-up Hdwy	3.68	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	355	719	-	-	1242	-
Stage 1	692	-	-	-	-	-
Stage 2	625	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	354	719	-	-	1242	-
Mov Cap-2 Maneuver	354	-	-	-	-	-
Stage 1	690	-	-	-	-	-
Stage 2	625	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	515	1242
HCM Lane V/C Ratio	-	-	0.032	0.002
HCM Control Delay (s)	-	-	12.2	7.9
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

HCM 6th TWSC
1: Lincoln Boulevard & South Lincoln Avenue

2019 Existing Condition
Weekday Evening Peak Hour

Intersection						
Int Delay, s/veh	1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑↑		↑			↓
Traffic Vol, veh/h	15	23	421	27	24	222
Future Vol, veh/h	15	23	421	27	24	222
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	0	1	0	0	2
Mvmt Flow	16	25	453	29	26	239

Major/Minor	Minor1	Major1	Major2	Major2	Major2
Conflicting Flow All	759	468	0	0	482
Stage 1	468	-	-	-	-
Stage 2	291	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	377	599	-	-	1091
Stage 1	634	-	-	-	-
Stage 2	763	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	367	599	-	-	1091
Mov Cap-2 Maneuver	367	-	-	-	-
Stage 1	617	-	-	-	-
Stage 2	763	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.2	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	479	1091
HCM Lane V/C Ratio	-	-	0.085	0.024
HCM Control Delay (s)	-	-	13.2	8.4
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1

HCM 6th TWSC
1: Lincoln Boulevard & South Lincoln Avenue

2021 No-Build Condition
Weekday Morning Peak Hour

Intersection

Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	5	8	259	4	2	332
Future Vol, veh/h	5	8	259	4	2	332
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	20	0	4	25	0	3
Mvmt Flow	6	10	332	5	3	426

Major/Minor

	Minor1	Major1	Major2		
Conflicting Flow All	767	335	0	0	337
Stage 1	335	-	-	-	-
Stage 2	432	-	-	-	-
Critical Hdwy	6.6	6.2	-	-	4.1
Critical Hdwy Stg 1	5.6	-	-	-	-
Critical Hdwy Stg 2	5.6	-	-	-	-
Follow-up Hdwy	3.68	3.3	-	-	2.2
Pot Cap-1 Maneuver	346	712	-	-	1234
Stage 1	686	-	-	-	-
Stage 2	618	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	345	712	-	-	1234
Mov Cap-2 Maneuver	345	-	-	-	-
Stage 1	684	-	-	-	-
Stage 2	618	-	-	-	-

Approach

	WB	NB	SB
HCM Control Delay, s	12.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt

	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	505	1234
HCM Lane V/C Ratio	-	-	0.033	0.002
HCM Control Delay (s)	-	-	12.4	7.9
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

HCM 6th TWSC
1: Lincoln Boulevard & South Lincoln Avenue

2021 No-Build Condition
Weekday Evening Peak Hour

Intersection						
Int Delay, s/veh	1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Traffic Vol, veh/h	15	24	432	28	25	228
Future Vol, veh/h	15	24	432	28	25	228
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	0	1	0	0	2
Mvmt Flow	16	26	465	30	27	245

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	779	480	0	0	495
Stage 1	480	-	-	-	-
Stage 2	299	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	367	590	-	-	1079
Stage 1	627	-	-	-	-
Stage 2	757	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	356	590	-	-	1079
Mov Cap-2 Maneuver	356	-	-	-	-
Stage 1	609	-	-	-	-
Stage 2	757	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.4	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	471	1079
HCM Lane V/C Ratio	-	-	0.089	0.025
HCM Control Delay (s)	-	-	13.4	8.4
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1

HCM 6th TWSC
1: Lincoln Boulevard & South Lincoln Avenue

2021 Build Condition
Weekday Morning Peak Hour

Intersection

Int Delay, s/veh	1.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Traffic Vol, veh/h	27	22	259	27	18	332
Future Vol, veh/h	27	22	259	27	18	332
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	81	63	4	4	0	3
Mvmt Flow	35	28	332	35	23	426

Major/Minor

	Minor1	Major1	Major2	Major3	Major4	Major5
Conflicting Flow All	822	350	0	0	367	0
Stage 1	350	-	-	-	-	-
Stage 2	472	-	-	-	-	-
Critical Hdwy	7.21	6.93	-	-	4.1	-
Critical Hdwy Stg 1	6.21	-	-	-	-	-
Critical Hdwy Stg 2	6.21	-	-	-	-	-
Follow-up Hdwy	4.229	3.867	-	-	2.2	-
Pot Cap-1 Maneuver	256	575	-	-	1203	-
Stage 1	568	-	-	-	-	-
Stage 2	491	-	-	-	-	-
Platoon blocked, %						
Mov Cap-1 Maneuver	250	575	-	-	1203	-
Mov Cap-2 Maneuver	250	-	-	-	-	-
Stage 1	554	-	-	-	-	-
Stage 2	491	-	-	-	-	-

Approach

	WB	NB	SB
HCM Control Delay, s	18.2	0	0.4
HCM LOS	C		

Minor Lane/Major Mvmt

	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	335	1203
HCM Lane V/C Ratio	-	-	0.188	0.019
HCM Control Delay (s)	-	-	18.2	8.1
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.7	0.1

HCM 6th TWSC
1: Lincoln Boulevard & South Lincoln Avenue

2021 Build Condition
Weekday Evening Peak Hour

Intersection						
Int Delay, s/veh	1.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Traffic Vol, veh/h	38	40	432	50	39	228
Future Vol, veh/h	38	40	432	50	39	228
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	0	1	44	38	2
Mvmt Flow	41	43	465	54	42	245

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	821	492	0	0	519
Stage 1	492	-	-	-	-
Stage 2	329	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.48
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.542
Pot Cap-1 Maneuver	347	581	-	-	887
Stage 1	619	-	-	-	-
Stage 2	734	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	328	581	-	-	887
Mov Cap-2 Maneuver	328	-	-	-	-
Stage 1	585	-	-	-	-
Stage 2	734	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.6	0	1.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	422	887
HCM Lane V/C Ratio	-	-	0.199	0.047
HCM Control Delay (s)	-	-	15.6	9.3
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.7	0.1

STONEFIELD

March 20, 2019

Planning Board
Borough of Middlesex
1200 Mountain Avenue
Middlesex, NJ 08846

**RE: Traffic & Parking Assessment Letter Report
Proposed School Bus Parking, Storage, and Maintenance Facility
Block 249, Lots 1 & 2
930 Lincoln Boulevard
Borough of Middlesex, Middlesex County, New Jersey
SE&D Job No. S-19054**

Dear Board Members:

Stonefield Engineering and Design, LLC ("Stonefield") has prepared this analysis to examine the potential traffic and parking impacts of the proposed school bus parking, storage, and maintenance facility on the adjacent roadway network. The subject property is located along the southerly side of Lincoln Boulevard east of its intersection with South Lincoln Avenue in the Borough of Middlesex, Middlesex County, New Jersey. The subject property is designated as Block 249, Lots 1 and 2 as depicted on the Borough of Middlesex Tax Map. The site has approximately 720 feet of frontage along Lincoln Boulevard. The existing site is presently developed with three (3) vacant one (1)-story buildings. Existing access is provided via six (6) driveways along Lincoln Boulevard. Under the proposed development program, the existing buildings would be internally renovated to provide a 7,077-square-foot bus repair shop (Building 1), a 3,748-square-foot storage building (Building 2), and a 2,019-square-foot office building (Building 3). Additionally, the rest of the site would provide for a total of 86 school bus parking spaces and 16 normal parking spaces. Access on-site would be consolidated to five (5) driveways and would provide access to each of the specific uses of the proposed development.

Existing Conditions

The subject property is located along the southerly side of Lincoln Boulevard east of its intersection with South Lincoln Avenue in the Borough of Middlesex, Middlesex County, New Jersey. The subject property is designated as Block 249, Lots 1 and 2 as depicted on the Borough of Middlesex Tax Map. Land uses in the vicinity of the site are a mix of residential, industrial, and commercial uses.

Lincoln Boulevard is a local roadway with a general northeast-southwest orientation and is under the jurisdiction of the Borough of Middlesex. Along the site frontage, the roadway provides one (1) lane of travel in each direction and has a posted speed limit of 25 mph. Sidewalk and curb are partially provided along both sides of the roadway, shoulders are not provided, and on-street parking is permitted along both sides of the roadway. Lincoln Boulevard provides northeast-southwest mobility and access for a mix of residential, commercial, and industrial uses along its length. To the southwest of the site, Lincoln Boulevard changes to Middlesex County jurisdiction at its intersection with South Lincoln Avenue.

Trip Generation

Trip generation projections for the proposed school bus parking, storage, and maintenance facility were estimated based on operational and staffing details provided by Layla Transportation. Specifically, the traffic generated by the proposed development was based on the number of school buses and employee vehicles accessing the site on a daily basis.

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The proposed school bus parking, storage, and maintenance facility would contain a total of 80 buses. Thirty-six (36) buses would operate on a daily basis with the remaining buses in reserve in case of a mechanical failure. There would be 36 bus drivers, four (4) office employees for Building 3, and five (5) mechanics for Buildings 1 and 2. It is noted that a portion of employees would carpool to the facility. Based on information from the Applicant, one (1) bus driver, two (2) office employees, three (3) mechanics would carpool with other workers to/from the site. As such, the number of trips generated by the site would be reduced by six (6).

The bus drivers would arrive to the site by 6:00 a.m. while the office employees and mechanics would arrive by 7:30 a.m. The site would close at 5:00 p.m. on weekdays and would have limited operations on weekdays. Further, public schools within Middlesex and surrounding municipalities begin class as early as 8:00 a.m. and end as late as 3:10 p.m. As such, the majority of school buses are expected to leave the site between 6:45 a.m. and 7:15 a.m. for the morning shift and between 2:00 p.m. and 2:30 p.m. for the afternoon (school dismissal) shift. After returning to the site during the morning shift, bus drivers would leave the site and return in the afternoon. **Table I** provides the estimated number of trips entering and existing the site during the weekday morning and weekday afternoon peak hours.

TABLE I – PROPOSED TRIP GENERATION

Trip Type	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total
36 School Buses	0	36	36	36	0	36
36 Bus Drivers	36	0	36	0	36	36
4 Office Employees	4	0	4	0	4	4
5 Mechanics	5	0	5	0	5	5
<i>Carpool Reduction</i>	-6	0	-6	0	-6	-6
Total Site-Generated Trips	39	36	75	36	39	75

It is important to note that the arrival/departure of school buses, bus drivers, office employees, and mechanics would occur at different time periods and would likely be spread over a period longer than one (1) hour. However, for a conservative analysis, it was assumed that all trips would occur during the same hour. As indicated in Table I, the proposed use would generate a maximum of 75 new trips during the weekday morning and weekday afternoon peak hours. Based on Transportation Impact Analysis for Site Development published by ITE, a trip increase of less than 100 vehicles trips would likely not change the level of service of the roadway system or appreciably increase the volume-to-capacity ratio of an intersection approach. As such, the proposed development is not anticipated to significantly impact the operations of the adjacent roadway network.

Site Circulation/Parking Supply

A review was conducted of the proposed school bus parking, storage, and maintenance facility using the Site Plan prepared by Amertech Engineering, Inc., dated June 8, 2018 and last revised August 9, 2018. In completing this review, particular attention was focused on the site access and circulation.

Access to the site is currently provided via six (6) driveways along Lincoln Boulevard. Under the proposed development plan, five (5) driveways would remain and one (1) driveway would be removed. The westerly driveway would serve Building 1 (bus repair shop) and would be approximately 33 feet wide; the west-central driveway would serve Building 2 (storage building) and would be approximately 24 feet wide; the central driveway would provide ingress-only access to an 11-space parking lot located along the rear of Building 3 (office building) and would be approximately 15 feet wide; the east-central driveway would provide full-movement access to a five (5)-space parking lot serving Building 3 and would be approximately 24 feet wide; the easterly driveway would provide full-movement access to the school bus parking lot and would be approximately 22 feet wide. Cross access would be provided between the school bus parking lot and the 11-space parking lot. Two-way circulation within the school bus parking lot would be facilitated via 53-foot-wide drive aisle, which would be



adequate to accommodate parking maneuvers of all school bus sizes. Additionally, overhead doors would be provided at the rear of Buildings 1 and 2.

The Borough of Middlesex Ordinance does not specify a parking requirement for the proposed use. Therefore, the parking demand was estimated based on the operational and staffing details provided by Layla Transportation. The site would contain a total of 80 school buses in addition to employee vehicles for the four (4) office employees, five (5) mechanics, and 36 bus drivers. Based on the carpooling characteristics of the proposed development, the number of parked employee vehicles would be reduced by six (6). The site would provide a total of 86 school bus parking spaces and a total of 16 standard passenger-vehicle parking spaces. The bus parking stalls would be 12 feet wide by 40 feet deep and the standard parking stalls would be nine (9) feet wide by 18 feet deep in accordance with industry standards.

Available on-street parking in the vicinity of the site was surveyed to determine parking availability for employees of the site. A field visit was conducted by our office on Tuesday, March 19, 2019 at 7:00 a.m. to examine the on-street parking conditions within the site vicinity. Portions of Lincoln Boulevard and South Lincoln Avenue were surveyed and are shown on the appended Parking Study Area Map. **Table 2** provides a summary of the collected data.

TABLE 2 – PARKING COUNT SUMMARY

Street Name & Location	Supply (spaces)	Parked Vehicles	Available Spaces
Lincoln Boulevard (east of South Lincoln Avenue)	50	4	46
Lincoln Boulevard (between Sheridan Avenue and South Lincoln Avenue)	57	11	46
South Lincoln Avenue (between Lincoln Boulevard and Voorhees Avenue)	17	3	14
Total	124	18	106

As shown in Table 2, there were approximately 106 available on-street parking spaces within a five (5)-minute walk to the proposed site. In addition to the proposed on-site parking supply, sufficient on-street parking would be available to support the anticipated parking demand. **Table 3** summarizes the parking demand and supply associated with the proposed development.

TABLE 3 – PARKING DEMAND AND SUPPLY

Demand Type	Parking Demand	Parking Supply	
		On-Site	Off-Site
80 School Buses	80 oversized spaces	86 oversized spaces	--
36 Bus Drivers	35 spaces	0 spaces	106 spaces
4 Office Employees	2 spaces	5 spaces	
5 Mechanics	2 spaces	11 spaces	
Total	80 oversized spaces 39 spaces	86 oversized spaces 122 spaces	

As shown in Table 3, the expected parking demand of 80 school buses and 39 passenger vehicles associated with the proposed development could be satisfied and the school bus parking demand would be accommodated completely on-site. After accounting for parking demand of the proposed development, there would still be 83 available on-street spaces during the morning peak period.



Conclusions

This report was prepared to examine the potential traffic and parking impacts of the proposed school bus parking, storage, and maintenance facility. The analysis findings indicate that the proposed development would not have a significant impact on the traffic operations of the adjacent roadway network. The site driveways and on-site layout have been designed to provide for effective access to and from the subject property. The on-site parking supply and available on-street parking within the site vicinity would be sufficient to support the proposed development, and the development would not need to utilize on-street parking to accommodate the school bus parking demand.

Please do not hesitate to contact our office should you have any questions or comments.

Best regards,

Charles D. Olivo, PE, PP, PTOE
Stonefield Engineering and Design, LLC

John R. Corak, PE
Stonefield Engineering and Design, LLC

LEGEND
— Parking Study Area



SITE

STONEFIELD

Proposed School Bus Parking, Storage, and Maintenance Facility
930 Lincoln Boulevard
Borough of Middlesex, Middlesex County, New Jersey
Traffic & Parking Assessment Letter Report

Parking Study Area Map

