Traffic Impact Analysis
Whiskey Branch
Wilmington, North Carolina

RAMEY KEMP & ASSOCIATES

TRAFFIC IMPACT ANALYSIS

FOR

WHISKEY BRANCH

LOCATED

IN

WILMINGTON, NORTH CAROLINA

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April 2019

RKA Project No. 19103

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TRAFFIC IMPACT ANALYSIS UPDATE

WHISKEY BRANCH

WILMINGTON, NORTH CAROLINA

1. INTRODUCTION

The contents of this report present the findings of the Traffic Impact Analysis (TIA) conducted for the proposed Whiskey Branch development, formerly named Whiskey Navajo. The development is located along S. College Road, north of Mohican Trail in Wilmington, North Carolina. The original TIA sealed on March 16, 2017 was approved by the WMPO and NCDOT on July 7, 2017 for Access Alternative 1. The purpose of this study is to determine the potential impacts to the surrounding transportation system created by traffic generated by the proposed development, as well as recommend improvements to mitigate the impacts. This TIA update considers slightly more apartments than in the original TIA, and this study considers an alternative access scenario for the proposed development.

The proposed development is considered to be built out in three (3) phases with completion expected in 2019, 2021, and 2024 for phases 1A, 1B, and 2, respectively. The proposed development is expected to consist of the following land uses:

- 88 single family detached homes (Phase 1A)
- 82 townhomes (Phase 1A)
- 325 apartments (Phase 1B)
- 50,000 square feet (s.f.) of general office (Phase 2)
- 150,000 s.f. of shopping center (Phase 2)

The study analyzes traffic conditions during the weekday PM and Saturday midday peak hours for the following scenarios:

- Existing (2019) Traffic Conditions
- Background (2021) Traffic Conditions
- Combined (2021) Traffic Conditions – Phase 1B, Access Alternative 1
- Combined (2021) Traffic Conditions – Phase 1B, Access Alternative 4
- Background (2024) Traffic Conditions

- Combined (2024) Traffic Conditions – Phase 2, Access Alternative 1
- Combined (2024) Traffic Conditions – Phase 2. Access Alternative 4

Access alternative 1 was approved with the original TIA. Since that time, the developer is now proposing a revised access alternative, labeled as access alternative 4. Access alternative 1 includes a right-in/right-out driveway (Site Drive #3) and a left-over driveway (Site Drive #5). Access alternative 4 includes the access alternative 1 driveways with the addition of an ingress only driveway (Site Drive #4) at the existing U-turn location north of Site Drive #3. The site driveway labeling from the original TIA was included in this updated study for continuity.

1.1. Site Location and Study Area

The development is proposed to be located along S. College Road, north of Mohican Trail in Wilmington, North Carolina. Refer to Figure 1 for the site location map.

The study area for the TIA was determined through coordination with the Wilmington Metropolitan Planning Organization (WMPO) and the approved scoping document can be found in Appendix A. The approved study area consists of the following intersections:

- S. College Road and Cape Fear Academy / Pine Cliff Drive
- S. College Road and Mohican Trail / Jasmine Cove Way
- S. College Road U-Turn Location north of Mohican Trail / Site Drive #4 (ingress only)
- Navaho Trail and Lansdowne Road / Nicholas Creek Circle
- S. College Road and Site Drive #3 (proposed right-in/right-out driveway)
- S. College Road and Site Drive #5 (proposed left-over driveway)
- S. College Road and Northbound U-Turn north of Weybridge Lane
- S. College Road and Southbound U-Turn north of Site Drive #5

1.2. Proposed Land Use and Site Access

The proposed development is anticipated to be built out in three (3) phases with completion expected in 2019, 2021, and 2024 for phases 1A, 1B, and 2, respectively. The proposed development is expected to consist of the following land uses:

- 88 single family detached homes (Phase 1A)
- 82 townhomes (Phase 1A)
- 325 apartments (Phase 1B)
- 50,000 square feet (s.f.) of general office (Phase 2)
- 150,000 s.f. of shopping center (Phase 2)

Two (2) access alternatives are included in this study. Access alternative 1 is the alternative that was approved by the WMPO as the desired alternative. Access scenario 1 includes a right-in/right-out driveway (Site Drive #3) and a left-over driveway (Site Drive #5). Access alternative 4 is a newly proposed alternative that utilizes Access scenario 1 and proposes an additional ingress only driveway (Site Drive #4) at the existing u-turn location north of Site Drive #3. Refer to Figures 2A and 2B for a copy of the preliminary site plans for both access alternatives 1 and 4, respectively.

1.3. Adjacent Land Uses

The proposed development is located in an area consisting primarily of residential development.

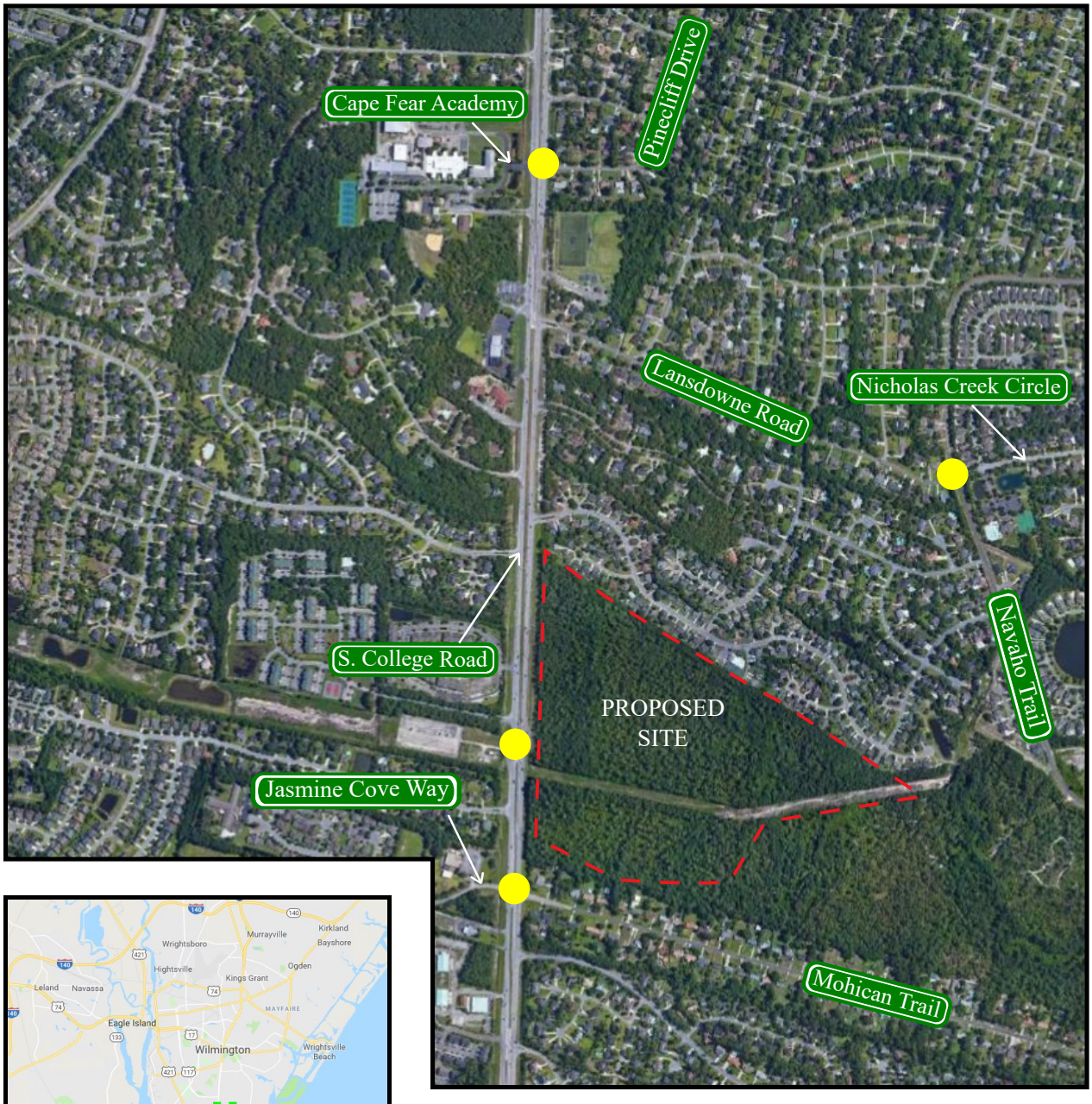
1.4. Existing Roadways

Existing lane configurations (number of traffic lanes on each intersection approach), lane widths, storage capacities, and other intersection and roadway information was collected through field reconnaissance by Ramey Kemp & Associates, Inc. (RKA). Table 1 provides a summary of the field data collected. Refer to Figure 3 for an illustration of the existing lane configurations within the study area.

Table 1: Existing Roadway Inventory

Road Name	Route Number	Typical Cross Section	Speed Limit	Maintained By	2017 AADT (vpd)
S. College Road	NC 132	4-lane divided	45 mph	NCDOT	40,000
Pine Cliff Drive	N/A	2-lane undivided	25 mph	City	500*
Cape Fear Academy	N/A	2-lane one-way loop	25 mph (assumed)	Private	500*
Lansdowne Road	SR 1592	2-lane undivided	35 mph	NCDOT	4,100*
Nicholas Creek Circle	N/A	2-lane undivided	25 mph (assumed)	Private	1,000*
Navaho Trail	SR 1516	2-lane undivided	45 mph	NCDOT	2,400*
Jasmine Way	SR 1565	2-lane undivided	25 mph	NCDOT	500*
Mohican Trail	SR 1565	2-lane undivided	40 mph	NCDOT	2,700

* ADT based on the traffic counts from 2019 and assuming the weekday PM peak hour volume is 10% of the average daily traffic.



N

LEGEND

- Proposed Site Location
- Study Intersection
- Study Area

RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Site Location Map Scale: Not to Scale | Figure 1

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SCALE
0 150' 300' 600'

DWG: 16206_cpt_alt1
DATE: January 28, 2019

Whiskey Branch
Access Alternative 1
Wilmington, North Carolina

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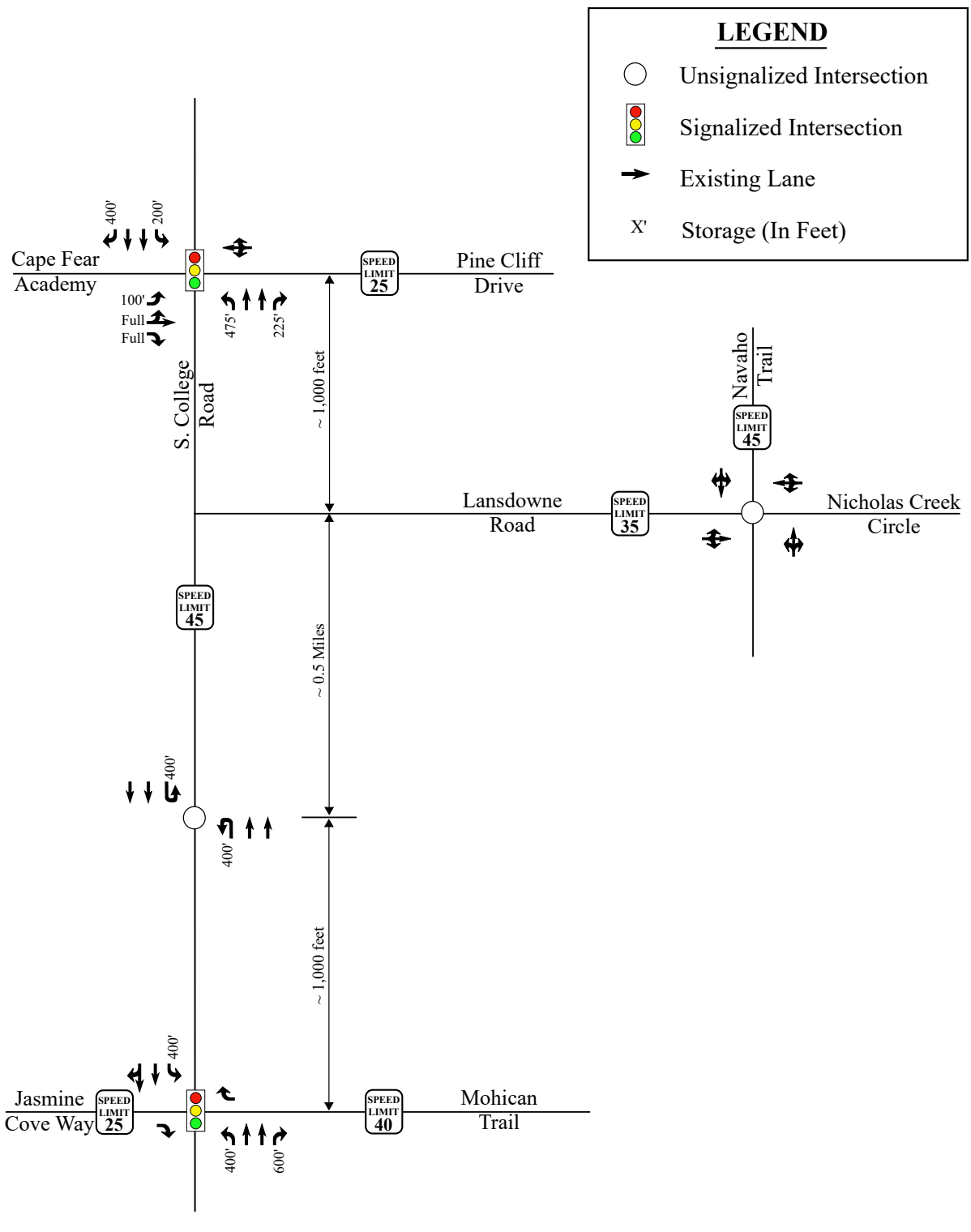
SCALE
0' 200' 400'

DWG: 16206_cpt_alt4
DATE: February 5, 2019

Whiskey Branch
Access Alternative 4
Wilmington, North Carolina



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Existing Lane Configurations Scale: Not to Scale | Figure 3

2. EXISTING (2019) PEAK HOUR CONDITIONS

2.1. Existing (2019) Peak Hour Traffic

Existing peak hour traffic volumes were determined based on traffic counts conducted at the study intersections listed below, in April of 2019 by RKA. Counts were conducted during typical weekday PM (4:00 PM – 6:00 PM) and Saturday midday (11:00 AM – 1:00 PM) peak periods at the following intersections:

- S. College Road and Cape Fear Academy / Pinecliff Drive
- S. College Road and Mohican Trail / Jasmine Cove Way
- S. College Road and NB / SB U-turn location north of Mohican Trail
- Lansdowne Road / Nicholas Creek Circle and Navaho Trail

The peak hour of the control intersection, S. College Road at Cape Fear Academy / Pinecliff Drive, was utilized for processing of all study intersections to ensure the same peak hours were included in this analysis. Refer to Figure 4 for existing (2019) unadjusted weekday PM and Saturday midday peak hour traffic volumes. A copy of the count data is located in Appendix B of this report. To account for Phase 1A of the Whiskey Branch development, which is expected to be completed in 2019, average weekday daily, weekday PM peak hour, and Saturday midday peak hour trips for the subject phase of development were estimated using methodology contained within the ITE *Trip Generation Manual*, 10th Edition. Table 2 provides a summary of the trip generation potential for the site. These trips were reviewed and approved by the WMPO as part of the scoping process.

Table 2: Phase 1A Trip Generation Summary

Land Use (ITE Code)	Intensity	Weekday Daily Traffic (vpd)	PM Peak Hour Trips (vph)		Saturday Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Single Family Detached Housing[1] (210)	88 units	920	57	33	50	42
Townhomes Multi-Family (Low-Rise)[1] (220)	82 units	580	32	18	28*	27*
Total Site Trips		**1,500**	**89**	**51**	**78**	**69**

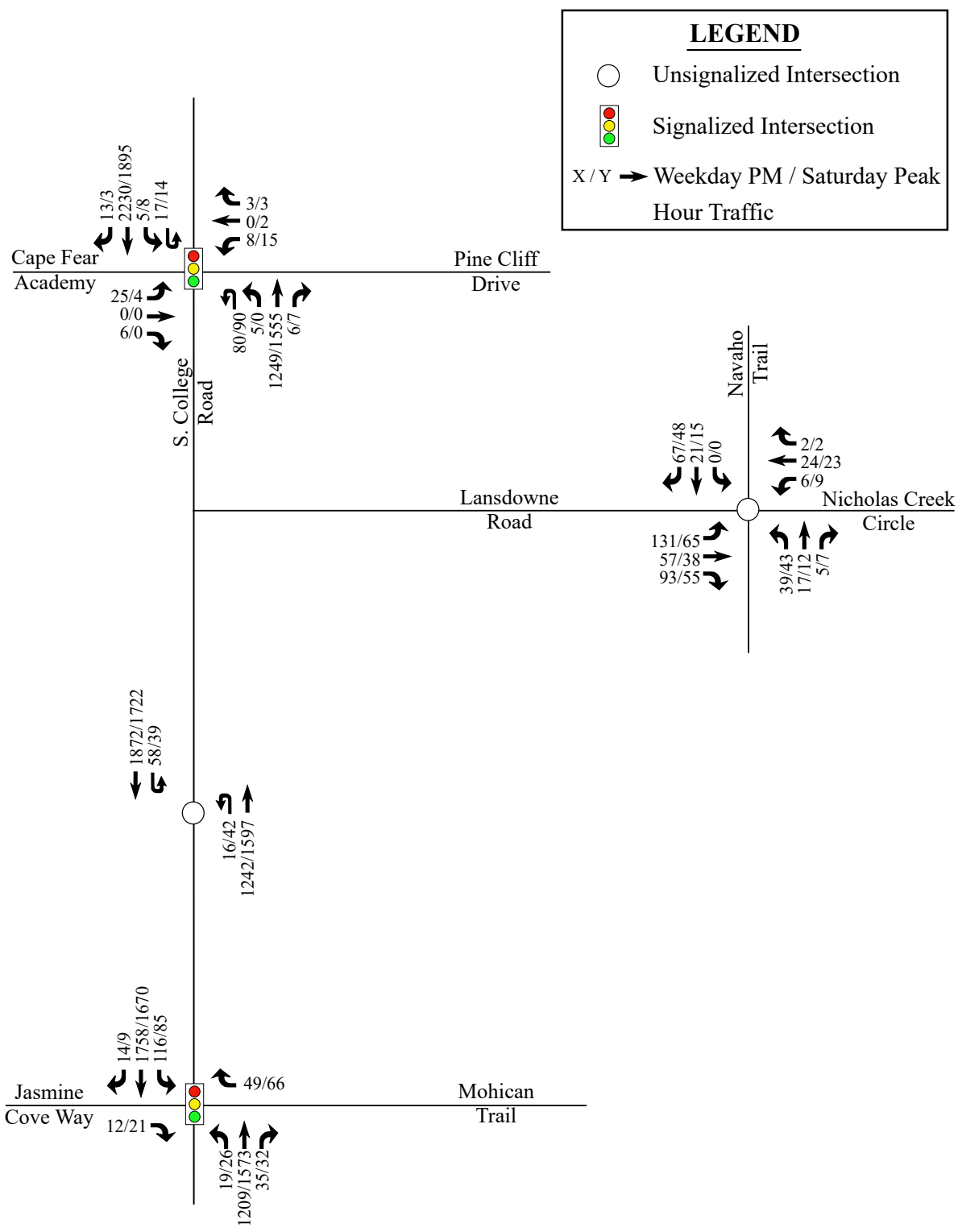
1) No Adjacent Street data was given for Saturday, Generator calculations were used instead.
* No Saturday directional distribution was given so 50%/50% split was assumed

The site trips associated with Phase 1 were distributed according to the approved trip distribution for the subject phase. Refer to figures 5A and 5B for the trip distributions for the weekday PM and Saturday peak hours for phase 1A of the subject development. Figure 6 includes the Phase 1A site trip assignment.

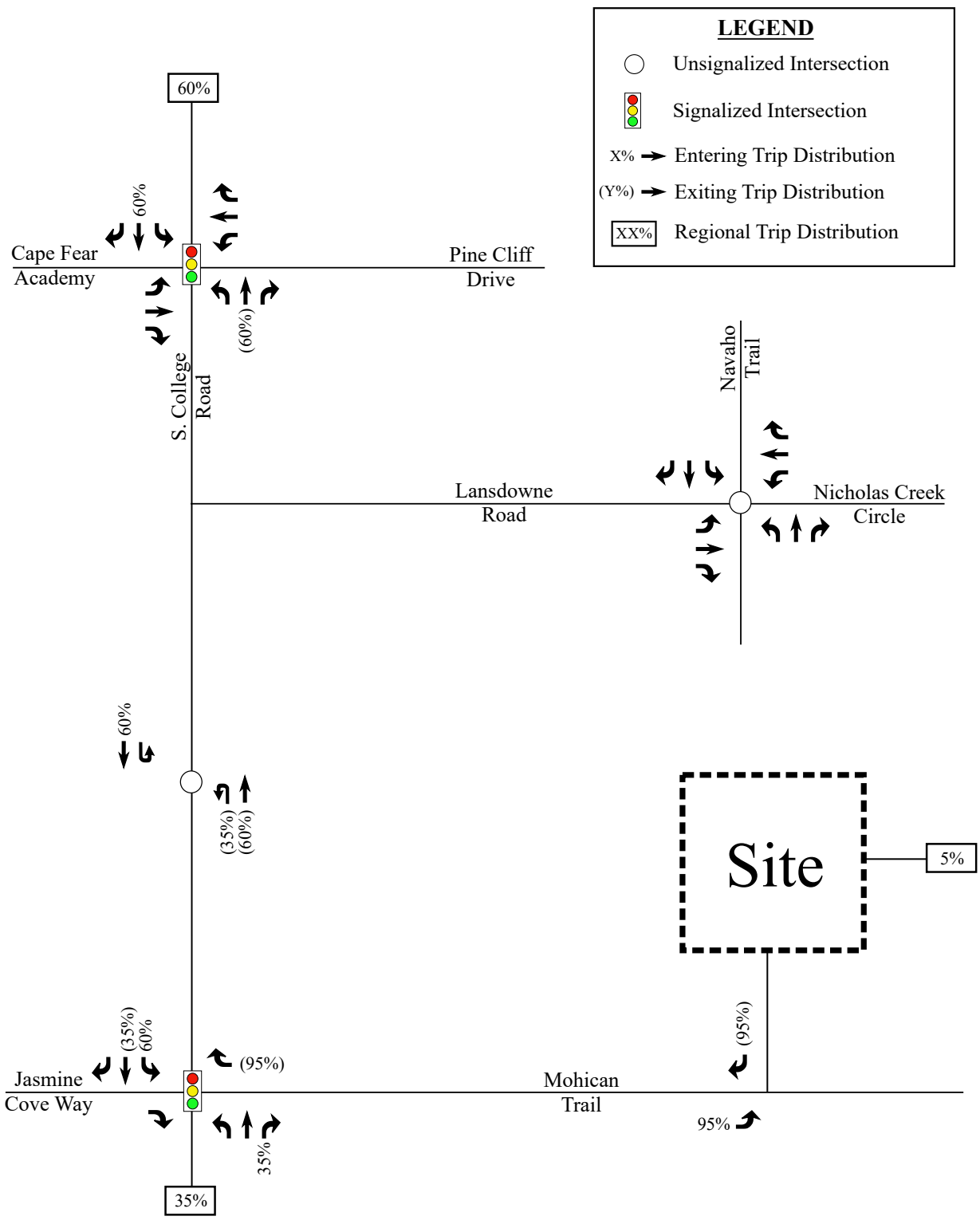
These Phase 1A site trips were added to the unadjusted existing (2019) traffic volumes to determine the existing (2019) peak hour traffic with Phase 1A trips. Refer to figure 7 for the existing (2019) peak hour traffic volumes with the Phase 1A traffic.

2.2. Analysis of Existing (2019) Peak Hour Traffic

The existing (2019) Phase 1A weekday PM and Saturday midday peak hour traffic volumes were analyzed to determine the current levels of service at the study intersections under existing roadway conditions. Signal information was obtained from the NCDOT and the City of Wilmington (City) and is included in Appendix C. The results of the analysis are presented in Section 7 of this report.



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Existing (2019) Peak Hour Traffic (unadjusted) Scale: Not to Scale | Figure 4



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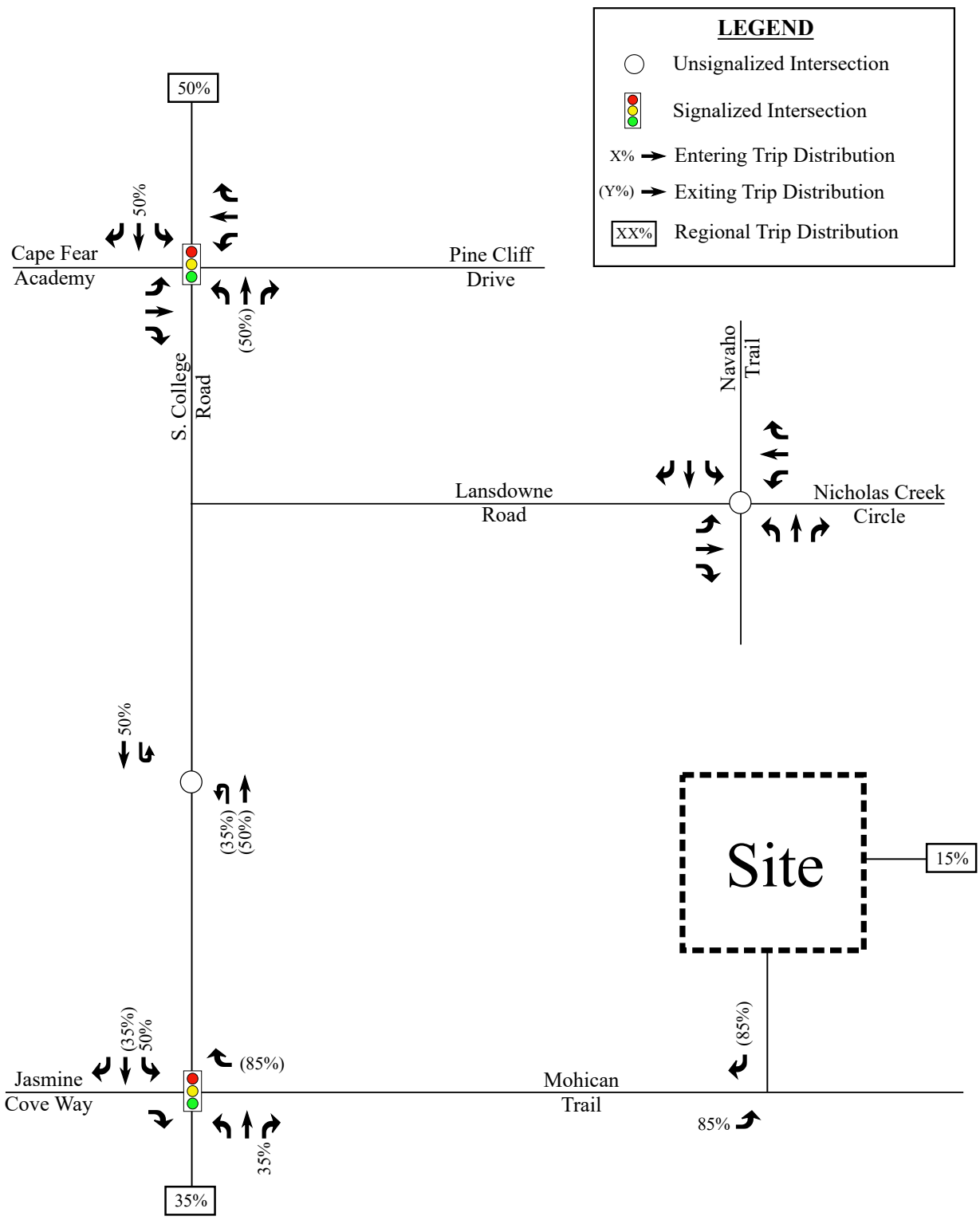
Whiskey Branch Development
Wilmington, NC

Weekday PM Site Trip Distribution - Phase 1A

Scale: Not to Scale | Figure 5A



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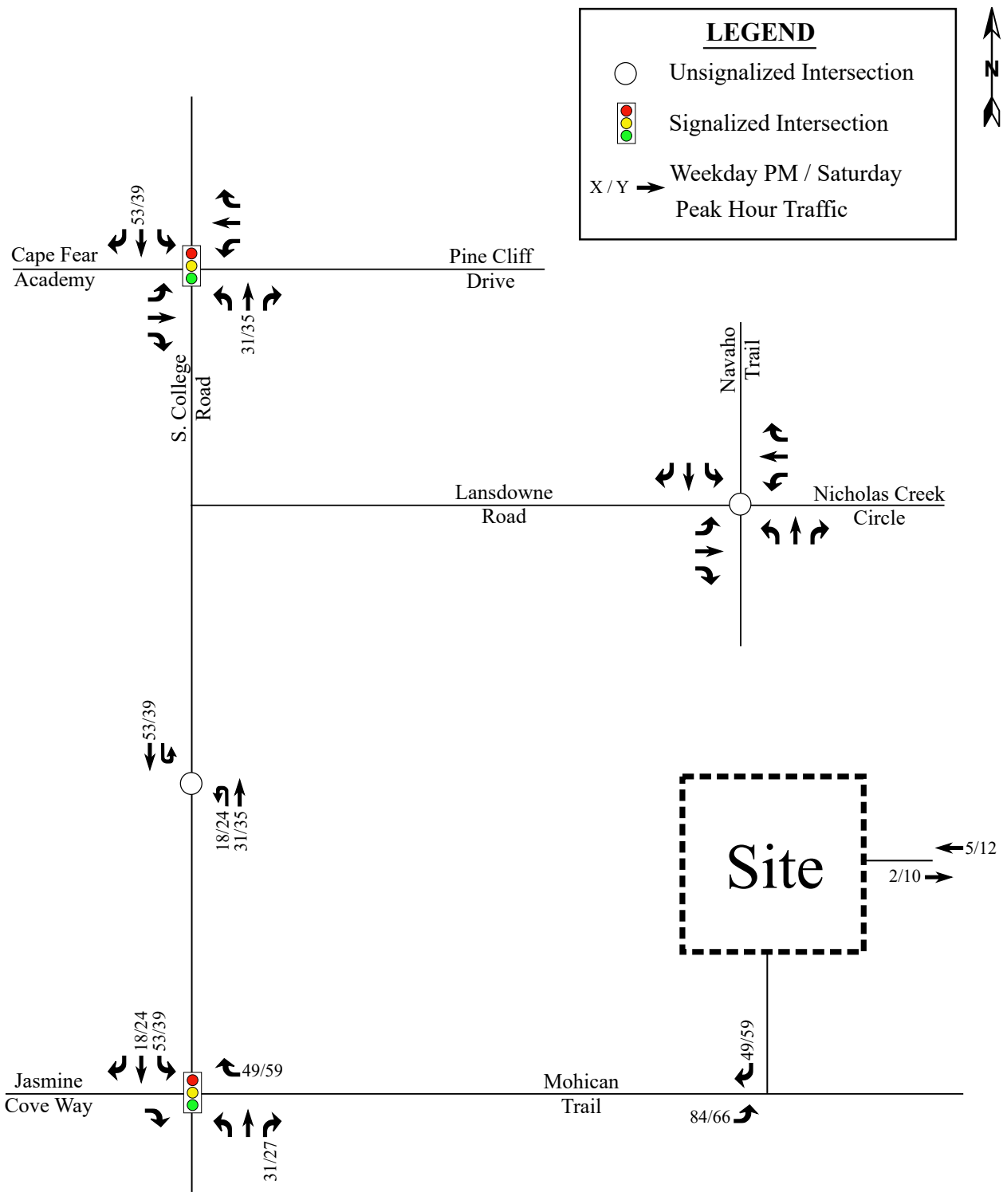
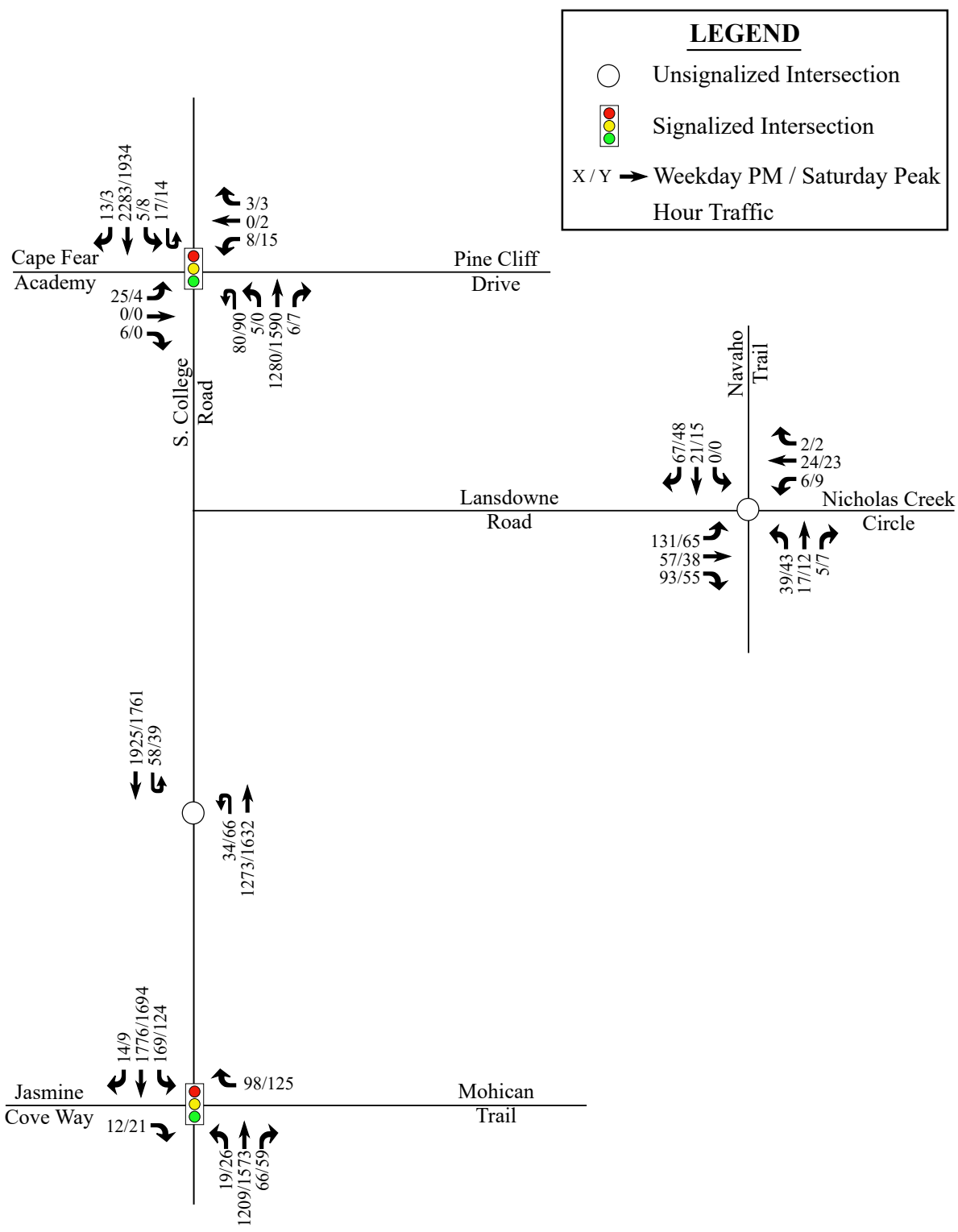
Wilmington, NC

Saturday Site Trip Distribution - Phase 1A

Scale: Not to Scale | Figure 5B



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Phase 1A Trip Assignment	
		Scale: Not to Scale	Figure 6



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Existing (2019) Peak Hour Traffic with Phase 1A Traffic Scale: Not to Scale | Figure 7

3. BACKGROUND (2021 / 2024) PEAK HOUR CONDITIONS

In order to account for growth of traffic and subsequent traffic conditions at a future year, background traffic projections are needed. Background traffic is the component of traffic due to the growth of the community and surrounding area that is anticipated to occur regardless of whether or not the proposed development is constructed. Background traffic is comprised of existing traffic growth within the study area and additional traffic created as a result of adjacent approved developments.

3.1. Ambient Traffic Growth

Through coordination with the WMPO, it was determined that an annual growth rate of 1% would be used to generate projected (2021 / 2024) weekday PM and Saturday midday peak hour traffic volumes. In order to provide a more accurate projection of the existing traffic volumes, the existing (2019) unadjusted volumes were grown to these horizon years with the phase 1A site trips added back in as an adjacent development. Refer to Figure 8A and 9A for the projected (2021) and projected (2024) peak hour traffic, respectively.

3.2. Adjacent Development Traffic

Through coordination with the WMPO, no developments were outlined to be included as adjacent developments. Phase 1A of the Whiskey Branch development was however to be included in existing traffic conditions and was not included in the projected volumes to prevent excessive growth of these site trips. To account for the Phase 1A traffic in future years, these site trips were added back in as an adjacent development according to the same methodology and assumptions in Section 2.

3.3. Future Roadway Improvements

Based on coordination with the WMPO, no future roadway improvements were included in background conditions.

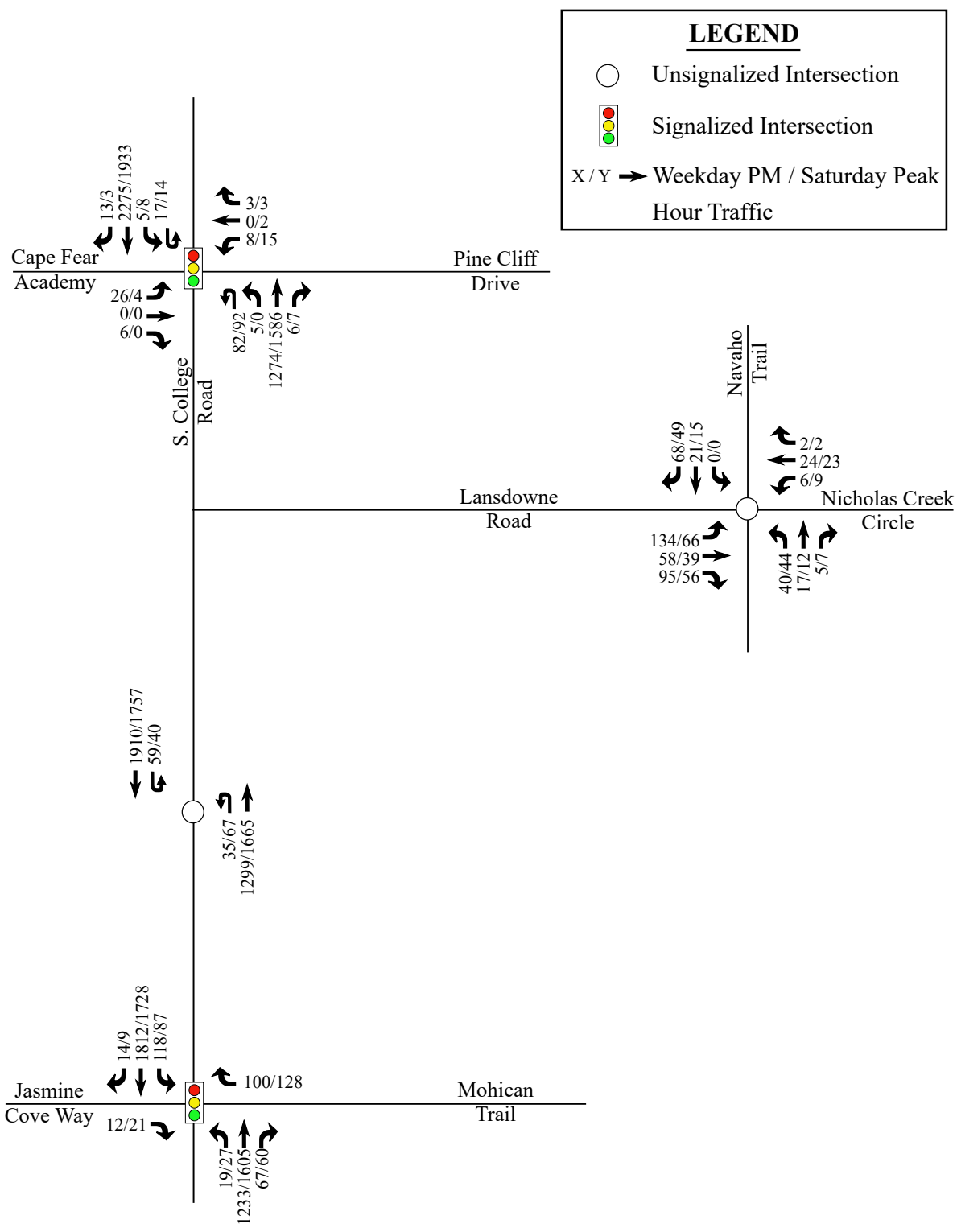
3.4. Background (2021 / 2024) Peak Hour Traffic Volumes

The background (2021 / 2024) traffic volumes were determined by projecting the existing (2019) unadjusted peak hour traffic to the years 2021 and 2024, and adding the Phase 1A site

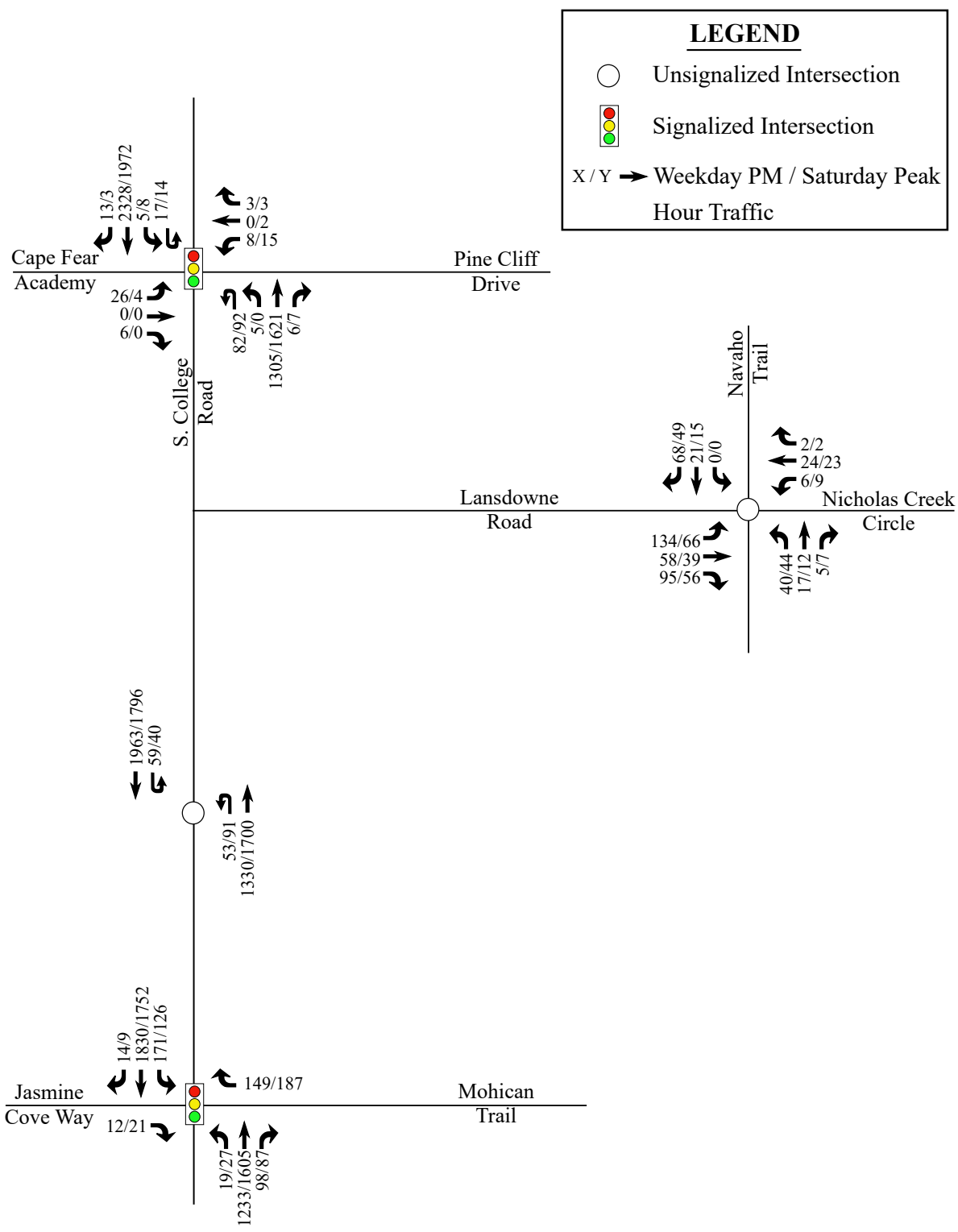
trips. Refer to Figure 8B for an illustration of the background (2021) peak hour traffic volumes and Figure 9B for the background (2024) peak hour traffic volumes.

3.5. Analysis of Background (2021 / 2024) Peak Hour Traffic Conditions

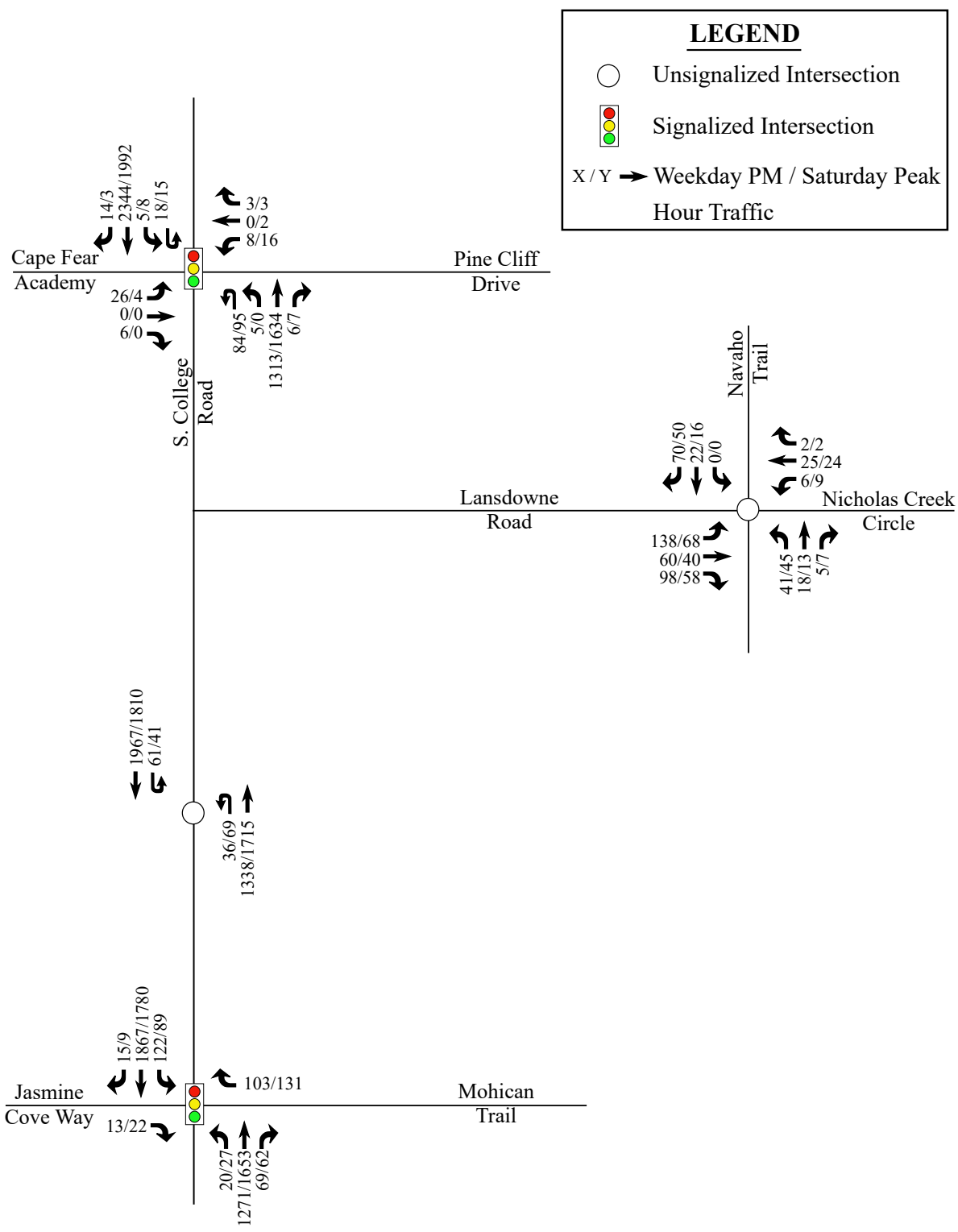
The background (2019 / 2020) AM and PM peak hour traffic volumes at the study intersections were analyzed with existing geometric roadway conditions and traffic control. The analysis results are presented in Section 7 of this report.



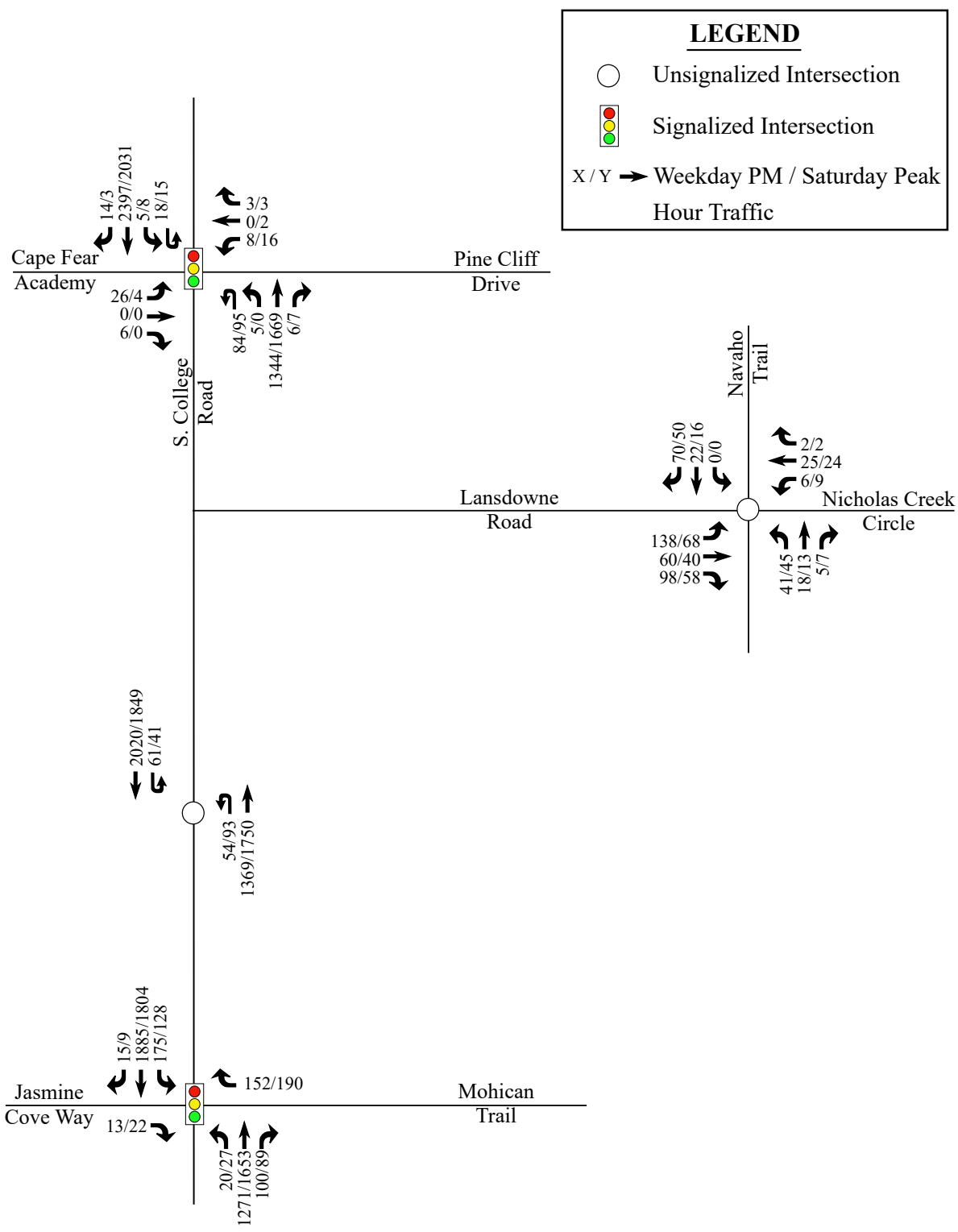
RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Projected (2021) Peak Hour Traffic (unadjusted) Scale: Not to Scale — Figure 8A



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Background (2021) Peak Hour Traffic	
		Scale: Not to Scale	Figure 8B



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Projected (2024) Peak Hour Traffic (unadjusted) Scale: Not to Scale — Figure 9A



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Background (2024) Peak Hour Traffic Scale: Not to Scale | Figure 9B

4. SITE TRIP GENERATION AND DISTRIBUTION

4.1. Trip Generation

Phases 1B and 2 of the proposed development are assumed to consist of approximately 325 apartments and (multi-family mid-rise) [Phase 1B], 50,000 s.f. of general office [Phase 2], and 150,000 s.f. of retail [Phase 2]. Average weekday daily, weekday PM peak hour, and Saturday midday peak hour trips for these phases of the proposed development were estimated using methodology contained within the ITE *Trip Generation Manual*, 10th Edition. Under phase 2 conditions, internal capture was calculated according to methodology included in the NCHRP 684 reports with the assumptions reviewed and approved by the WMPO during scoping. Tables 3 and 4 provide a summary of the trip generation potential for the site under phases 1B and 2 buildout.

Table 3: Phase 1B Trip Generation Summary

Land Use (ITE Code)	Intensity	Weekday Daily Traffic (vpd)	PM Peak Hour Trips (vph)		Saturday Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Multi-Family Housing (Mid-Rise)[1] (221)	325 units	1,770	84	53	70	73

1) No Adjacent Street data was given for Saturday, Generator calculations were used instead.

It is estimated that Phase 1B of the proposed development will generate approximately 1,770 total site trips on the roadway network during a typical 24-hour weekday period. It is anticipated that 137 trips (84 entering and 53 exiting) will occur during the weekday PM peak hour and 143 (70 entering and 73 exiting) will occur during the Saturday midday peak hour

Table 4: Phase 2 Trip Generation

Land Use (ITE Code)	Intensity	Weekday Daily Traffic (vpd)	PM Peak Hour Trips (vph)		Saturday Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Multi-Family Housing (Mid-Rise)[1] (221)	325 units	1,770	84	53	70	73
General Office Building[2] (710)	50,000 sq. ft.	540	22	98	15	12
Shopping Center[1] (820)	150,000 sq. ft.	7,920	352	382	444	409
Total Site Trips		**10,230**	**458**	**533**	**529**	**494**
Internal Capture (17 % PM Entering and 14% PM Exiting)[3]			*-78*	*-75*	*-0*	*-0*
Total External Trips			**380**	**458**	**529**	**494**
Pass-By Trips: Shopping Center (34% PM, 26% Saturday)			*-106*	*-106*	*-111*	*-111*
Total Primary Trips			**274**	**352**	**418**	**383**

1) No Adjacent Street data was given for Saturday, Generator calculations were used instead.
2) No Adjacent Street data was given for Saturday, Generator calculations were used instead. No equation provided for Saturday, rates were used instead.
3) Internal capture was calculated according to methodology contained in the NCHRP 684 Report. 2,000 feet spacing between retail / office and residential land uses and 0 feet of spacing between office and retail land uses were assumed. Phase 1A was omitted from these calculations as it will be included in the existing traffic calculations

It is estimated that full buildout (phase 2) of the proposed development will generate approximately 10,230 total site trips on the roadway network during a typical 24-hour weekday period. It is anticipated that 991 trips (458 entering and 533 exiting) will occur during the weekday PM peak hour and 1,023 (529 entering and 494 exiting) will occur during the Saturday midday peak hour.

Internal capture of trips between the office, residential, and retail uses were considered according to the methodology contained within the National Cooperative Highway Research Program (NCHRP) 684 report. Internal capture is the consideration for trips that will be made within the site between different land uses, so the vehicle does not leave the internal site but can

still be considered as a trip to that specific land use. Internal capture typically only considers trips between residential, office, and retail/restaurant land uses. Based on the NCHRP 684 spreadsheet that is referenced in the current ITE *Trip Generation Handbook*, the internal capture percentage was found to be 17% entering and 14% exiting during the weekday PM peak hours. The internal capture is expected to account for approximately 153 trips (78 entering and 75 exiting) during the weekday PM peak hour.

Pass-by trips were taken into consideration in this study and applied after the internal capture reduction was taken into account. Pass-by trips are made by the traffic already using the adjacent roadway, entering the site as an intermediate stop on their way to another destination. Pass-by trips are expected to account for approximately 212 trips (106 entering and 106 exiting) during the weekday PM peak hour and 222 trips (111 entering and 111 exiting) during the Saturday midday peak hour. It should be noted that the pass-by trips were balanced, as it is likely that these trips would enter and exit in the same hour.

The total primary site trips are the calculated site trips after the reduction for internal capture and pass-by trips. It is anticipated that 626 trips (274 entering and 352 exiting) will occur during the weekday PM peak hour and 801 trips (418 entering and 383 exiting) will occur during the Saturday midday peak hour.

4.2. Site Trip Distribution and Assignment

Trip distribution percentages used in assigning site traffic for this development were estimated based on a combination of existing traffic patterns, population centers adjacent to the study area, and engineering judgment. For the purpose of the site trip distributions, the retail and office site traffic was grouped together as “commercial”. The following distributions have been approved by the WMPO:

Residential Site Trip Distributions (Weekday PM Peak Hour)

- 60% to/from the north via S. College Road
- 40% to/from the south via S. College Road

Residential Site Trip Distributions (Saturday Peak Hour)

- 50% to/from the north via S. College Road
- 50% to/from the south via S. College Road

Commercial Site Trip Distributions (Weekday PM and Saturday Peak Hour)

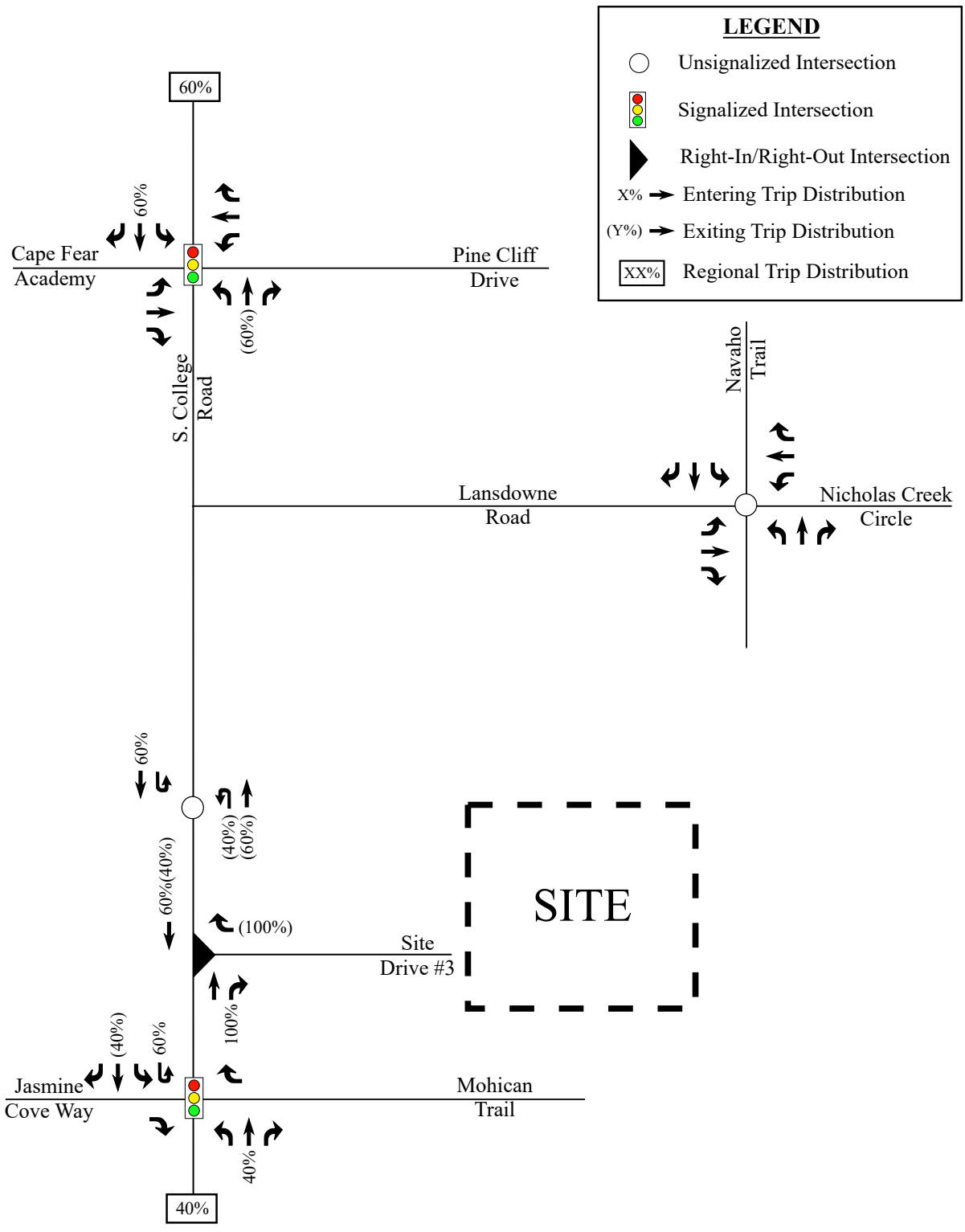
- 60% to/from the north via S. College Road
- 30% to/from the south via S. College Road
- 5% to/from the east via Mohican Trail
- 5% to/from the residential development to the east on Navaho Trail

The weekday PM and Saturday access alternatives 1 and 4, phase 1B, site trip distributions are provided in Figures 10A – 10D. Refer to Figures 11A – 11D for the weekday PM and Saturday access alternatives 1 and 4, Phase 2, residential site trip distributions. Figures 12A – 12B provide the access alternatives 1 and 4 commercial site trip distributions for Phase 2 and figures 13A – 13B provide the access alternatives 1 and 4 pass-by site trip distributions for Phase 2.

Refer to figures 14A – 14B for the Phase 1B access alternatives 1 and 4 site trip assignments. Figures 15A – 15B provide the access alternatives 1 and 4 residential site trip assignments while figures 16A – 16B contain the commercial trip assignments, and figures 17A – 17B contain the pass-by trip assignments for Phase 2 of the development.

The total site trips for Phase 2 were determined by adding the primary site trips and the pass-by site trips. Refer to Figures 18A – 18B for the Phase 2 total site trips under access alternatives 1 and 4.

Background traffic at the existing southbound U-Turn was rerouted to utilize the proposed southbound U-turn location north of the site. As in original TIA report, 50% of the existing southbound U-turns were reassigned to the new U-turn location. Refer to Figure 19 for the diverted trips associated with this new U-turn location.



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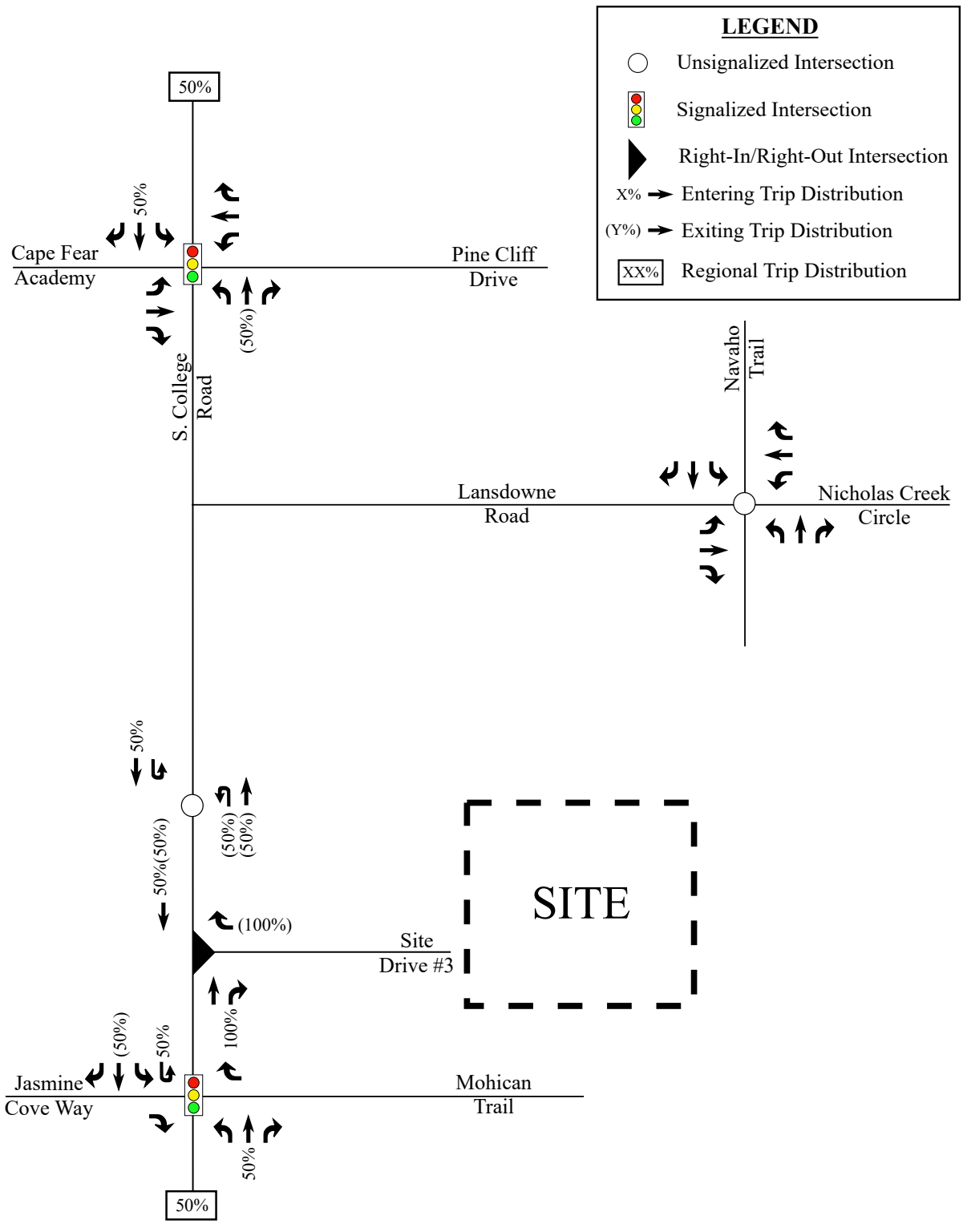
Whiskey Branch Development
Wilmington, NC

Weekday PM Site Trip Distribution - Phase 1B, Alternative 1

Scale: Not to Scale | Figure 10A



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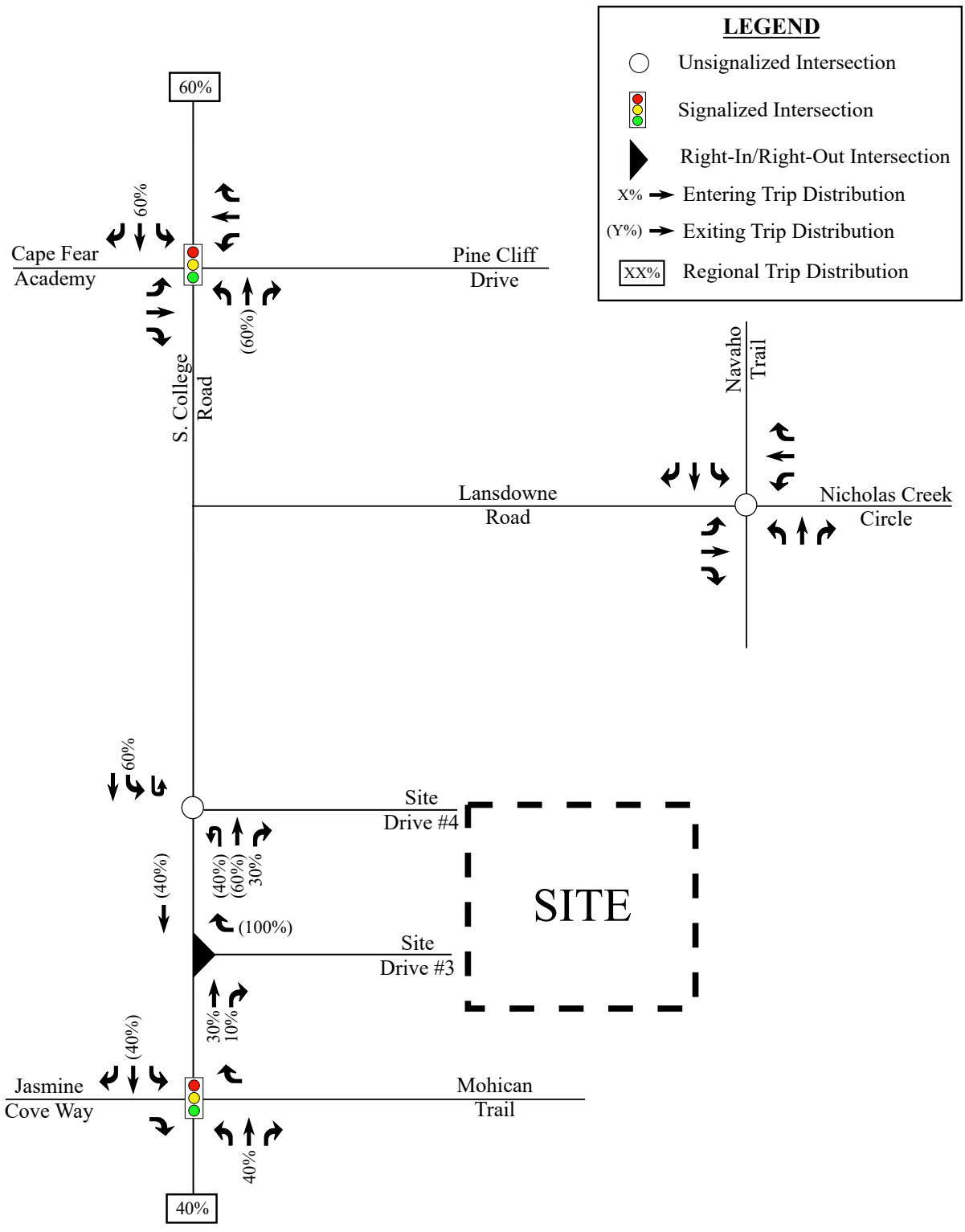
Whiskey Branch Development
Wilmington, NC

Saturday Site Trip Distribution - Phase 1B, Alternative 1

Scale: Not to Scale | Figure 10B



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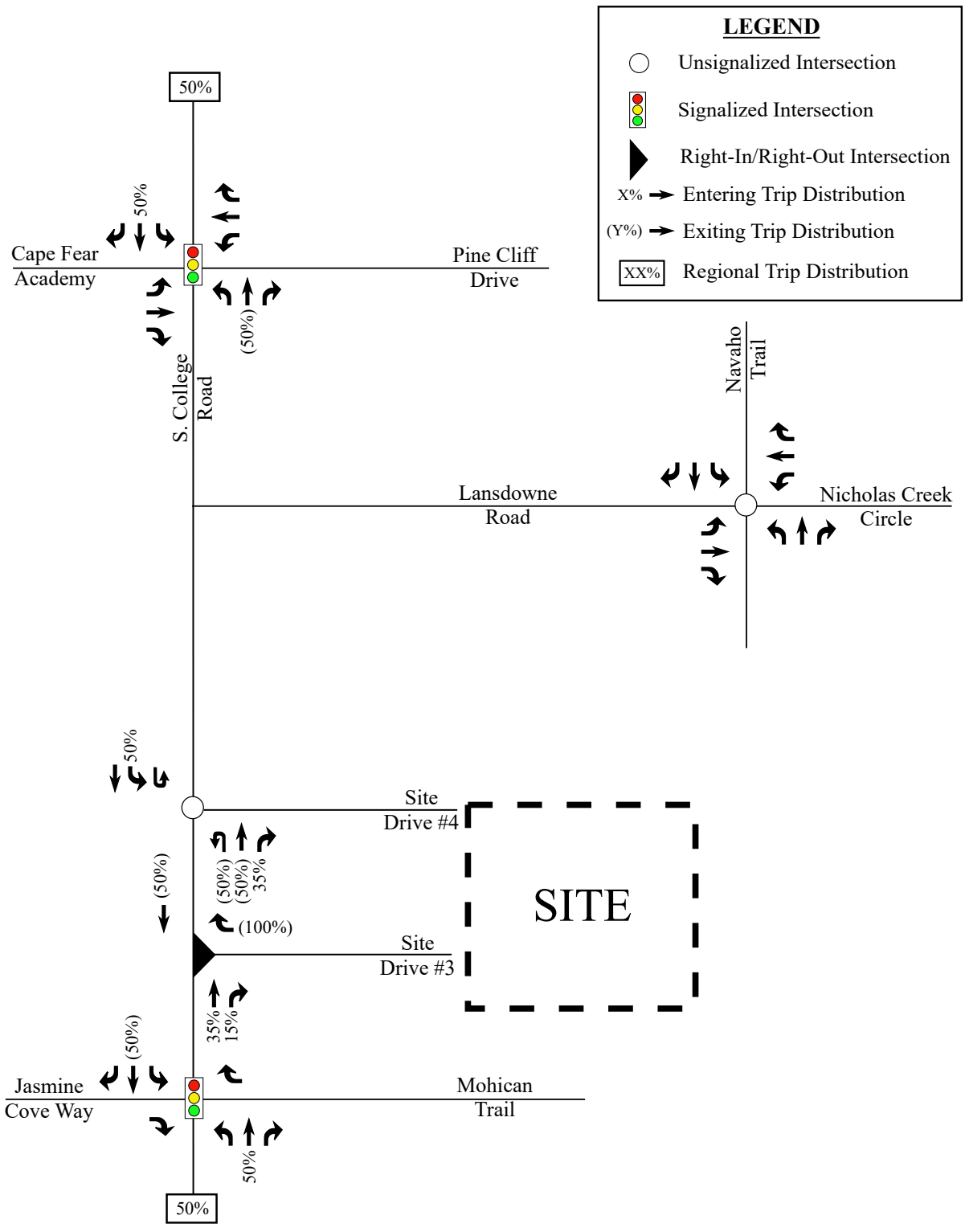
Whiskey Branch Development
Wilmington, NC

Weekday PM Site Trip Distribution - Phase 1B, Alternative 4

Scale: Not to Scale | Figure 10C



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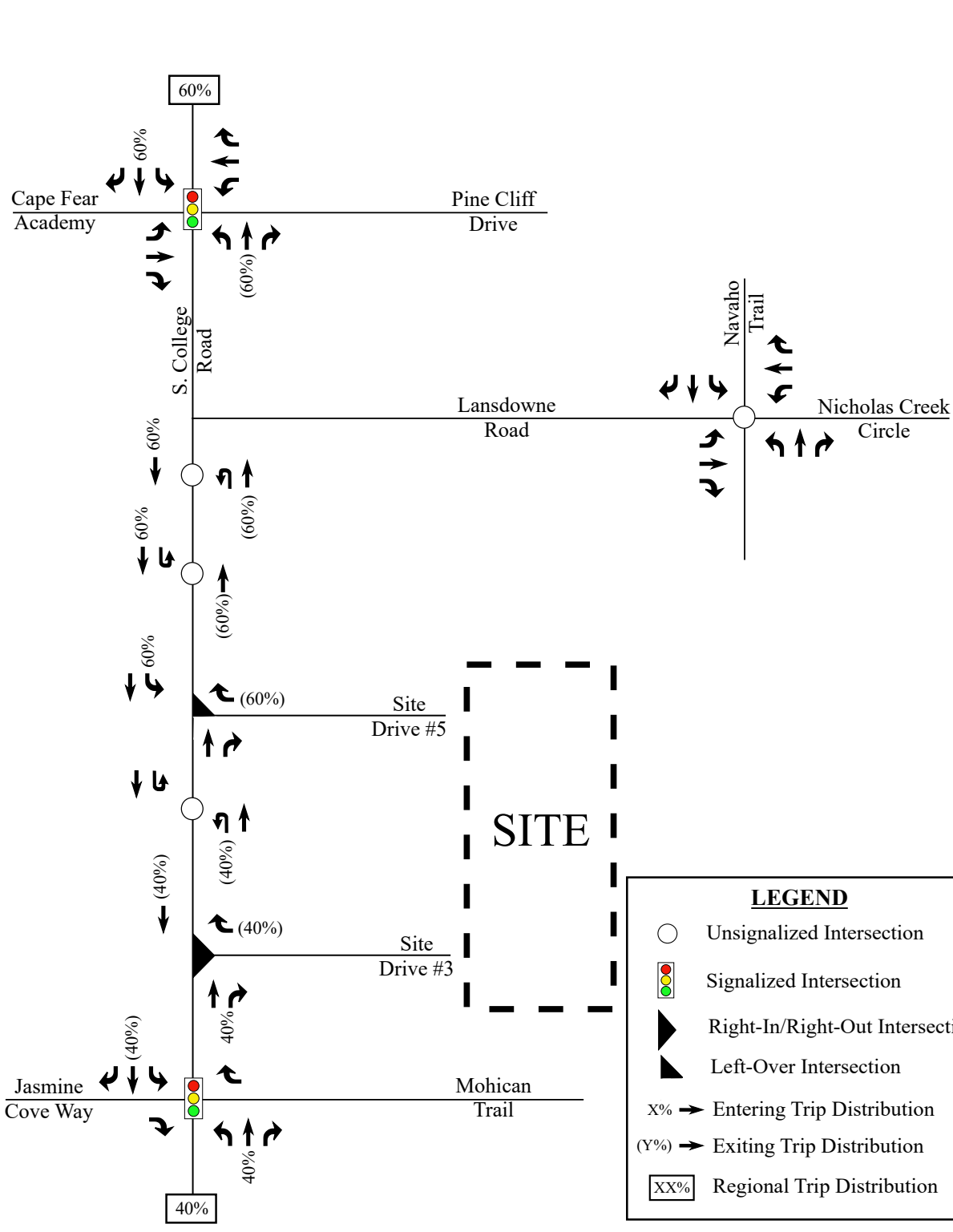
Whiskey Branch Development
Wilmington, NC

Saturday Site Trip Distribution - Phase 1B, Alternative 4

Scale: Not to Scale | Figure 10D



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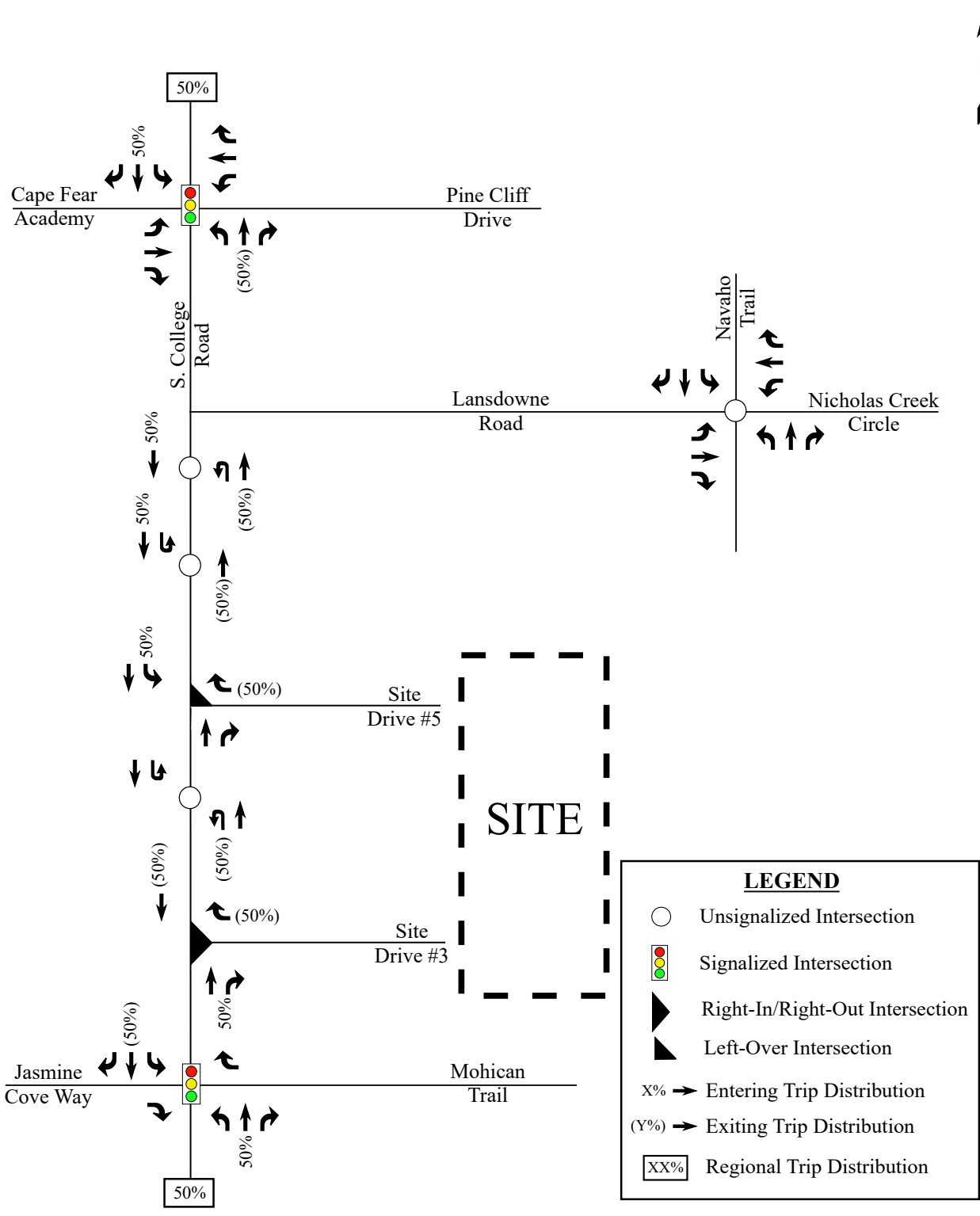
Whiskey Branch Development
Wilmington, NC

Weekday PM Residential Site Trip Distribution - Phase 2, Alternative 1

Scale: Not to Scale | Figure 11A



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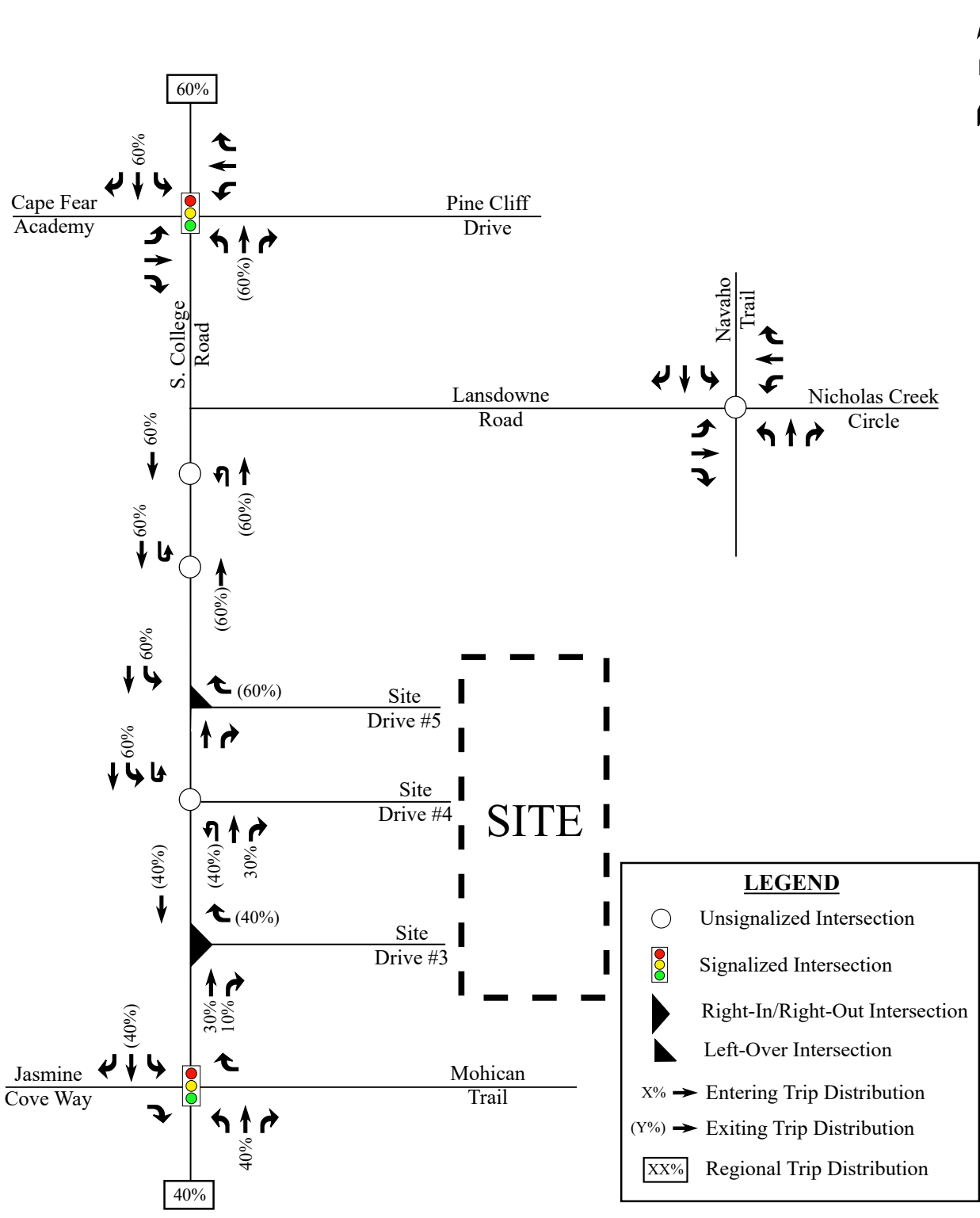
Wilmington, NC

Saturday Residential Site Trip Distribution - Phase 2, Alternative 1

Scale: Not to Scale | Figure 11B

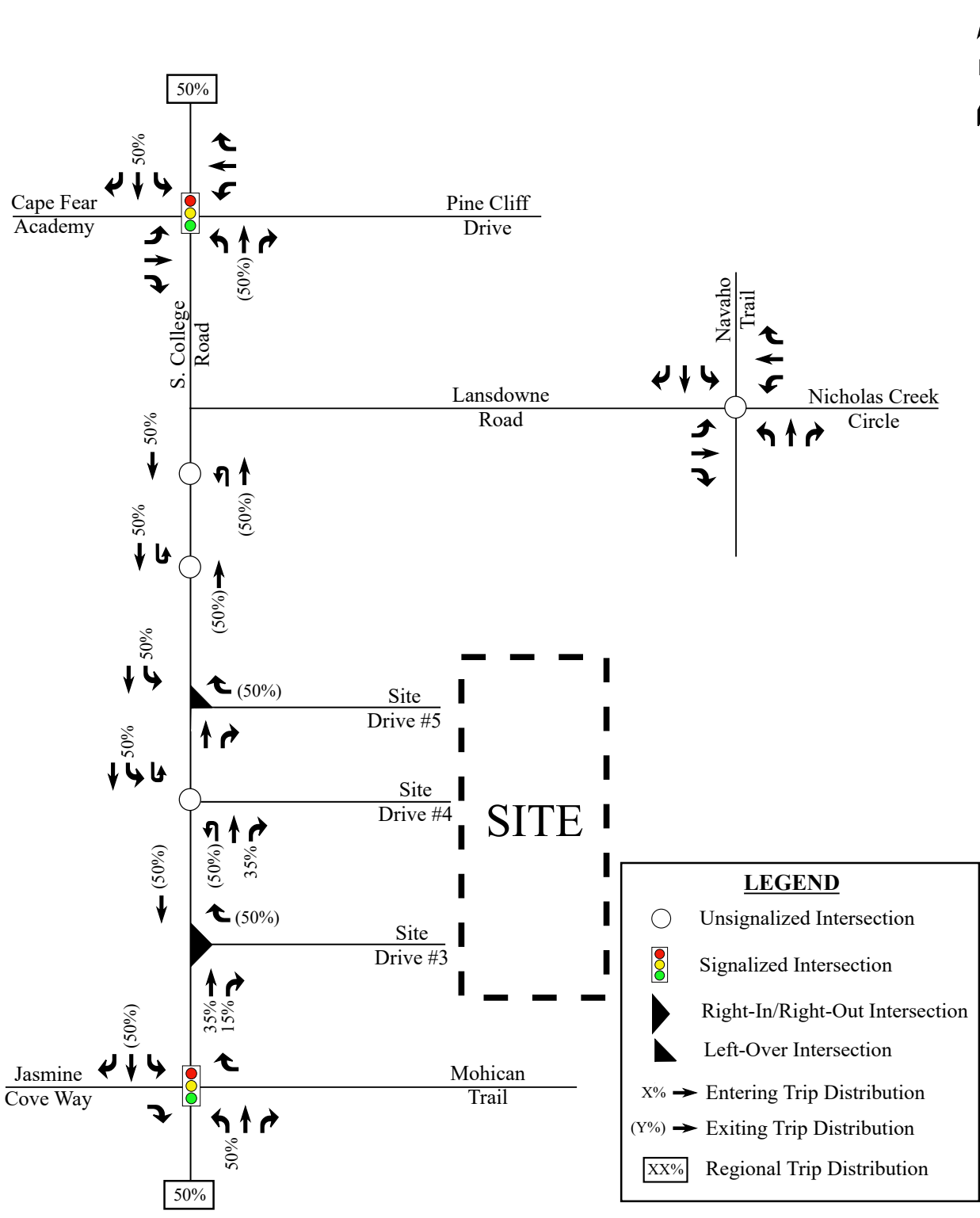


RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Whiskey Branch Development
Wilmington, NC

Weekday PM Residential Site Trip Distribution - Phase 2, Alternative 4

Scale: Not to Scale | Figure 11C

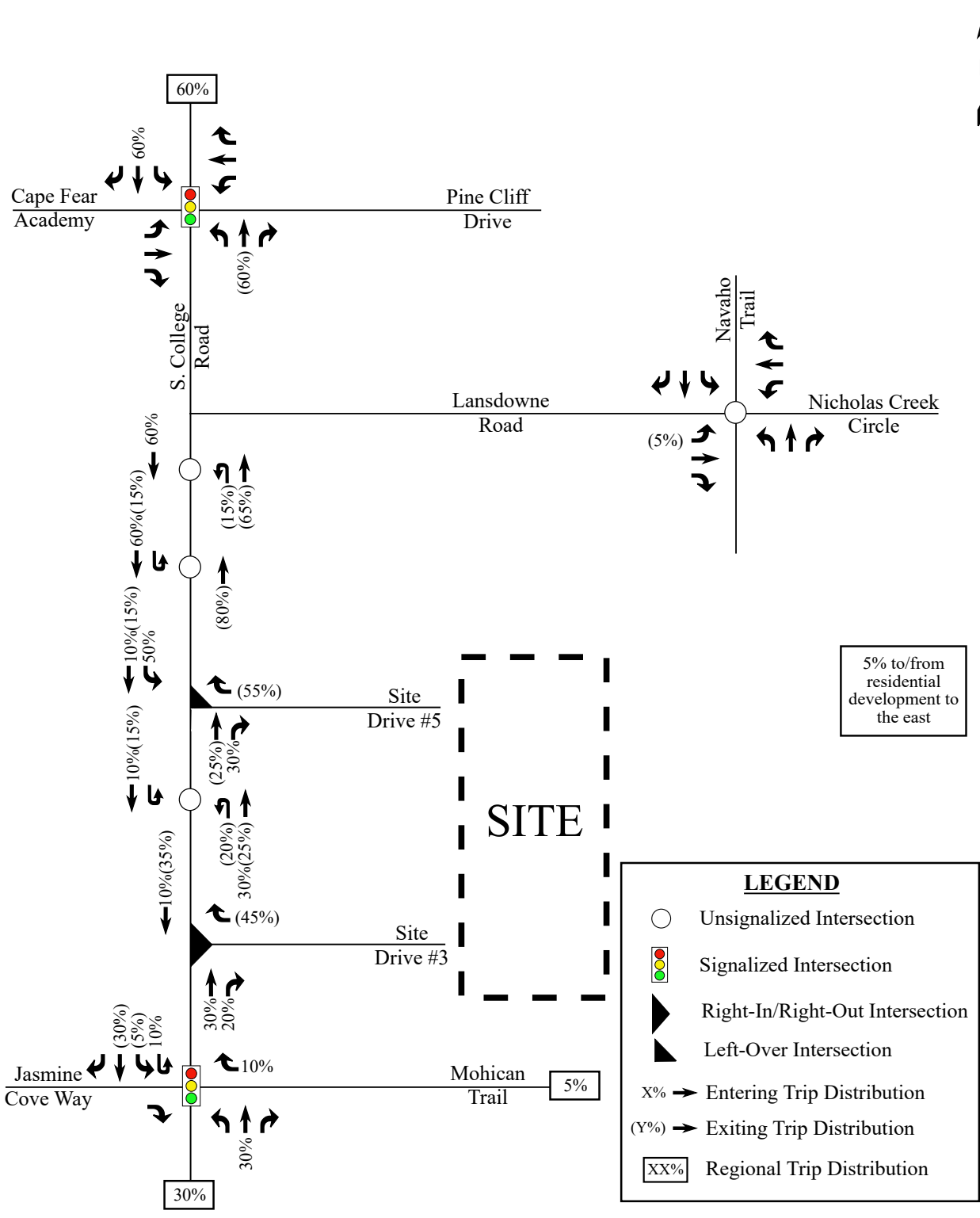


RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Whiskey Branch Development
Wilmington, NC

Saturday Residential Site Trip Distribution - Phase 2, Alternative 4

Scale: Not to Scale | Figure 11D

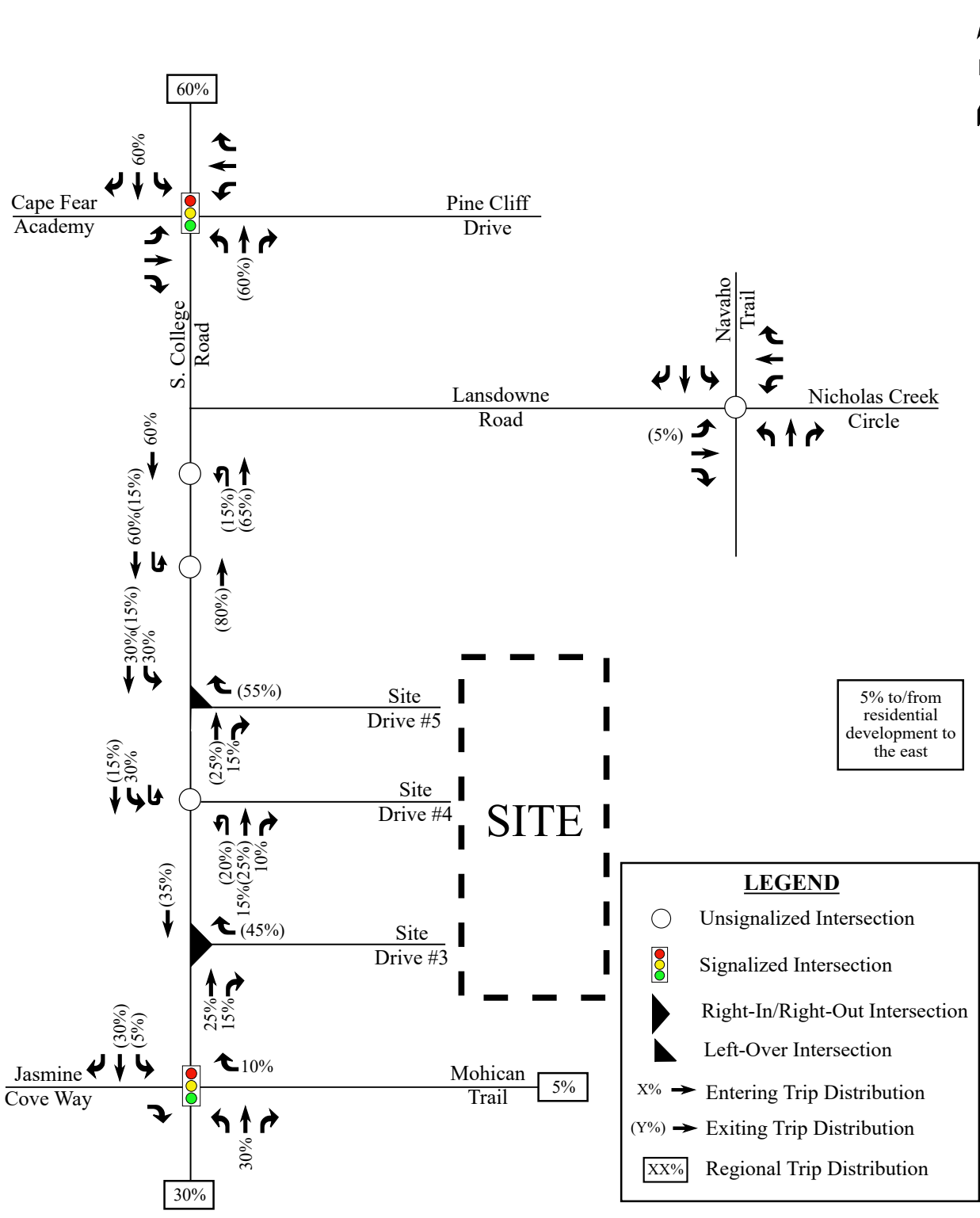


RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Whiskey Branch Development
Wilmington, NC

PM + Saturday Commercial Site Trip Distribution - Phase 2, Alternative 1

Scale: Not to Scale | Figure 12A



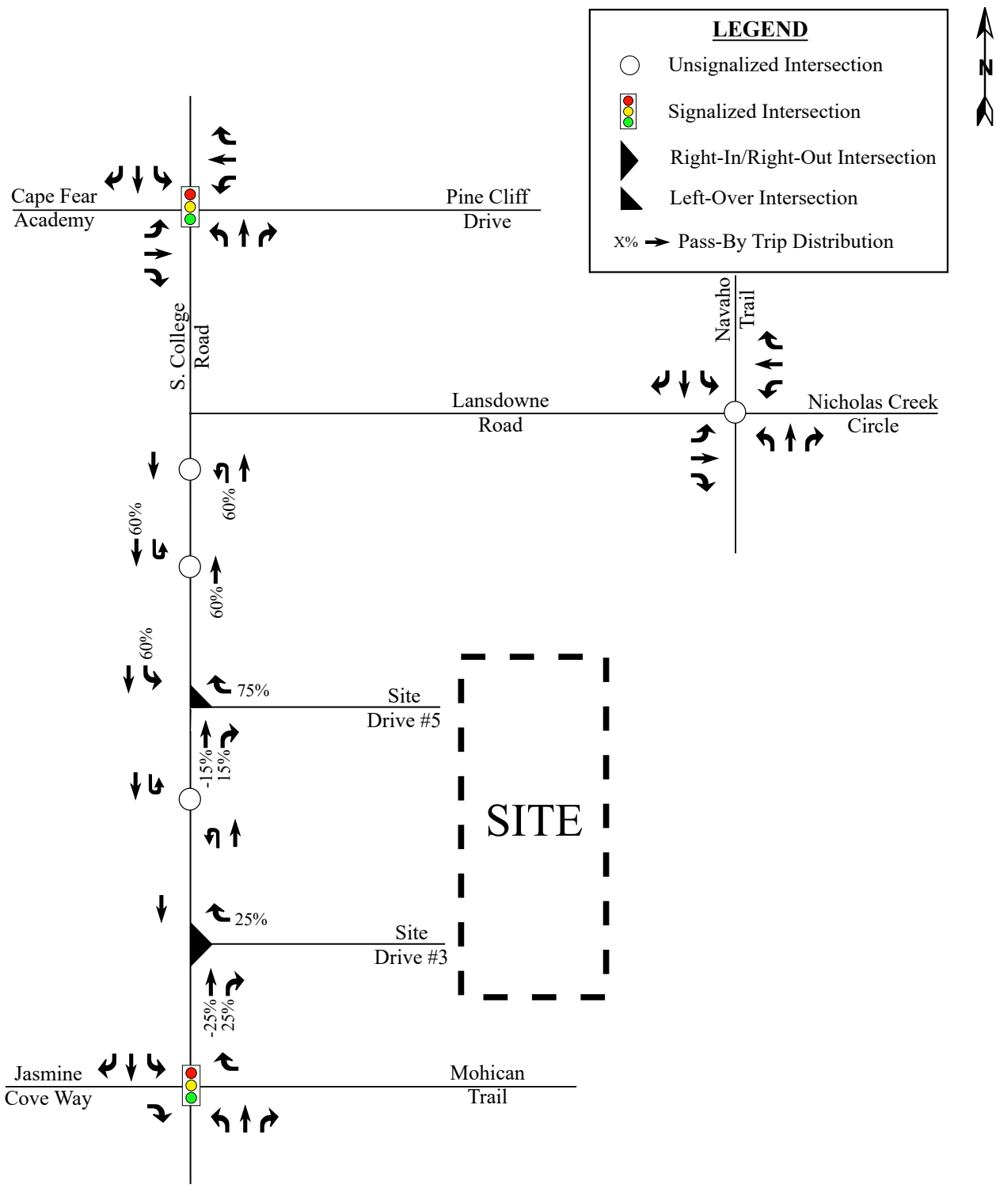
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Whiskey Branch Development
Wilmington, NC

PM + Saturday Commercial Site Trip Distribution - Phase 2, Alternative 4

Scale: Not to Scale

Figure 12B

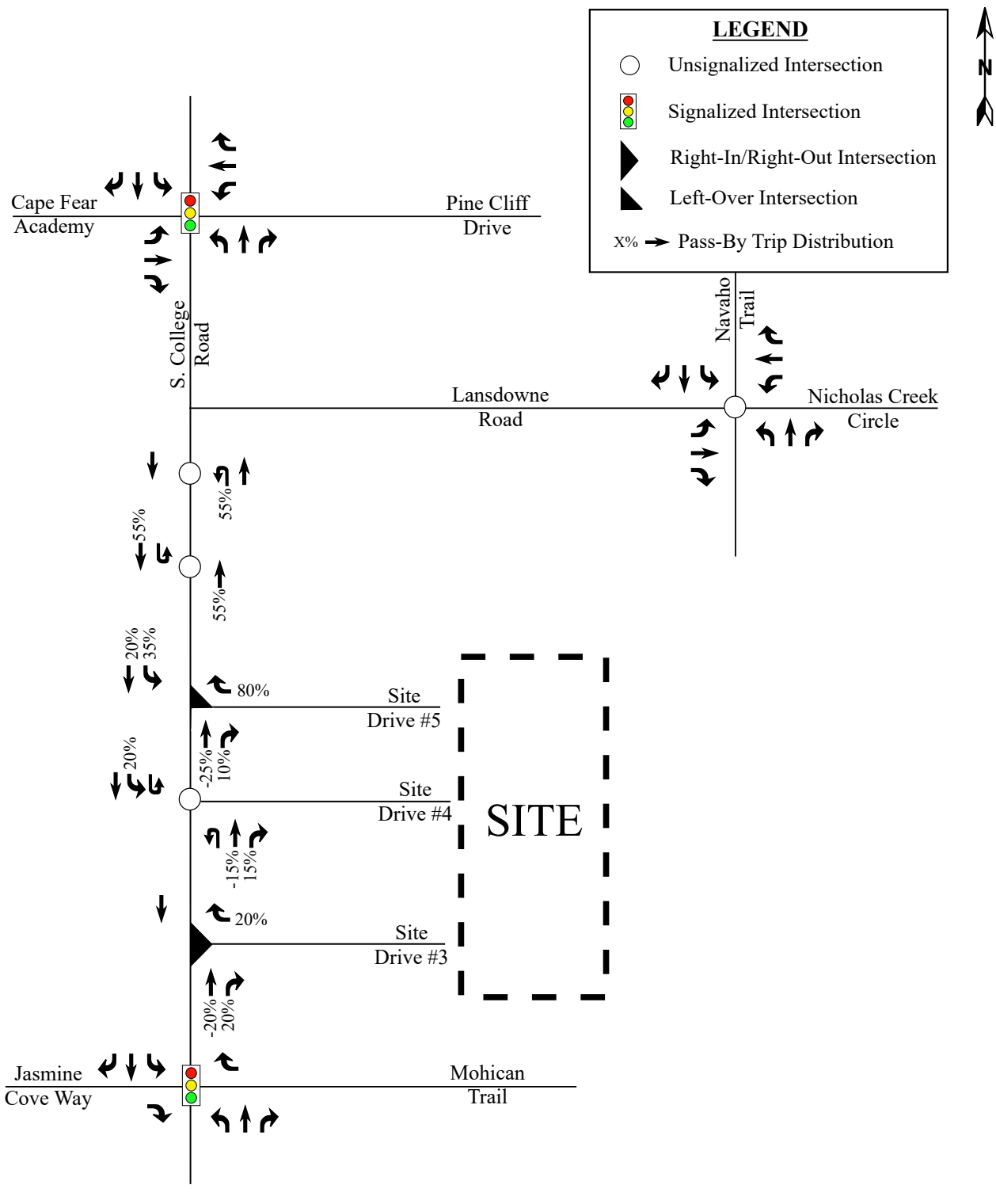


RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

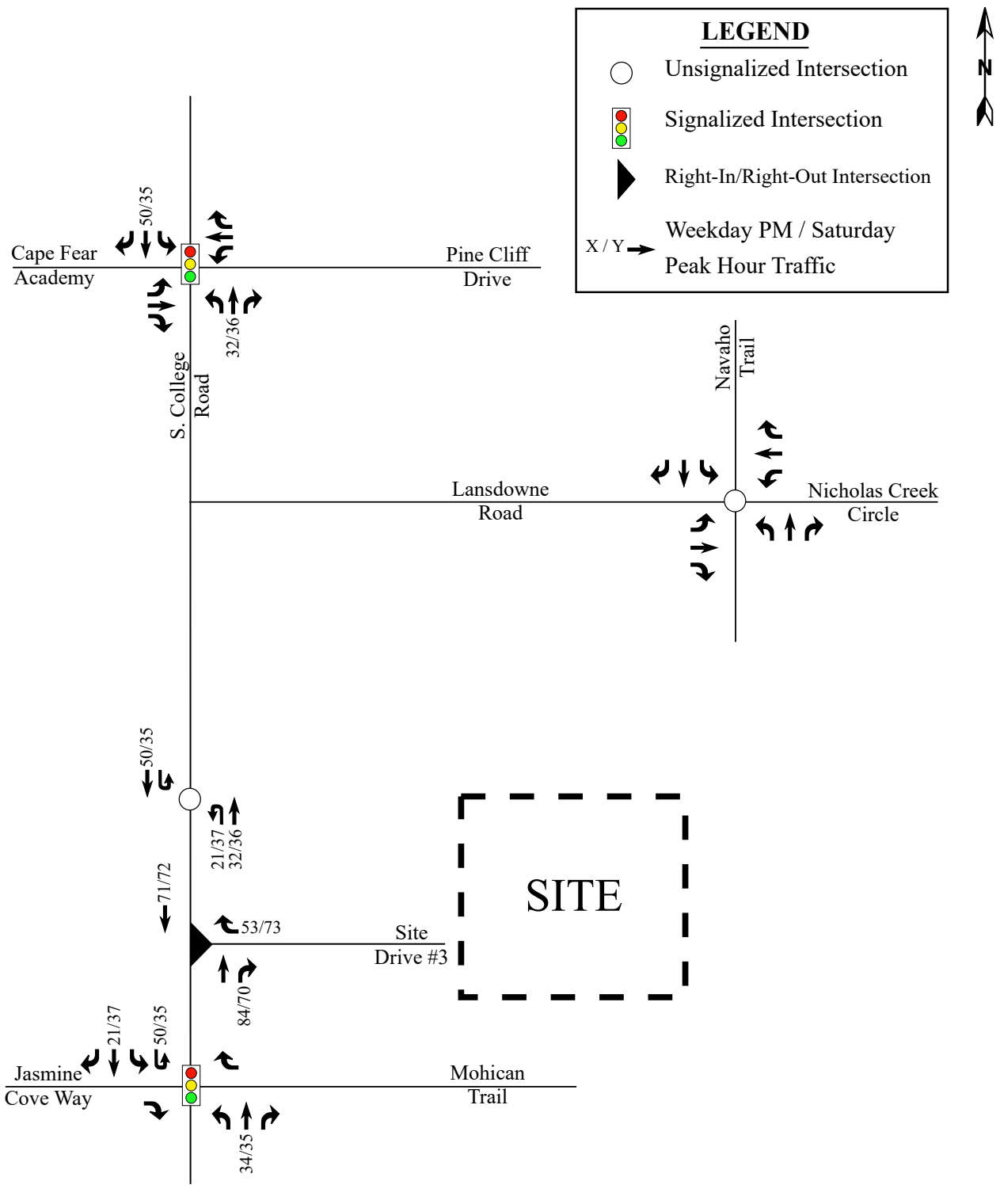
Whiskey Branch Development
Wilmington, NC

Weekday PM + Saturday Pass-By Distribution - Phase 2, Alternative 1

Scale: Not to Scale | Figure 13A



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Weekday PM + Saturday Pass-By Distribution - Phase 2, Alternative 4 Scale: Not to Scale | Figure 13B



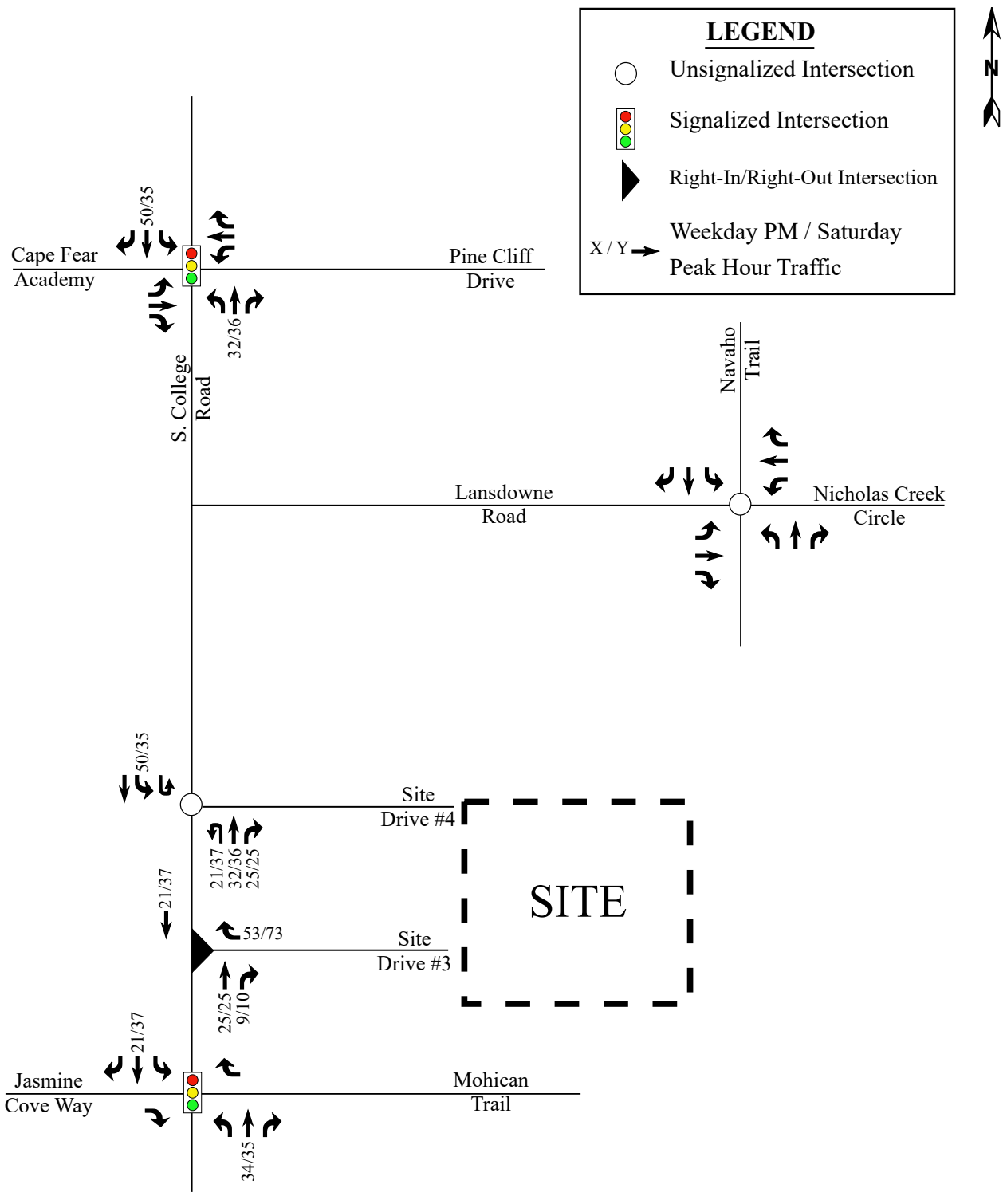
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Whiskey Branch
Development
Wilmington, NC

Total Trip Assignment
- Phase 1B, Alternate 1

Scale: Not to Scale

Figure 14A



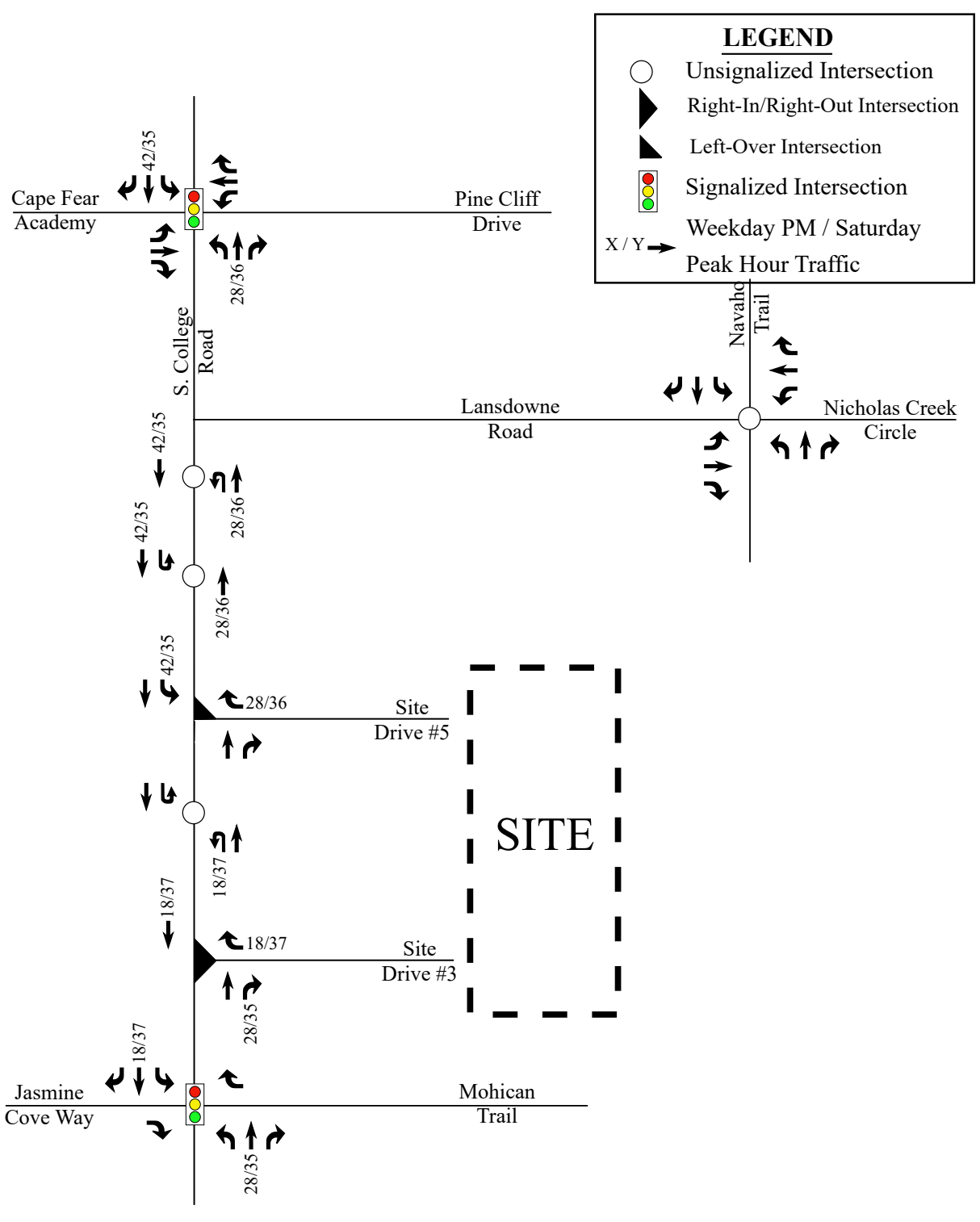
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Whiskey Branch Development
Wilmington, NC

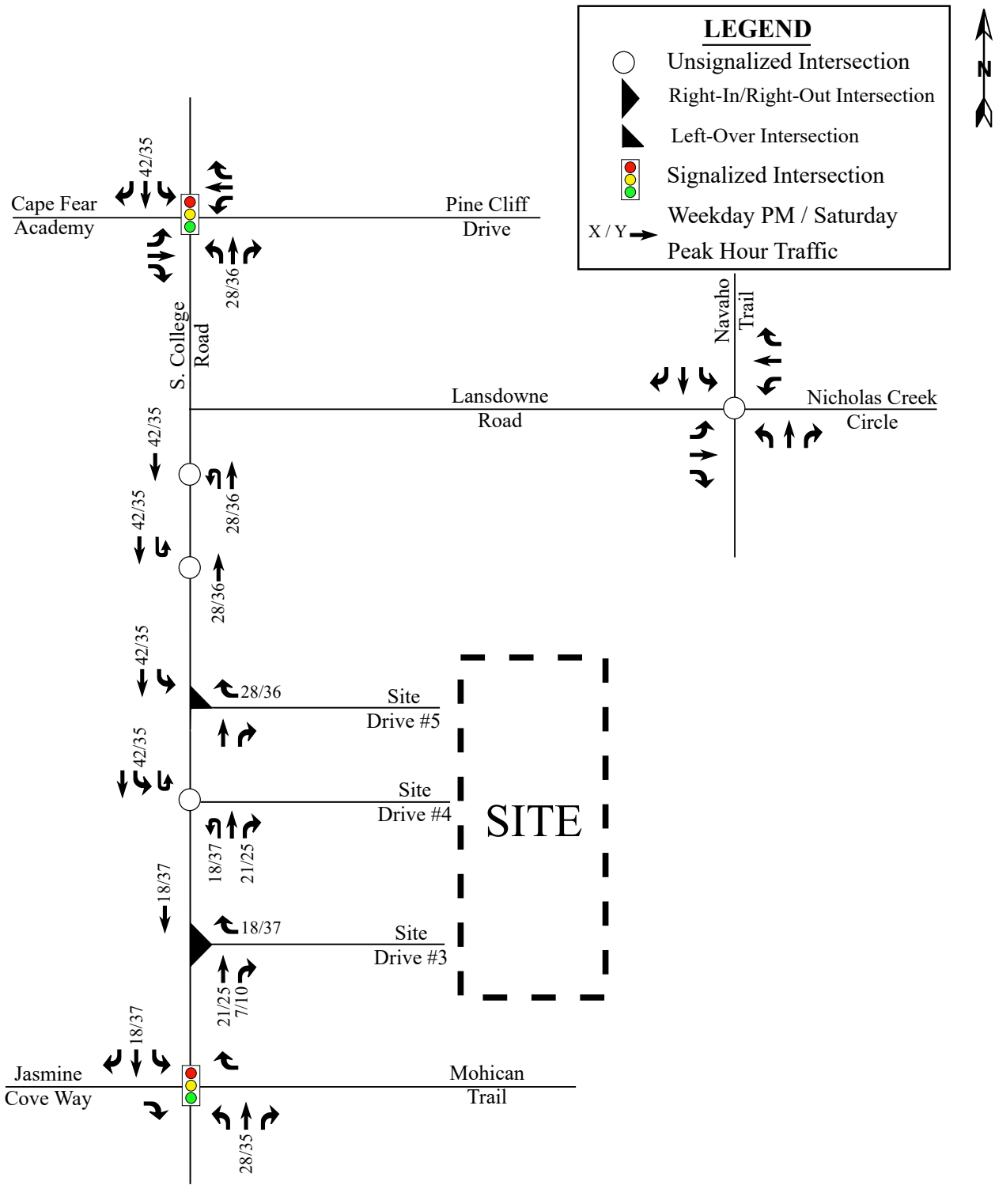
Total Trip Assignment
- Phase 1B, Alternate 4

Scale: Not to Scale

Figure 14B



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Residential Trip Assignment - Phase 2, Alternate 1 Scale: Not to Scale | Figure 15A



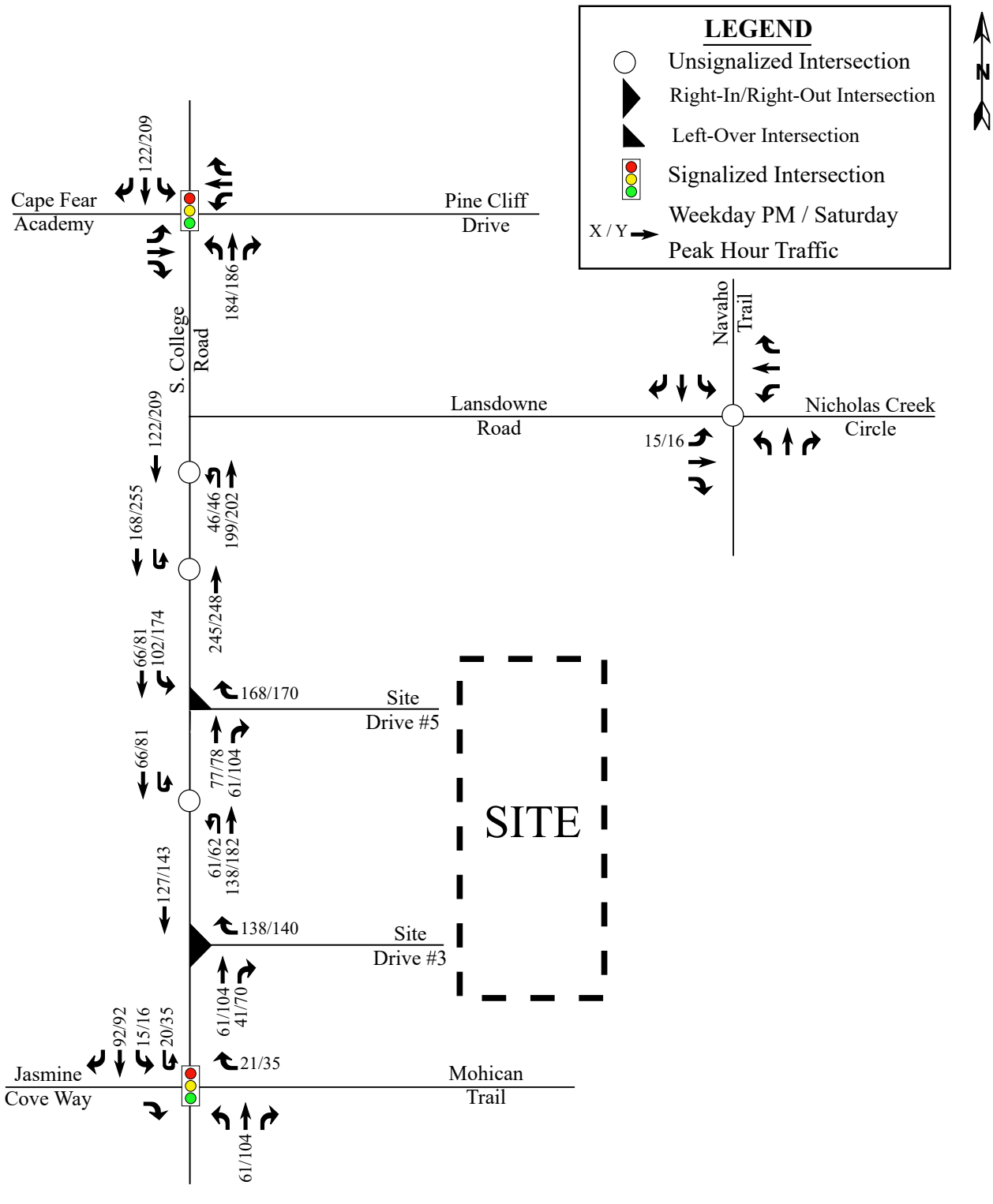
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Whiskey Branch Development
Wilmington, NC

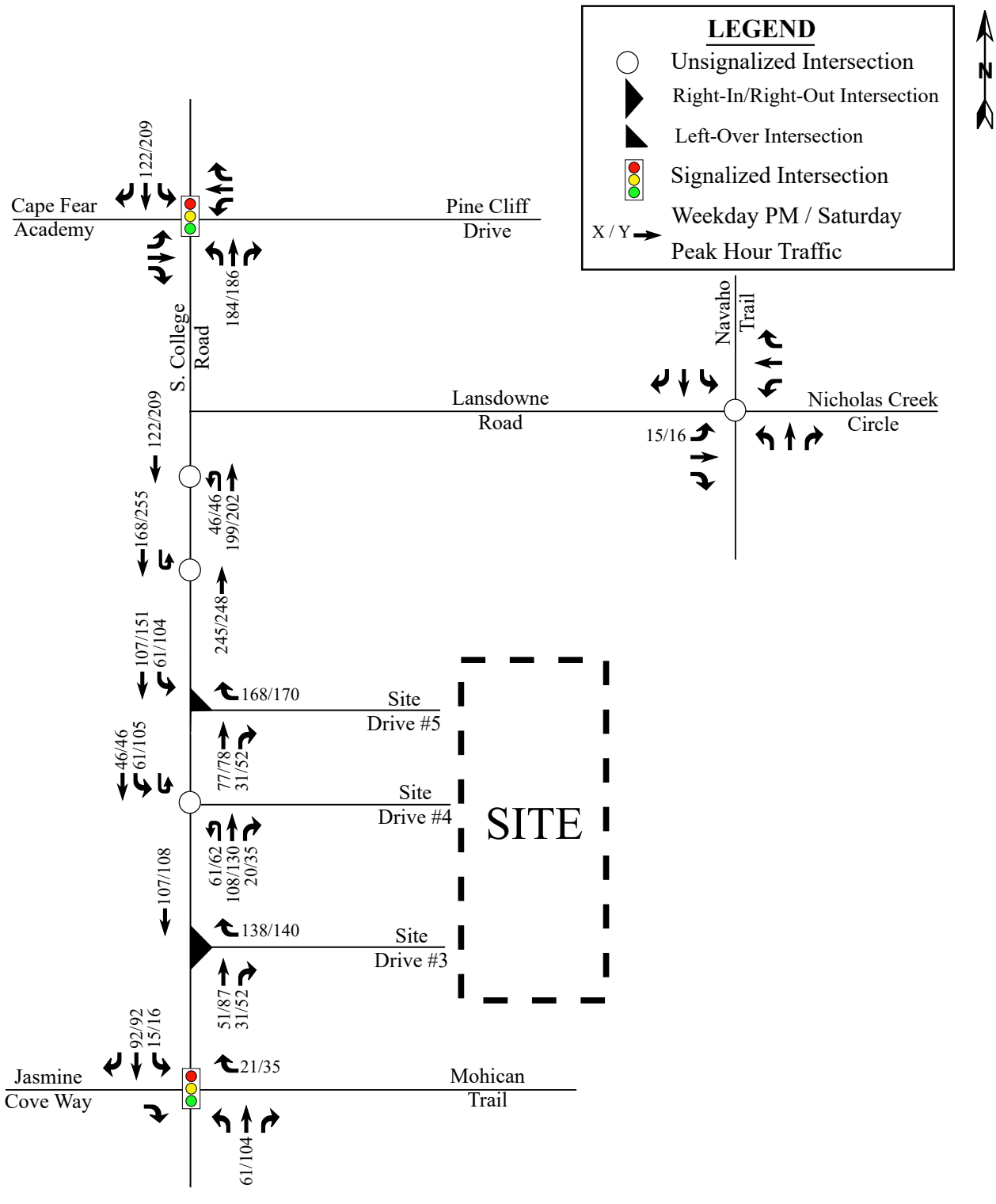
Residential Trip Assignment - Phase 2, Alternate 4

Scale: Not to Scale

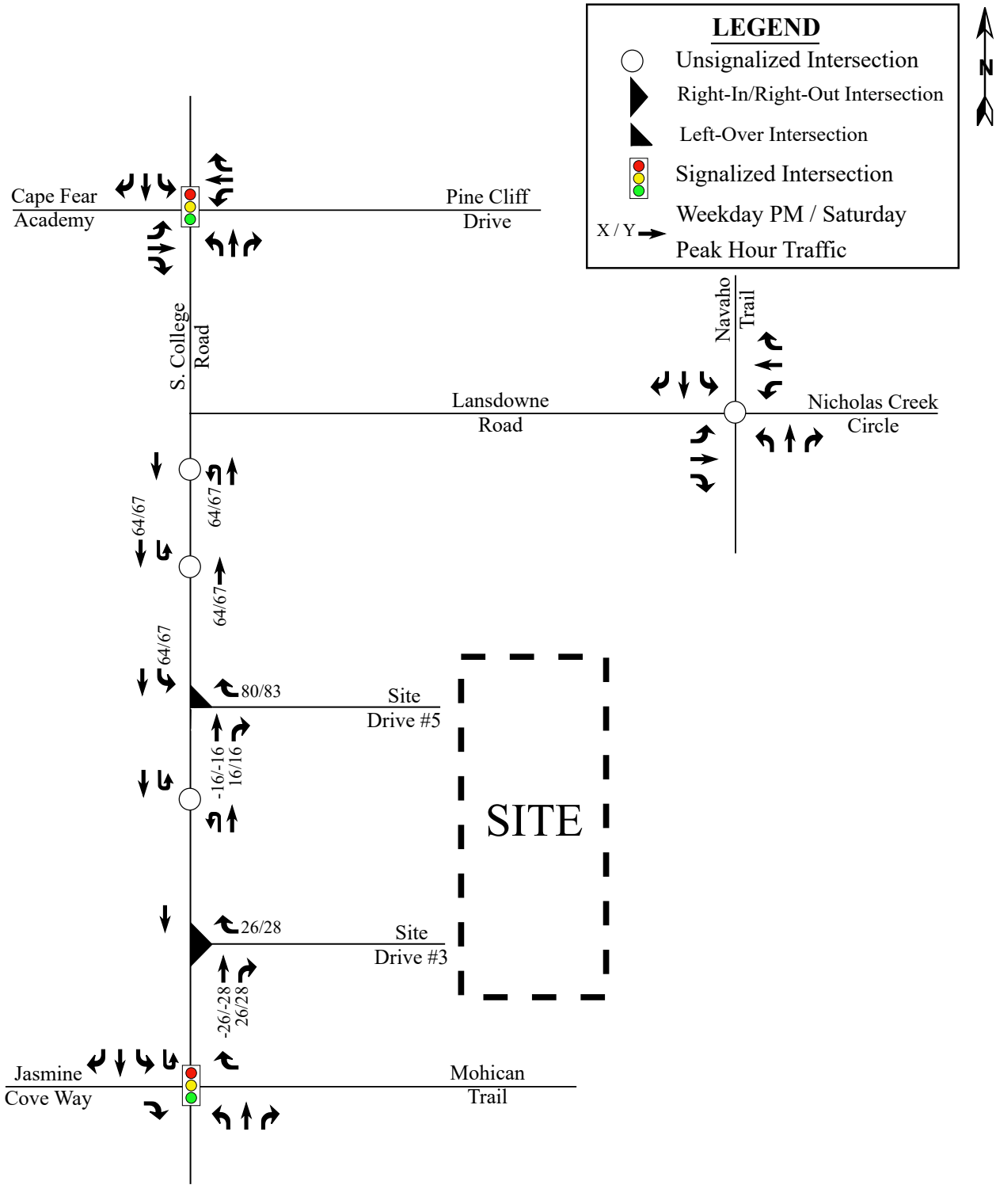
Figure 15B



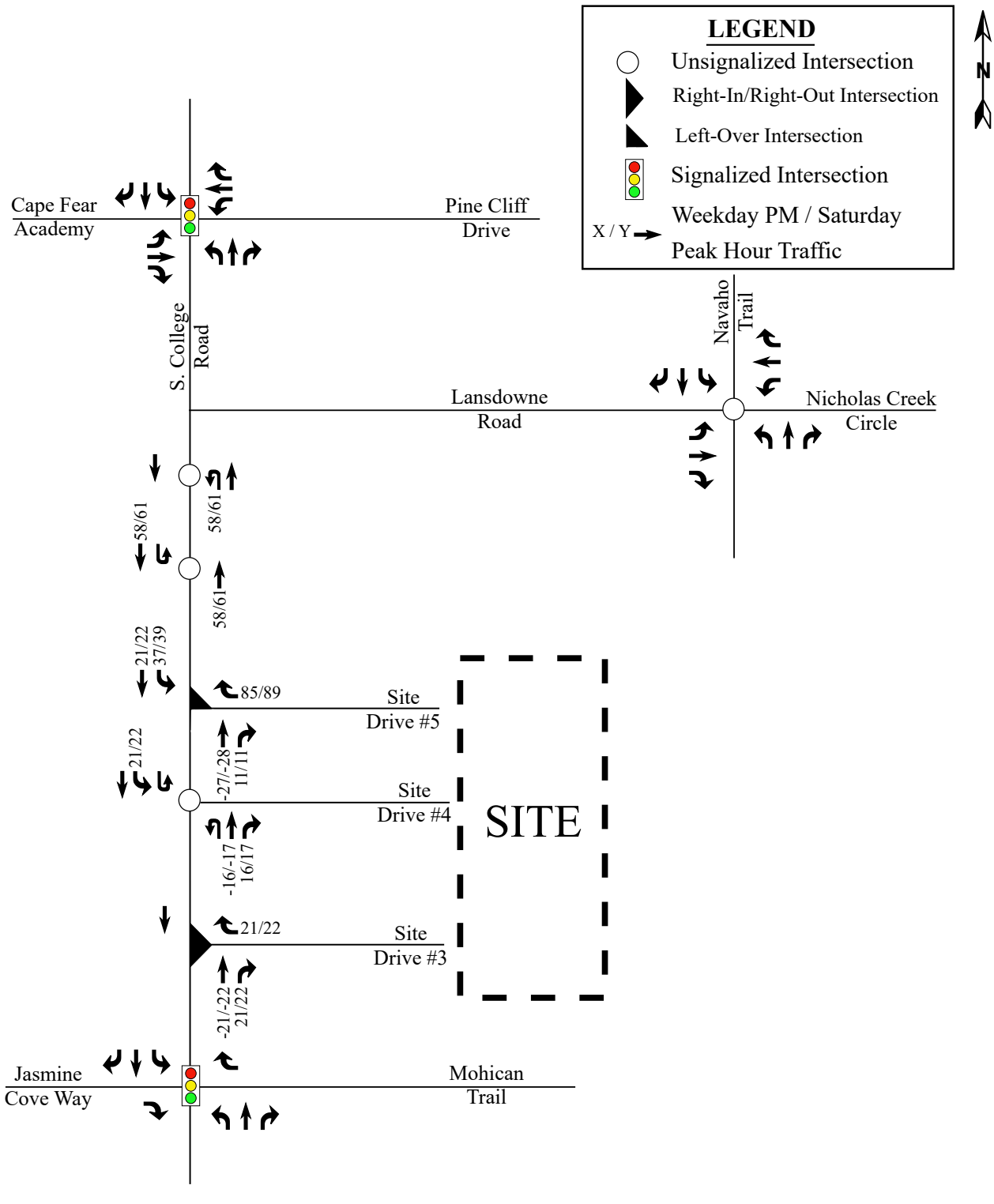
RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Commercial Trip Assignment - Phase 2, Alternate 1 Scale: Not to Scale | Figure 16A



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Commercial Trip Assignment - Phase 2, Alternate 4 Scale: Not to Scale | Figure 16B



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Pass-By Trip Assignment - Phase 2, Alternate 1 Scale: Not to Scale | Figure 17A



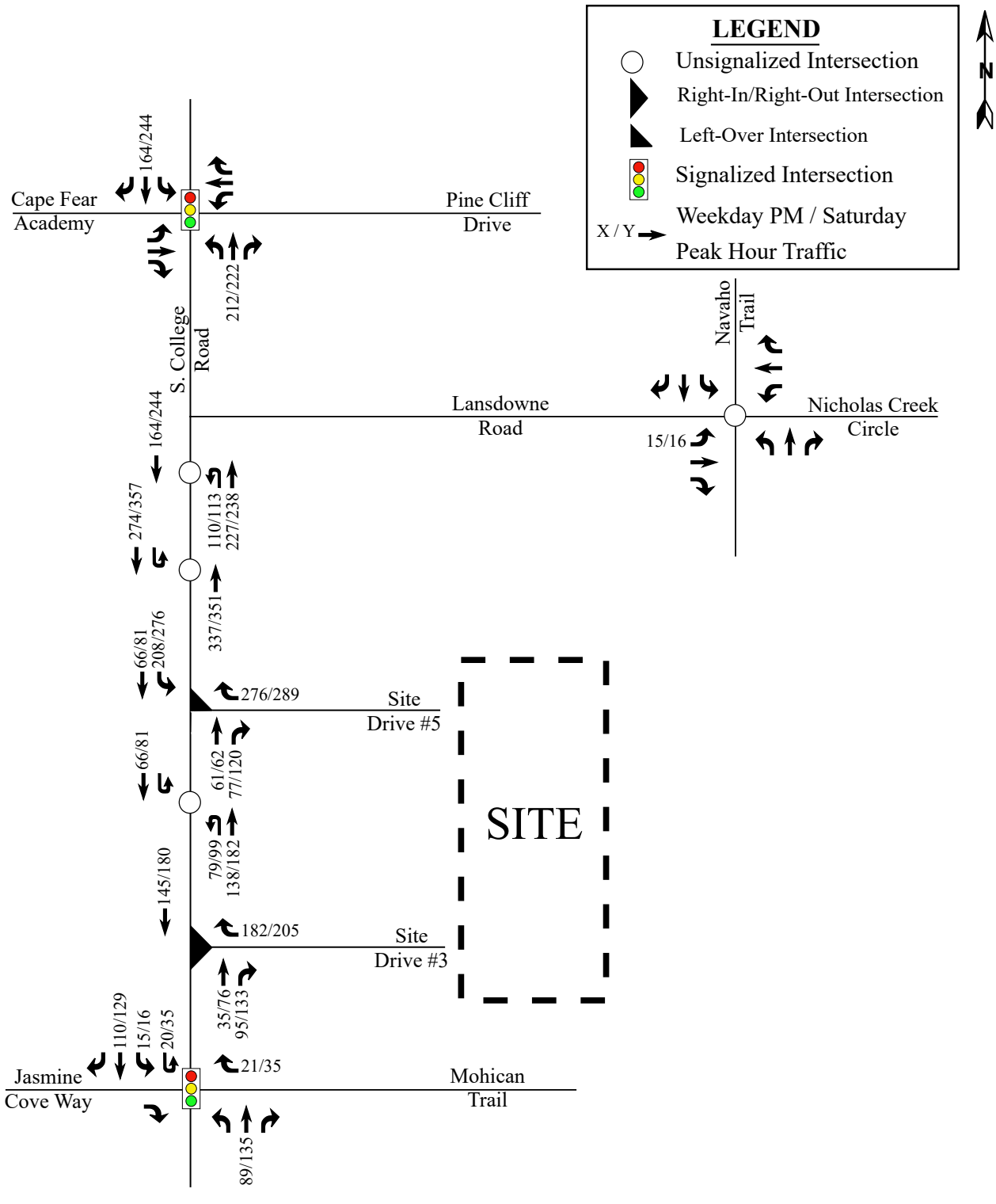
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Whiskey Branch Development
Wilmington, NC

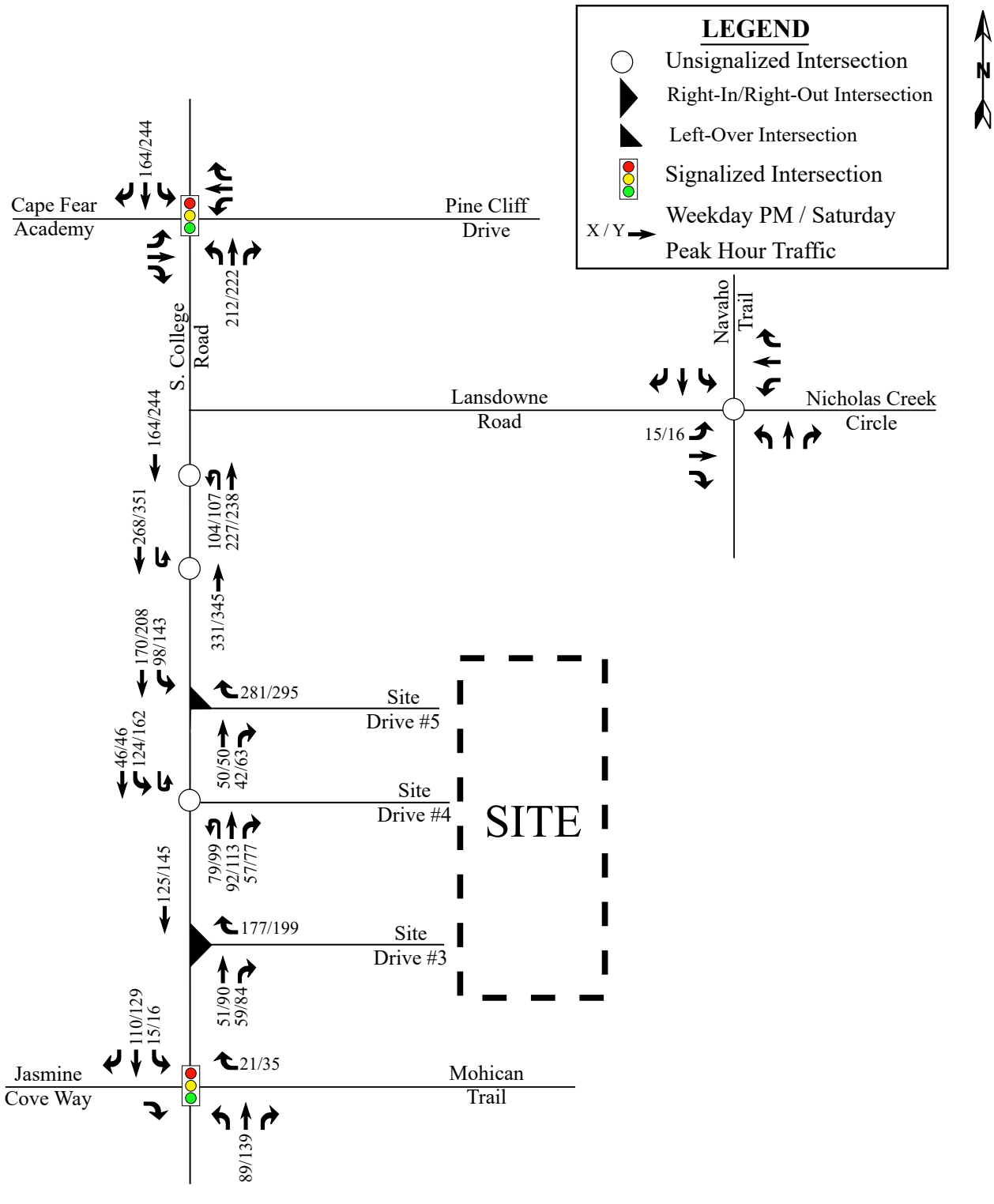
Pass-by Trip Assignment - Phase 2, Alternate 4

Scale: Not to Scale

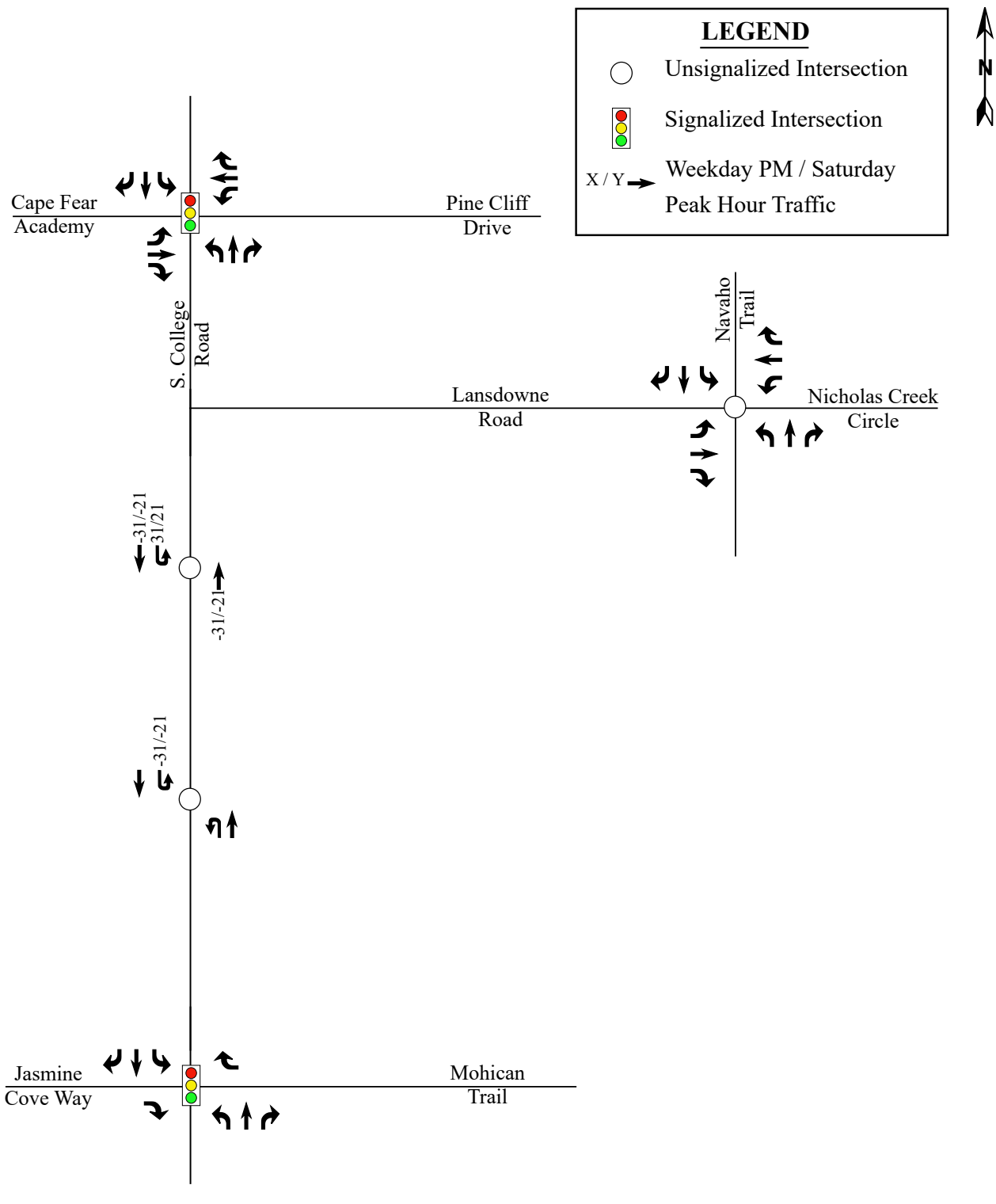
Figure 17B



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Total Trip Assignment - Phase 2, Alternate 1 Scale: Not to Scale | Figure 18A



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Total Trip Assignment - Phase 2, Alternate 4 Scale: Not to Scale | Figure 18B



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Diverted U-Turn Traffic Scale: Not to Scale | Figure 19

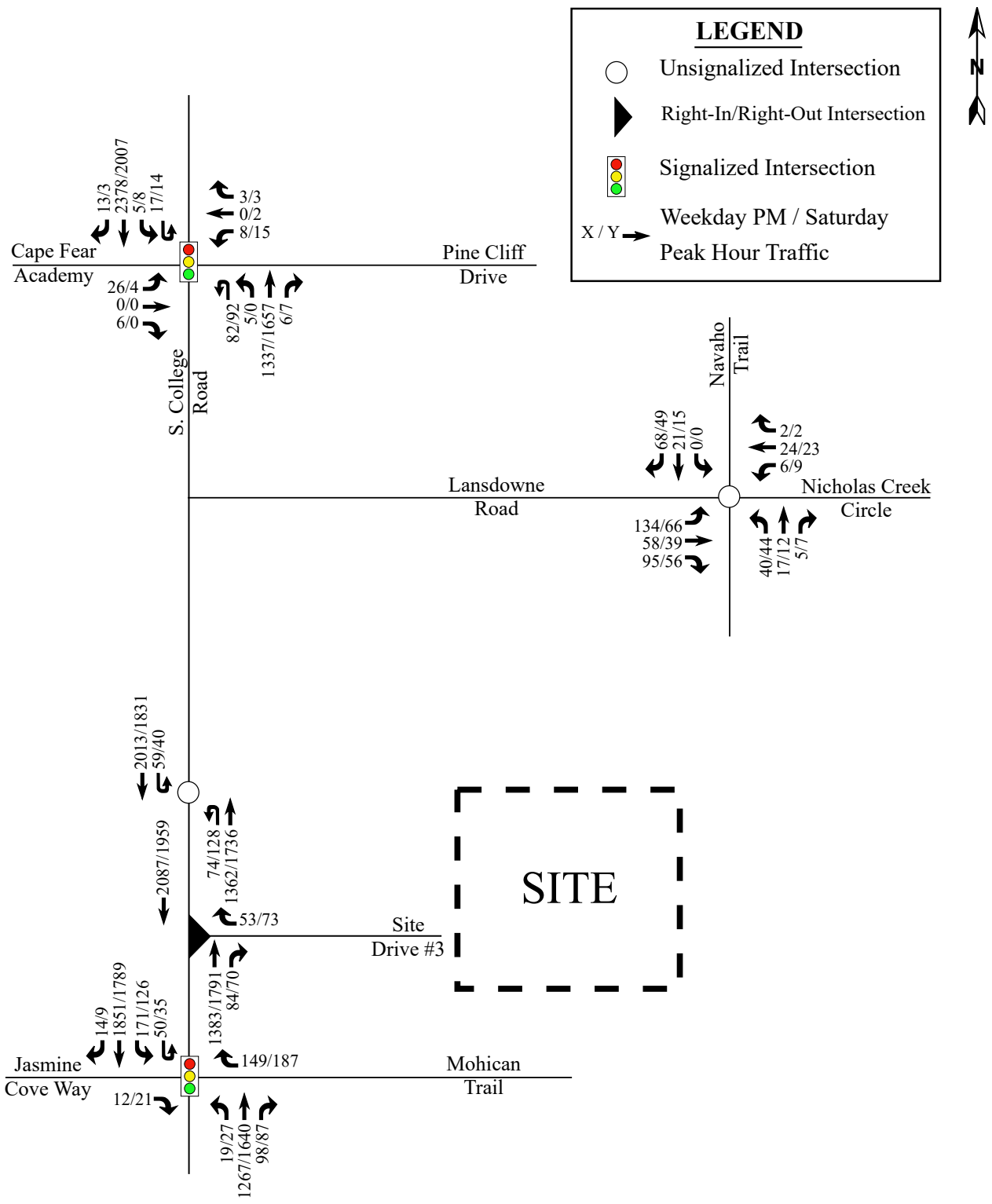
5. COMBINED (2021 / 2024) TRAFFIC CONDITIONS

5.1. Combined (2021 / 2024) Peak Hour Traffic Volumes

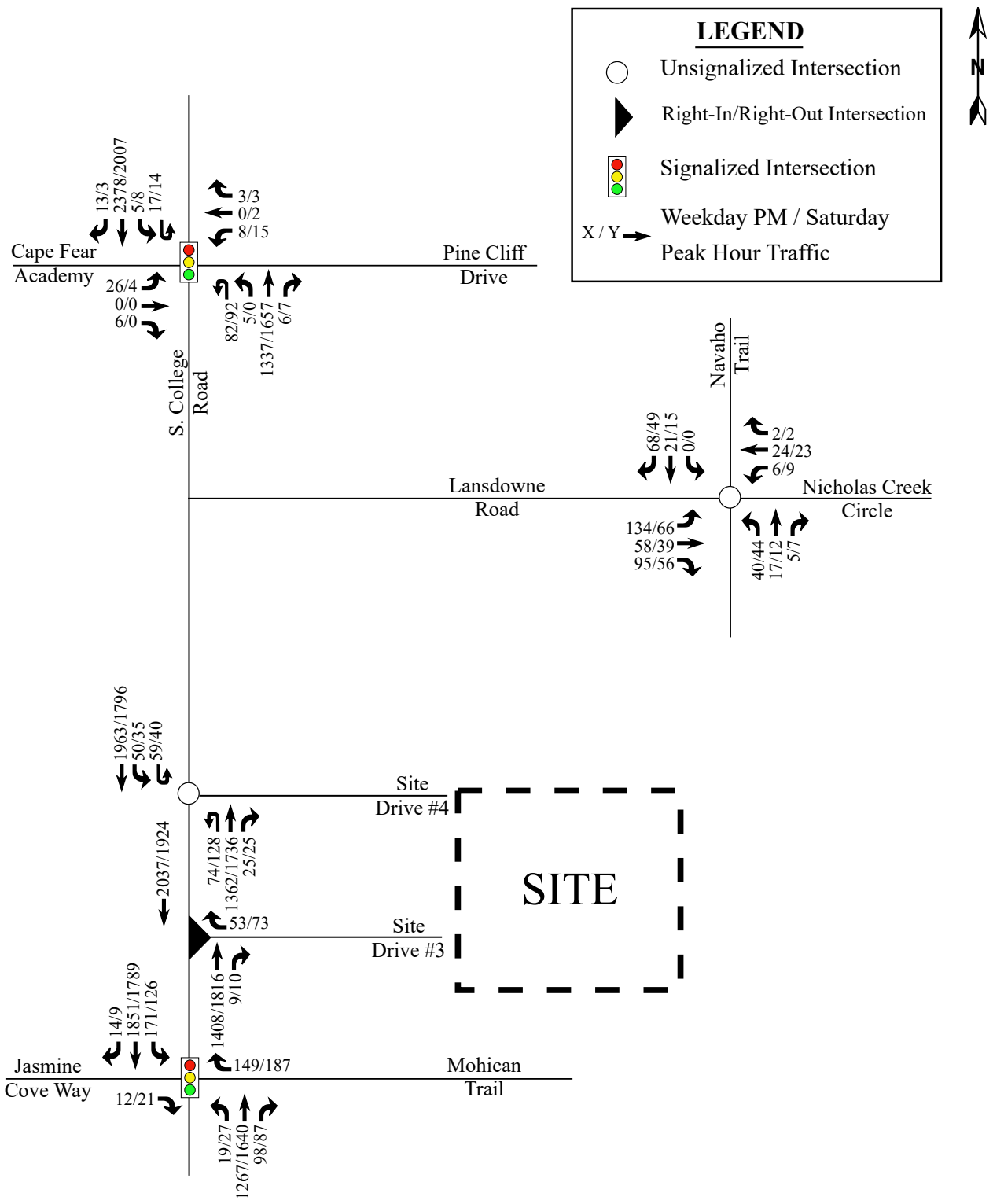
To estimate traffic conditions under phase 1B and with the site fully built-out (phase 2), the total site trips for each phase were added to the background (2021 / 2024) traffic volumes and the diverted U-turn traffic to determine the combined (2021 / 2024) traffic volumes under access alternatives 1 and 4. Refer to Figures 20A and 20B for an illustration of the combined (2021) phase 1B peak hour traffic volumes under access alternatives 1 and 4, respectively. Figures 21A and 21B provide the combined (2024) phase 2 peak hour traffic volumes under access alternatives 1 and 4, respectively.

5.2. Analysis of Combined (2021 / 2024) Peak Hour Traffic

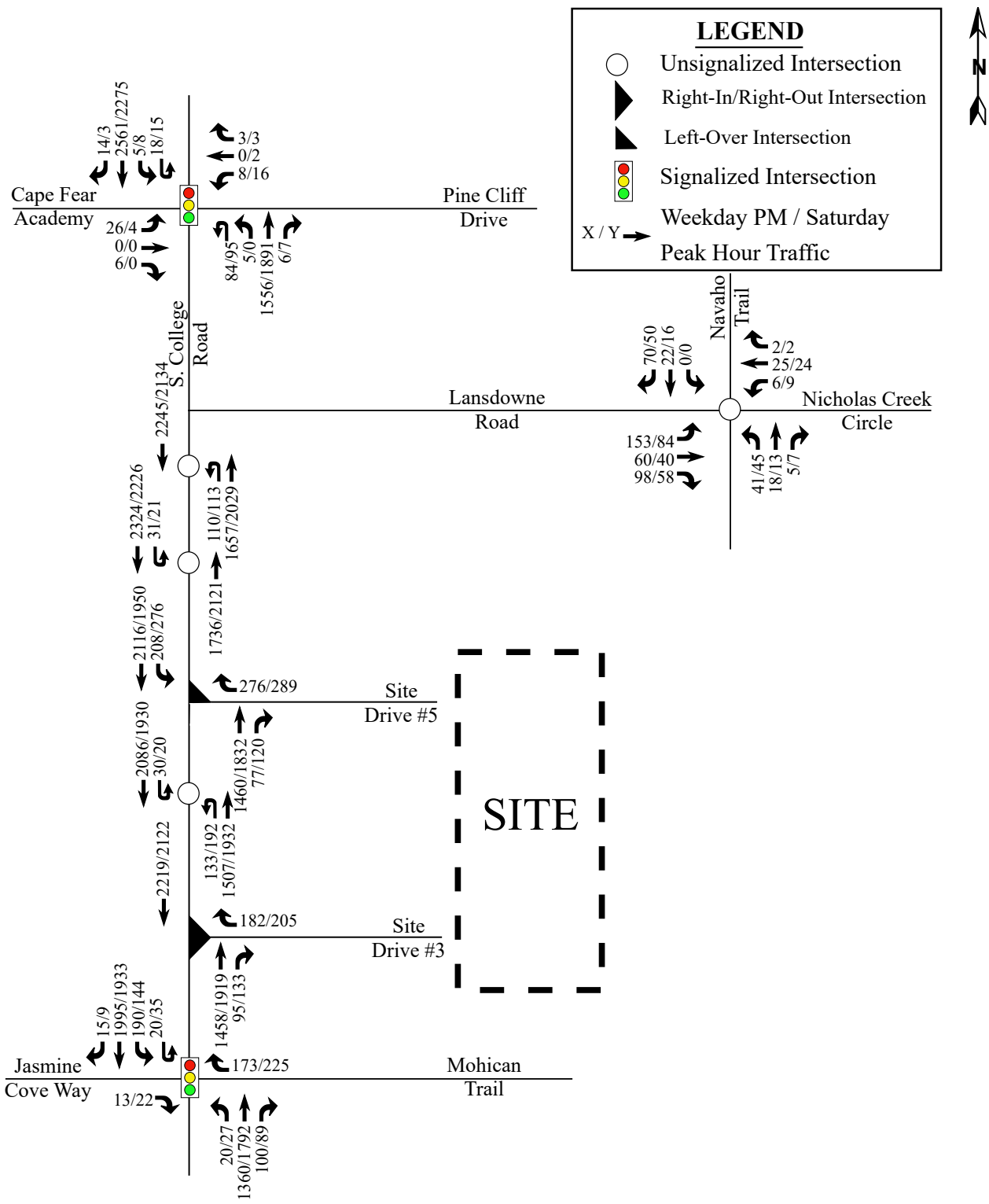
Study intersections were analyzed with the combined (2021 / 2024) traffic volumes using the same methodology previously discussed for existing and background traffic conditions. Intersections were analyzed with improvements necessary to accommodate future traffic volumes. The results of the capacity analysis for each intersection are presented in Section 7 of this report. The SimTraffic queuing reports for can be found in Appendix M.



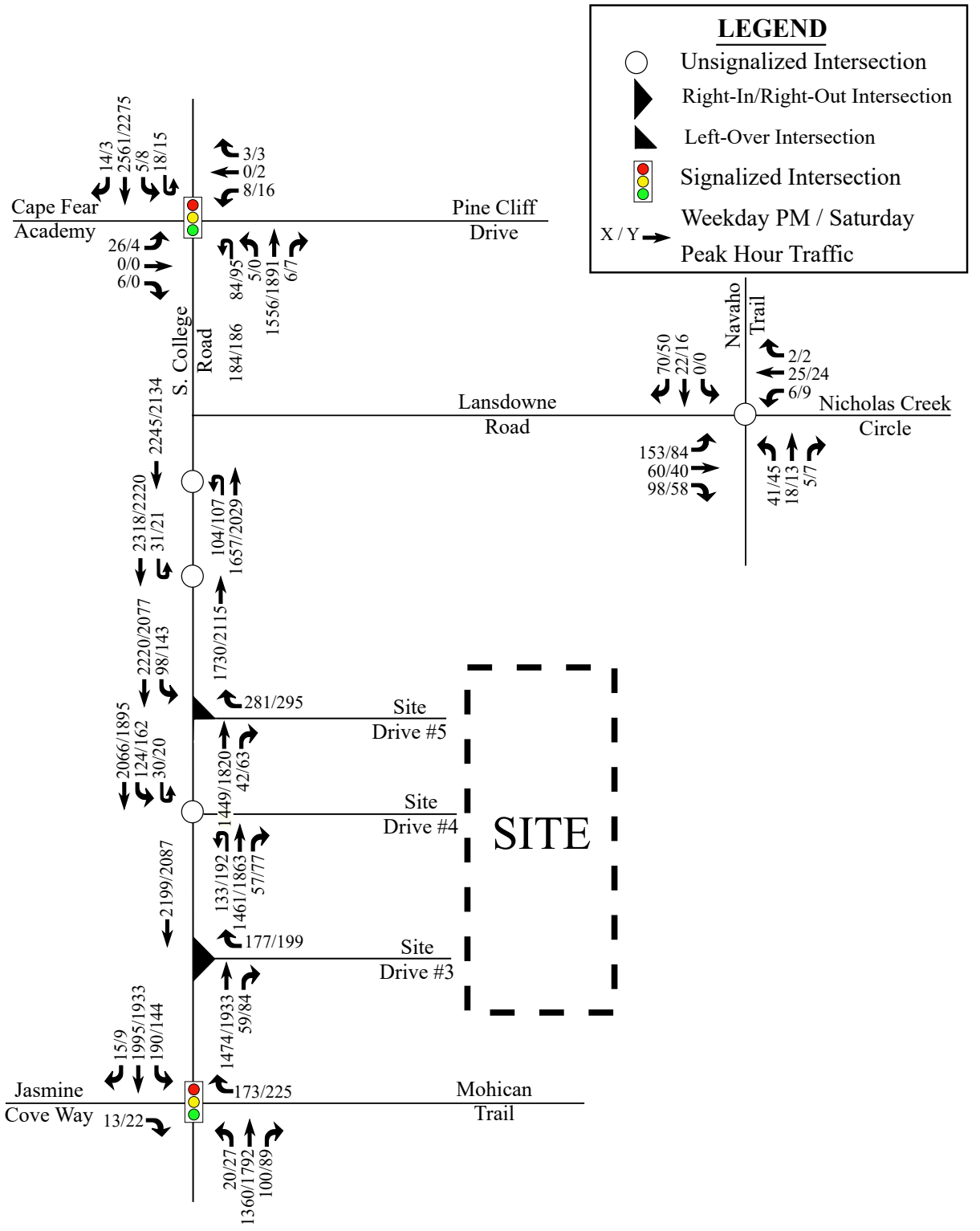
RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Combined (2021) Peak Hour Traffic - Phase 1B, Alternate 1 Scale: Not to Scale | Figure 20A



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Combined (2021) Peak Hour Traffic - Phase 1B, Alternate 4 Scale: Not to Scale | Figure 20B



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Combined (2024) Peak Hour Traffic - Phase 2, Alternate 1 Scale: Not to Scale | Figure 21A



RAMEY KEMP & ASSOCIATES TRANSPORTATION ENGINEERS	Whiskey Branch Development Wilmington, NC	Combined (2024) Peak Hour Traffic - Phase 2, Alternate 4 Scale: Not to Scale | Figure 21B

6. TRAFFIC ANALYSIS PROCEDURE

Study intersections were analyzed using the methodology outlined in the *Highway Capacity Manual* (HCM), 6th Edition, published by the Transportation Research Board. Capacity and level of service are the design criteria for this traffic study. A computer software package, Synchro (Version 10.3), was used to complete the analyses for most of the study area intersections. Please note that the unsignalized capacity analysis does not provide an overall level of service for an intersection; only delay for an approach with a conflicting movement.

The HCM defines capacity as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions." Level of service (LOS) is a term used to represent different driving conditions, and is defined as a "qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers." Level of service varies from Level "A" representing free flow, to Level "F" where breakdown conditions are evident. Refer to Table 5 for HCM levels of service and related average control delay per vehicle for both signalized and unsignalized intersections. Control delay as defined by the HCM includes "initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay". An average control delay of 50 seconds at a signalized intersection results in LOS "D" operation at the intersection.

Table 5: Highway Capacity Manual – Levels-of-Service and Delay

UNSIGNALIZED INTERSECTION		SIGNALIZED INTERSECTION	
LEVEL OF SERVICE	**AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)**	**LEVEL OF SERVICE**	**AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)**
A	0-10	A	0-10
B	10-15	B	10-20
C	15-25	C	20-35
D	25-35	D	35-55
E	35-50	E	55-80
F	>50	F	>80

6.1. Adjustments to Analysis Guidelines

Capacity analysis at all study intersections was completed according to the NCDOT Congestion Management Guidelines, with the exception of the following items:

Congestion Management Guidelines indicate the applicant shall identify mitigation improvements at study area intersections if at least one of the following conditions exist when comparing the background and combined conditions:

- The total average delay of the intersection or an individual approach increases by at least 25%, while maintaining the same level of service.
- The level of service degrades by at least one level.
- The level of service is F.

There are intersections with analysis results that do not comply with these guidelines; however, constructing improvements to meet these guidelines is not always feasible or economical. Many of the study intersections and their respective approaches operate at LOS C or better with low delays under background conditions. Based on the Congestion Management conditions, the margin of acceptable added delay is smaller for intersections that operate well than intersections that operate poorly. For example, adding 5 seconds of delay to a signalized intersection operating at LOS A with 8 seconds of delay under background conditions would meet the 25% condition as well as the degrading LOS condition; however, if the 5 seconds were added to an intersection operating at LOS D with 40 seconds of delay under background conditions, improvements would not be triggered based on the Congestion Management Guidelines. Additionally, many study intersections are expected to operate with delays near the threshold for the better LOS grade. In the situations where this was the case and the combined LOS was still acceptable, improvements were not recommended based on the degrading LOS condition.

Although the Division 3, District 3 Supplemental Guidelines state “Signal timing adjustments and/or Signal Optimization in Synchro (i.e. “Optimize Splits”) shall not be used unless phase changes are recommended as an improvement. Signal timing adjustment and/or Signal Optimization as a sole “improvement” to mitigate the impacts of site-generated traffic will not be permitted”, per coordination with NCDOT Congestion Management.

7. CAPACITY ANALYSIS

7.1. S. College Road and Cape Fear Academy / Pinecliff Drive

The existing signalized intersection of S. College Road and Cape Fear Academy / Pinecliff Drive was analyzed under existing (2019), background (2021), background (2024), combined (2021) Phase 1B – access alternatives 1 and 4, and combined (2024) Phase 2 – access alternative 1 and 4 traffic conditions with the lane configurations and traffic control shown in Table 6. Refer to Table 6 for a summary of the analysis results. Refer to Appendix D for the Synchro capacity analysis reports.

Table 6: Analysis Summary of S. College Road [N/S] and Cape Fear Academy / Pinecliff Drive [E/W]

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Existing (2019) Conditions	EBL EBL/T EBR	44/89 44/103 21/21	E E D	74 74 52	E (70)	C (25)	18/-- 18/24 14/44	E E D	71 71 51	E (64)	B (18)
	WBL/T/R	42/65	E	74	E (74)		53/83	E	75	E (75)	
	NBL NBT NBR	157/156 424/164 2/--	F A A	88 9 3	B (14)		153/574 789/1326 2/2	E B A	73 11 2	B (15)	
	SBL SBT SBR	58/299 1603/1016 5/47	E C A	75 30 3	C (30)		58/90 1256/429 3/--	E B A	75 18 4	B (19)	
Background (2021) Conditions	EBL EBL/T EBR	46/27 44/90 21/22	E E D	75 74 51	E (70)	C (27)	18/-- 18/25 14/22	E E D	71 71 51	E (64)	B (18)
	WBL/T/R	42/44	E	74	E (74)		53/44	E	75	E (75)	
	NBL NBT NBR	159/145 438/309 2/--	F A A	89 9 3	B (14)		147/187 822/1570 2/325	E B A	73 12 2	B (15)	
	SBL SBT SBR	58/300 1656/769 5/490	E C A	75 34 3	C (34)		58/298 1303/830 3/20	E B A	75 19 4	B (20)	
Combined (2021) Conditions – Phase 1B, Access Alternative 1	EBL EBL/T EBR	46/76 44/112 21/22	E E D	75 74 51	E (70)	C (30)	18/-- 18/46 14/22	E E D	71 71 51	E (64)	B (18)
	WBL/T/R	42/53	E	74	E (74)		58/63	E	75	E (75)	
	NBL NBT NBR	159/145 456/265 2/--	F A A	89 9 3	B (14)		146/574 840/1342 2/--	E B A	75 12 2	B (15)	
	SBL SBT SBR	58/299 1714/1346 5/500	E D A	75 38 3	D (39)		58/299 1344/422 3/21	E B A	75 20 4	C (20)	

Table 6: Analysis Summary of S. College Road [N/S] and Cape Fear Academy / Pinecliff Drive [E/W] (continued)

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Combined (2021) Conditions –Phase 1B, Access Alternative 4	EBL EBL/T EBR	46/72 44/89 21/22	E E D	75 74 51	E (70)	C (30)	18/-- 18/24 14/22	E E D	71 71 51	E (64)	B (18)
	WBL/T/R	42/42	E	74	E (74)		53/44	E	75	E (75)	
	NBL NBT NBR	159/146 456/303 2/1	F A A	89 9 3	B (14)		145/574 847/868 2/--	E B A	75 12 2	B (15)	
	SBL SBT SBR	58/93 1714/927 5/20	E D A	75 38 3	D (39)		58/70 1344/462 3/--	E B A	75 20 4	C (20)	
Background (2024) Conditions	EBL EBL/T EBR	46/70 44/84 21/22	E E D	75 74 51	E (70)	D (36)	18/-- 18/46 14/22	E E D	71 71 51	E (64)	B (19)
	WBL/T/R	42/66	E	74	E (74)		54/42	E	76	E (76)	
	NBL NBT NBR	162/164 460/614 2/--	F A A	89 9 3	B (14)		148/230 866/267 2/1	E B A	74 12 2	B (15)	
	SBL SBT SBR	59/299 1735/1679 6/500	E D A	75 47 3	D (47)		59/68 1377/568 3/--	E C A	75 21 4	C (21)	
Combined (2024) Conditions –Phase 2, Access Alternative 1	EBL EBL/T EBR	46/27 44/86 21/21	E E D	75 74 51	E (70)	D (49)	18/-- 18/32 14/41	E E D	71 71 51	E (64)	C (23)
	WBL/T/R	42/46	E	74	E (74)		54/86	E	76	E (76)	
	NBL NBT NBR	156/165 305/225 1/--	F A A	90 7 2	B (11)		129/574 825/639 1/2	E B A	68 13 3	B (16)	
	SBL SBT SBR	59/299 1928/1853 6/500	E E A	75 73 3	E (73)		59/299 1664/983 3/18	E C A	75 29 4	C (29)	
Combined (2024) Conditions –Phase 2, Access Alternative 4	EBL EBL/T EBR	46/72 44/88 21/44	E E D	75 74 51	E (70)	D (50)	18/-- 18/47 14/43	E E D	71 71 52	E (64)	C (22)
	WBL/T/R	42/44	E	74	E (74)		54/105	E	76	E (76)	
	NBL NBT NBR	160/252 247/210 1/--	F A A	98 6 2	B (12)		124/574 986/644 1/--	F A A	87 9 1	B (13)	
	SBL SBT SBR	59/287 1928/2020 6/500	E E A	75 73 3	E (73)		59/88 1664/551 3/20	E C A	75 29 4	C (29)	

Developer improvements to lane configuration shown in bold.

Capacity analysis indicates that the intersection of S. College Road and Cape Fear Academy / Pinecliff Drive is expected to operate at an overall LOS D or better under all analysis scenarios during the weekday PM and Saturday Midday peak hours. The proposed development is expected to have only minor impacts to the expected background operations. Additionally, the proposed development is anticipated to only contribute through traffic along S. College Road at this intersection. Due to these reasons, no improvements are recommended.

7.2. S. College Road and Mohican Trail

The signalized intersection of S. College Road and Mohican Trail was analyzed under existing (2019), background (2021), background (2024), combined (2021) Phase 1B – access alternatives 1 and 4, and combined (2024) Phase 2 – access alternative 1 and 4 traffic conditions with the lane configurations and traffic control shown in Table 7. Although Mohican Trail and Jasmine Cove Way align, due to the super-street configuration of S. College Road, they operate as separate intersections with differing traffic control and movements. Due to this, they are separated in this analysis into two intersections. Refer to Table 7 for a summary of the analysis results. Refer to Appendix E for the Synchro capacity analysis reports.

Table 7: Analysis Summary of S. College Road [N/S] and Mohican Trail [W]

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Existing (2019) Conditions	WBR	72/112	C	24	C (24)	A (8)	203/176	F	86	F (86)	B (11)
	NBT NBR	185/140 21/98	A A	7 4	A (7)		423/302 26/87	A A	7 3	A (7)	
	SBL*	0/140	A	0	A (0)		0/314	A	0	A (0)	
Background (2021) Conditions	WBR	108/114	C	26	C (26)	A (9)	329/304	F	95	F (95)	B (16)
	NBT NBR	232/267 36/76	A A	9 5	A (9)		440/305 35/52	A A	9 4	A (9)	
	SBL*	0/160	A	0	A (0)		0/226	A	0	A (0)	
Combined (2021) Conditions –Phase 1B, Access Alternative 1	WBR	113/186	C	27	C (27)	A (9)	329/372	F	95	F (95)	B (16)
	NBT NBR	247/197 36/76	A A	9 5	A (9)		459/306 35/53	A A	9 4	A (9)	
	SBL*	0/198	A	0	A (0)		0/354	A	0	A (0)	
Combined (2021) Conditions – Phase 1B, Access Alternative 4	WBR	113/199	C	27	C (27)	A (10)	329/275	F	95	F (95)	B (16)
	NBT NBR	247/224 36/73	A A	9 5	A (9)		459/305 35/95	A A	9 4	A (9)	
	SBL*	0/223	A	0	A (0)		0/222	A	0	A (0)	

*Due to the super-street configuration of S. College Road, the southbound left-turn movement was modeled as an eastbound through.

Table 7: Analysis Summary of S. College Road [N/S] and Mohican Trail [W] (continued)

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Background (2024) Conditions	WBR	116/177	C	27	C (27)	A (10)	335/344	F	96	F (96)	B (16)
	NBT NBR	251/204 37/96	A A	9 6	A (9)		467/305 36/53	A A	9 4	A (9)	
	SBL*	0/139	A	0	A (0)		0/195	A	0	A (0)	
Combined (2024) Conditions –Phase 2, Access Alternative 1	WBR	144/134	C	29	C (29)	B (11)	427/382	F	109	F (109)	B (20)
	NBT NBR	309/234 40/96	B A	10 6	B (10)		556/306 36/52	B A	11 5	B (11)	
	SBL*	0/149	A	0	A (0)		0/255	A	0	A (0)	
Combined (2024) Conditions –Phase 2, Access Alternative 4	WBR	144/133	C	29	C (29)	B (11)	427/368	F	109	F (109)	B (20)
	NBT NBR	309/256 40/72	B A	10 6	B (10)		556/286 36/90	B A	11 5	B (11)	
	SBL*	0/158	A	0	A (0)		0/229	A	0	A (0)	

*Due to the super-street configuration of S. College Road, the southbound left-turn movement was modeled as an eastbound through.

Capacity analysis of all analysis scenarios indicates the intersection of S. College Road and Mohican Trail is expected to operate at an overall LOS B or better during the weekday PM and Saturday midday peak hours. The proposed development is only expected to have marginal increases in delay at the subject intersection during Phase 1B and phase 2 of buildout. Due to the superstreet layout of this intersection, which is signalized for the northbound and westbound approaches, analysis was separated from the Jasmine Cove Way connection as it is currently unsignalized. Additionally, these intersections operate independently from one another.

7.3. S. College Road and Jasmine Cove Way

The existing unsignalized intersection of S. College Road and Jasmine Cove Way was analyzed under existing (2019), background (2021), background (2024), combined (2021) Phase 1B – access alternatives 1 and 4, and combined (2024) Phase 2 – access alternative 1 and 4 traffic conditions with the lane configurations and traffic control shown in Table 8. Although Mohican Trail and Jasmine Cove Way align, due to the super-street configuration of S. College Road, they operate as separate intersections with differing traffic control and movements. Due to this, they are separated in this analysis into two intersections. Refer to Table 8 for a summary of the analysis results. Refer to Appendix F for the Synchro capacity analysis reports.

Table 8: Analysis Summary of S. College Road [N/S] and Jasmine Cove Way [E]

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Existing (2019) Conditions	EBR	5*/73	C[1]	21	C (21)	N/A	8*/54	C[1]	20	C (20)	N/A
	NBL**	--/53	--	--	--		--/74	--	--	--	
	SBT	--	--	--	--		--	--	--	--	
	SBT/R	--	--	--	--		--	--	--	--	
Background (2021) Conditions	EBR	5*/51	C[1]	22	C (22)	N/A	8*/69	C[1]	21	C (21)	N/A
	NBL**	--/31	--	--	--		--/140	--	--	--	
	SBT	--	--	--	--		--	--	--	--	
	SBT/R	--/22	--	--	--		--	--	--	--	
Combined (2021) Conditions –Phase 1B, Access Alternative 1	EBR	5*/50	C[1]	22	C (22)	N/A	8*/90	C[1]	22	C (22)	N/A
	NBL**	--/74	--	--	--		--/74	--	--	--	
	SBT	--	--	--	--		--	--	--	--	
	SBT/R	--/22	--	--	--		--	--	--	--	
Combined (2021) Conditions – Phase 1B, Access Alternative 4	EBR	5*/49	C[1]	22	C (22)	N/A	8*/49	C[1]	22	C (22)	N/A
	NBL**	--/53	--	--	--		--/74	--	--	--	
	SBT	--	--	--	--		--	--	--	--	
	SBT/R	--	--	--	--		--/22	--	--	--	

1. Level of service and delay for the minor-street approach.
*Due to limitations with synchro reporting, a vehicle length of 25 feet was used to determine the 95th percentile queue in feet.
**Due to the super-street configuration of S. College Road, the northbound left-turn movement was modeled as a westbound through.

Table 8: Analysis Summary of S. College Road [N/S] and Jasmine Cove Way [E] (continued)

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Background (2024) Conditions	EBR	5*/28	C[1]	22	C (22)	N/A	8*/89	C[1]	22	C (22)	N/A
	NBL**	--/74	--	--	--		--/70	--	--	--	
	SBT	--	--	--	--		--	--	--	--	
	SBT/R	--	--	--	--		--	--	--	--	
Combined (2024) Conditions –Phase 2, Access Alternative 1	EBR	5*/49	C[1]	24	C (24)	N/A	10*/50	C[1]	24	C (24)	N/A
	NBL**	--/53	--	--	--		--/74	--	--	--	
	SBT	--	--	--	--		--	--	--	--	
	SBT/R	--/53	--	--	--		--/53	--	--	--	
Combined (2024) Conditions –Phase 2, Access Alternative 4	EBR	5*/49	C[1]	24	C (24)	N/A	10*/28	C[1]	24	C (24)	N/A
	NBL**	--/72	--	--	--		--/74	--	--	--	
	SBT	--	--	--	--		--	--	--	--	
	SBT/R	--/20	--	--	--		--/22	--	--	--	

1. Level of service and delay for the minor-street approach.
*Due to limitations with synchro reporting, a vehicle length of 25 feet was used to determine the 95th percentile queue in feet.
**Due to the super-street configuration of S. College Road, the northbound left-turn movement was modeled as a westbound through.

Capacity analysis results for all scenarios studied indicates all minor-street approaches of the intersection of S. College Road and Jasmine Cove Way is expected to operate at LOS C during the weekday PM and Saturday midday peak hours. Additionally, the proposed development is expected to have only marginal increases in delay for this minor street approach. Since this intersection is unsignalized, the northbound left-turn movement was not able to be analyzed for delay due to limitations with Synchro analysis of unsignalized superstreets. Additionally, queues for this northbound left-turn movement were reviewed and were noted to be relatively minor with little impacts due to the proposed development.

7.4. S. College Road and U-Turn Location / Site Drive #4

The unsignalized intersection of S. College Road and U-Turn Location / Site Drive #4 was analyzed under existing (2019), background (2021), background (2024), combined (2021) Phase 1B – access alternatives 1 and 4, and combined (2024) Phase 2 – access alternative 1 and 4 traffic conditions with the lane configurations and traffic control shown in Table 9. Although these U-turn intersections operate independently of one another, the analysis is combined in one summary for the purposes of this study. Refer to Table 9 for a summary of the analysis results. Refer to Appendix G for the Synchro capacity analysis reports.

Table 9: S. College Road [N/S] and U-Turn Location / Site Drive #4

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Existing (2019) Conditions	NBU** NBT	15*/72 --	D[1] --	25 --	D (25)	N/A	30*/77 --	D[1] --	26 --	D (26)	N/A
	SBU** SBT	15*/73 --	C[1] --	17 --	C (17)		15*/74 --	C[1] --	21 --	C (21)	
Background (2021) Conditions	NBU** NBT	28*/96 --	D[1] --	29 --	D (29)	N/A	50*/161 --	D[1] --	31 --	D (31)	N/A
	SBU** SBT	18*/74 --	C[1] --	18 --	C (18)		25*/52 --	C[1] --	22 --	C (22)	
Combined (2021) Conditions –Phase 1B, Access Alternative 1	NBU** NBT	45*/137 --	D[1] --	35 --	D (35)	N/A	88*/180 --	E[1] --	42 --	E (42)	N/A
	SBU** SBT	18*/116 --	C[1] --	18 --	C (18)		15*/74 --	C[1] --	22 --	C (22)	
Combined (2021) Conditions –Phase 1B, Access Alternative 4	NBU** NBT **NBR**	45*/97 -- --	D[1] -- --	33 --	D (33)	N/A	85*/161 -- --	E[1] -- --	40 --	E (40)	N/A
	SBU/L** SBT	38*/113 --	C[1] --	21 --	C (21)		35*/95 --	D[1] --	26 --	D (26)	
Background (2024) Conditions	NBU** NBT	30*/113 --	D[1] --	31 --	D (31)	N/A	55*/140 --	D[1] --	33 --	D (33)	N/A
	SBU** SBT	18*/93 --	C[1] --	18 --	C (18)		18*/73 --	C[1] --	23 --	C (23)	

Developer improvements to lane configuration shown in bold.

1. Level of service and delay for the major-street U-turn movement.

*Due to limitations with synchro reporting, a vehicle length of 25 feet was used to determine the 95th percentile queue in feet.

**Due to the super-street configuration of S. College Road, the southbound U-turn movement was modeled as an eastbound through and the northbound U-turn movement as a westbound through.

Table 9: S. College Road [N/S] and U-Turn Location / Site Drive #4 (continued)

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Combined (2024) Conditions – Phase 2, Access Alternative 1	NBT	--	--	--	--	N/A	--/105	--	--	--	N/A
	SBU/L**	10*/53	C[1]	18	C (18)		8*/72	C[1]	24	C (24)	
	NBU**	216/162	E	77	E (77)	A (7)	290/162	F	81	F (81)	B (12)
	SBT	173/166	A	3	A (3)		60/166	A	5	A (5)	
Combined (2024) Conditions – Phase 2, Access Alternative 4	NBT **NBR**	406/156 27/94	A A	8 4	A (7)	B (13)	903/156 25/94	B A	13 3	F (81)	B (19)
	SBU/L**	181/161	E	73	E (73)		238/161	F	81	B (13)	
	NBU**	216/162	E	77	E (77)	A (9)	288/180	F	82	F (82)	B (12)
	SBT	162/165	A	4	A (4)		246/177	A	5	A (5)	

Developer improvements to lane configuration shown in bold.

1. Level of service and delay for the major-street U-turn movement.

*Due to limitations with synchro reporting, a vehicle length of 25 feet was used to determine the 95th percentile queue in feet.

**Due to the super-street configuration of S. College Road, the southbound U-turn movement was modeled as an eastbound through and the northbound U-turn movement as a westbound through.

Capacity analysis of existing (2019) through combined (2021) phase 1B scenarios indicate the unsignalized U-turn movement is expected to operate at LOS E or better during the weekday PM and Saturday midday peak hours. The phase 1B conditions were reviewed for the need for signalization but sufficient storage is available for the U-turn movements, which ITRE superstreet warrants for signalization now considers. Additionally, under phase 1B conditions these U-turns accommodate mostly residential traffic, which operates during two peak periods on a typical weekday thus limiting the hours which would meet the traditional Manual on Uniform Traffic Control Devices (MUTCD) warrants for signalization. Under Phase 2, access alternatives 1 and 4, this intersection is expected to increase in delay and turning volumes. Due to this, signalization is expected to be needed to mitigate the delays added by the proposed development. A full signal warrant analysis is recommended during buildout to verify that signalization is warranted. With signalization for the northbound U-turn under access alternative

1 and the northbound and southbound U-turns under access alternative 4, the subject intersections are expected to operate at an overall LOS B or better during the weekday PM and Saturday midday peak hours. Under access alternative 1, the southbound U-turn is expected to operate at LOS C without signalization with minor queueing, therefore, signalization is not recommended for this movement under access alternative 1.

Although these northbound and southbound U-turn movements operate independently as two separate intersections, the analysis has been combined for these intersections due to the proximity and in order to provide a more simplified analysis.

7.5. Navaho Trail and Lansdowne Road / Nicholas Creek Circle

The unsignalized intersection of Navaho Trail and Lansdowne Road / Nicholas Creek Circle was analyzed under existing (2019), background (2021), background (2024), combined (2021) Phase 1B – access alternatives 1 and 4, and combined (2024) Phase 2 – access alternative 1 and 4 traffic conditions with the lane configurations and traffic control shown in Table 10. Refer to Table 10 for a summary of the analysis results. Refer to Appendix H for the Synchro capacity analysis reports.

Table 10: Analysis Summary of Navaho Trail [N/S] and Lansdowne Road [E] / Nicholas Creek Circle [W]

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Existing (2019) Conditions	EBL/T/R	48*/96	B[2]	13	B (13)	N/A	20*/98	B[2]	11	B (11)	N/A
	WBL/T/R	5*/31	B[2]	11	B (11)		5*/30	B[2]	11	B (11)	
	NBL/T/R	3*/22	A[1]	8	--		3*/22	A[1]	7	--	
	SBL/T/R	0/--	A[1]	7	--		0/--	A[1]	7	--	
Background (2021) Conditions	EBL/T/R	50*/134	B[2]	13	B (13)	N/A	20*/54	B[2]	11	B (11)	N/A
	WBL/T/R	5*/54	B[2]	11	B (11)		5*/54	B[2]	11	B (11)	
	NBL/T/R	3*/26	A[1]	8	--		3*/23	A[1]	7	--	
	SBL/T/R	0/--	A[1]	7	--		0/--	A[1]	7	--	
Combined (2021) Conditions – Phase 1B, Access Alternative 1	EBL/T/R	50*/111	B[2]	13	B (13)	N/A	20*/71	B[2]	11	B (11)	N/A
	WBL/T/R	5*/73	B[2]	11	B (11)		5*/53	B[2]	11	B (11)	
	NBL/T/R	3*/22	A[1]	8	--		3*/20	A[1]	7	--	
	SBL/T/R	0/--	A[1]	7	--		0/--	A[1]	7	--	
Combined (2021) Conditions – Phase 1B, Access Alternative 4	EBL/T/R	50*/76	B[2]	13	B (13)	N/A	20*/55	B[2]	11	B (11)	N/A
	WBL/T/R	5*/54	B[2]	11	B (11)		5*/53	B[2]	11	B (11)	
	NBL/T/R	3*/22	A[1]	8	--		3*/46	A[1]	7	--	
	SBL/T/R	0/--	A[1]	7	--		0/17	A[1]	7	--	
Background (2024) Conditions	EBL/T/R	53*/115	B[2]	13	B (13)	N/A	23*/70	B	11	B (11)	N/A
	WBL/T/R	5*/54	B[2]	11	B (11)		5*/30	B	11	B (11)	
	NBL/T/R	3*/26	A[1]	8	--		3*/26	A	7	--	
	SBL/T/R	0/--	A[1]	7	--		--	A	7	--	

1. Level of service and delay for the major-street left-turn movement.
2. Level of service and delay for the minor-street approach.

*Due to limitations with synchro reporting, a vehicle length of 25 feet was used to determine the 95th percentile queue in feet.

Table 10: Analysis Summary of Navaho Trail [N/S] and Lansdowne Road [E] / Nicholas Creek Circle [W] (continued)

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Combined (2024) Conditions –Phase 2, Access Alternative 1	EBL/T/R	58*/76	B[2]	13	B (13)	N/A	25*/76	B[2]	11	B (11)	N/A
	WBL/T/R	5*/54	B[2]	11	B (11)		5*/52	B[2]	11	B (11)	
	NBL/T/R	3*/22	A[1]	8	--		3*/26	A[1]	7	--	
	SBL/T/R	0/--	A[1]	7	--		0/--	A[1]	7	--	
Combined (2024) Conditions –Phase 2, Access Alternative 4	EBL/T/R	58*/108	B[2]	13	B (13)	N/A	25*/76	B[2]	11	B (11)	N/A
	WBL/T/R	5*/54	B[2]	11	B (11)		5*/49	B[2]	11	B (11)	
	NBL/T/R	3*/26	A[1]	8	--		3*/22	A[1]	7	--	
	SBL/T/R	0/--	A[1]	7	--		0/18	A[1]	7	--	

1. Level of service and delay for the major-street left-turn movement.
2. Level of service and delay for the minor-street approach.

*Due to limitations with synchro reporting, a vehicle length of 25 feet was used to determine the 95th percentile queue in feet.

Capacity analysis of all analysis scenarios indicates the minor street approach and major-street left-turn movement are expected to operate at LOS B or better during the weekday PM and Saturday midday peak hours. Additionally, each approach at this intersection are expected to operate with the same delay throughout buildout of the proposed development as existing (2019) conditions.

7.6. S. College Road and Site Drive #3

The proposed intersection of S. College Road and Site Drive #3 was analyzed under combined (2021) Phase 1B – access alternatives 1 and 4 and combined (2024) Phase 2 – access alternative 1 and 4 traffic conditions with the lane configurations and traffic control shown in Table 11. Refer to Table 11 for a summary of the analysis results. Refer to Appendix I for the Synchro capacity analysis reports.

Table 11: Analysis Summary of S. College Road [N/S] and Site Drive #3 [W]

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Combined (2021) Conditions –Phase 1B, Access Alternative 1	**WBR**	15*/67	C[1]	18	C (18)	N/A	35*/130	D[1]	27	D (27)	N/A
	NBT **NBR**	-- --	-- --	-- --	--		-- --	-- --	-- --	--	
	SBT	--	--	--	--		--	--	--	--	
Combined (2021) Conditions –Phase 1B, Access Alternative 4	**WBR**	15*/71	C[1]	18	C (18)	N/A	35*/108	D[1]	28	D (28)	N/A
	NBT **NBR**	-- --	-- --	-- --	--		-- --	-- --	-- --	--	
	SBT	--	--	--	--		--	--	--	--	
Combined (2024) Conditions – Phase 2, Access Alternative 1	**WBR**	100*/111	D[1]	33	D (33)	N/A	248*/532	F[1]	120	F (120)	N/A
	NBT **NBR**	--	-- --	-- --	--		--	-- --	-- --	--	
	SBT	--	--	--	--		--	--	--	--	
Combined (2024) Conditions – Phase 2, Access Alternative 4	**WBR**	98*/151	D[1]	33	D (33)	N/A	235*/487	F[1]	115	F (115)	N/A
	NBT **NBR**	--	-- --	-- --	--		--	--	--	--	
	SBT	--	--	--	--		--	--	--	--	

1. Level of service and delay for the minor street approach.
Developer improvements to lane configuration shown in bold.
*Due to limitations with synchro reporting, a vehicle length of 25 feet was used to determine the 95th percentile queue in feet.

Capacity analysis of combined (2021) Phase 1B conditions indicates the minor-street approach at the intersection of S. College Road and Site Drive #3 is expected to operate at LOS D or better during the weekday PM and Saturday midday peak hours. Under combined (2024) Phase

2 conditions the minor street approach is expected to operate at LOS D during the weekday PM peak hour and LOS F during the Saturday midday peak hour under access alternative 1 and 4 conditions. Due to the multiple egress options for the site, it is anticipated that the site traffic would utilize a different driveway for egress under these conditions if significant delay occurs at this intersection. Additionally, all queues at this intersection are expected to occur internal to the site and not affect operations on state-maintained roadways.

7.7. S. College Road and Site Drive #5

The proposed intersection of S. College Road and Site Drive #5 was analyzed under combined (2024) Phase 2 – access alternative 1 and 4 traffic conditions with the lane configurations and traffic control shown in Table 12. Refer to Table 12 for a summary of the analysis results. Refer to Appendix J for the Synchro capacity analysis reports.

Table 12: Analysis Summary of S. College Road [N/S] and Site Drive #5 [W]

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Combined (2024) Conditions – Phase 2, Access Alternative 1	**WBR**	372/440	E	69	E (69)	C (26)	411/349	E	75	E (75)	C (27)
	NBT **NBR**	634/353 53/200	B A	16 9	B (15)		707/487 68/200	B A	17 9	B (17)	
	SBL* SBT	207/162 --	D --	48 --	D (48)		327/162 --	D --	48 --	D (48)	
Combined (2024) Conditions – Phase 2, Access Alternative 4	**WBR**	376/385	E	69	E (69)	C (21)	419/353	E	74	E (74)	B (20)
	NBT **NBR**	647/290 11/198	A A	10 5	A (10)		125/288 6/31	A A	9 3	A (9)	
	SBL* SBT	88/116 --	D --	48 --	D (48)		170/162 --	E --	57 --	E (57)	

1. Level of service and delay for the major-street left-turn movement.
2. Level of service and delay for the minor-street approach.

*Due to the super-street configuration of S. College Road, the southbound left-turn movement was modeled as an eastbound through movement.

Developer improvements to lane configuration shown in bold.

Capacity analysis indicates the intersection of S. College Road and Site Drive #5 is expected to operate at an overall LOS C or better during the weekday PM and Saturday midday peak hours under all analysis conditions. Due to queueing and delay expected at this intersection, signalization is recommended under Phase 2 conditions. A signal warrant analysis should be conducted during buildout to determine when signalization should occur. The maximum queues were considered for the northbound right-turn movement and the southbound left-turn movement to determine the storage needed at this intersection. Spacing of the recommended signalized intersections along the S. College Road corridor were also considered. Under access alternative 4, this driveway should be constructed a minimum of 1,000 feet north of the existing southbound U-turn north of Mohican Trail.

7.8. S. College Road and Proposed U-Turn north of Weybridge Lane

The proposed intersection of S. College Road and Proposed U-Turn north of Weybridge Lane was analyzed under combined (2024) Phase 2 – access alternative 1 and 4 traffic conditions with the lane configurations and traffic control shown in Table 13. Refer to Table 13 for a summary of the analysis results. Refer to Appendix K for the Synchro capacity analysis reports.

Table 13: Analysis Summary of S. College Road [N/S] and Proposed U-Turn north of Weybridge Lane

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Combined (2024) Conditions –Phase 2, Access Scenario 1	**NBU*** NBT	192/162 --	F --	91 --	F (91)	A (10)	158/159 --	E --	71 --	E (71)	A (9)
	SBT	23/175	A	6	A (6)		100/118	A	6	A (6)	
Combined (2024) Conditions –Phase 2, Access Scenario 4	**NBU*** NBT	166/162 --	F --	83 --	F (83)	A (8)	138/163 --	E --	73 --	E (73)	A (9)
	SBT	35/147	A	4	A (4)		100/149	A	5	A (5)	

*Due to the super-street configuration of S. College Road, the northbound U-turn movement was modeled as a westbound left-turn movement.

1. Level of service and delay for the major-street U-turn movement.

Developer improvements to lane configuration shown in bold.

Capacity analysis of all analysis scenarios indicates the proposed intersection of S. College Road and the northbound U-turn north of Weybridge Lane is expected to operate at an overall LOS A during the weekday PM and Saturday midday peak hours. Signalization is recommended at this intersection to reduce the queues of the northbound U-turn lane. The northbound U-turn movement is expected to experience large delays during the weekday PM and Saturday midday peak hours due to the heavy mainline volumes. Additional U-turn lanes were considered but the traffic volumes for this movement does not warrant the additional capacity. Additionally, this capacity analysis considered protected only phasing to be conservative. During signal design protected / permitted phasing should be considered and implemented if sufficient sight distance is available.

7.9. S. College Road and Proposed U-Turn north of Site Drive #5 (SB to NB)

The proposed intersection of S. College Road and U-Turn north of Site Drive #5 was analyzed under combined (2024) Phase 2 – access alternative 1 and 4 traffic conditions with the lane configurations and traffic control shown in Table 14. Refer to Table 14 for a summary of the analysis results. Refer to Appendix L for the Synchro capacity analysis reports.

Table 14: Analysis Summary of S. College Road [N/S] and Proposed U-Turn north of Site Drive #5

ANALYSIS SCENARIO	LANE GROUP	Weekday PM Peak Hour					Saturday Midday Peak Hour				
		Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)	Queue 95th / Max (ft.)	Lane LOS	Delay (sec)	Approach LOS (sec)	Overall LOS (sec)
Combined (2024) Conditions –Phase 2, Access Scenario 1	NBT	--	--	--	--	N/A	--	--	--	--	N/A
	SBU** SBT	13*/73 --	C[1] --	22 --	C (22)		10*/50 --	D[1] --	28 --	D (28)	
Combined (2024) Conditions –Phase 2, Access Scenario 4	NBT	--	--	--	--	N/A	--	--	--	--	N/A
	SBU** SBT	13*/79 --	C[1] --	21 --	C (21)		10*/70 --	D[1] --	27 --	D (27)	

*Due to limitations with synchro reporting, a vehicle length of 25 feet was used to determine the 95th percentile queue in feet.

**Due to the super-street configuration of S. College Road, the southbound U-turn movement was modeled as an eastbound left-turn movement.

1. Level of service and delay for the major-street U-turn movement.

Developer improvements to lane configuration shown in bold.

Capacity analysis of all analysis scenarios indicates the U-turn movement is expected to operate at LOS D or better during the weekday PM and Saturday midday peak hours. Review of the queues and delays under unsignalized operations indicate the subject intersection is expected to operate adequately with unsignalized control.

8. CONCLUSIONS

This Traffic Impact Analysis was conducted to determine the potential traffic impacts of the proposed Whiskey Branch development with the proposed access alternatives. The proposed development is expected to be a mixed-use development and be built out in three (3) phases with anticipated buildout years of 2019, 2021, and 2024 for phases 1A, 1B, and 2, respectively. The proposed development is expected to consist of the following land uses:

- 88 single family detached homes (Phase 1A)
- 82 townhomes (Phase 1A)
- 325 apartments (Phase 1B)
- 50,000 square feet (s.f.) of general office (Phase 2)
- 150,000 s.f. of shopping center (Phase 2)

Two (2) access alternatives are included in this study. Access alternative 1 is the alternative that was previously approved by the WMPO as part of the original TIA submittal. Access scenario 1 includes a right-in/right-out driveway (Site Drive #3) and a left-over driveway (Site Drive #5). Access alternative 4 is a new proposed alternative that utilizes Access scenario 1 and proposes an additional ingress only driveway (Site Drive #4) at the existing SB U-turn location north of Site Drive #3.

The study analyzes traffic conditions during the weekday PM and Saturday midday peak hours for the following scenarios:

- Existing (2019) Traffic Conditions
- Background (2021) Traffic Conditions
- Combined (2021) Traffic Conditions – Access Alternative 1
- Combined (2021) Traffic Conditions – Access Alternative 4
- Background (2024) Traffic Conditions
- Combined (2024) Traffic Conditions – Access Alternative 1
- Combined (2024) Traffic Conditions – Access Alternative 4

Trip Generation

Under full buildout (phase 2) it is estimated that the proposed development will generate approximately 10,230 total site trips on the roadway network during a typical 24-hour weekday period. It is anticipated that 626 primary trips (274 entering and 352 exiting) will occur during the weekday PM peak hour and 801 (418 entering and 383 exiting) will occur during the Saturday midday peak hour.

Adjustments to Analysis Guidelines

Capacity analysis at all study intersections was completed according to NCDOT Congestion Management Guidelines. Refer to section 6.1 of this report for a detailed description of any adjustments to these guidelines made throughout the analysis.

Intersection Capacity Analysis Summary

In access alternative 4, the proposed ingress only access at Site Drive #4 operates at an acceptable level of service. This access provides two separate left-in driveways into the development allowing these left turns to be dispersed which improves traffic flow and circulation for the development. Allowing two separate left-in driveways also minimizes the need for dual left turns if only one left in is provided (as in access alternative 1). If one left turn lane can be provided at 2 intersections, the traffic signals could operate with protected + permitted phasing for the left turns, which could reduce delays for northbound College Road traffic. Dual left turn lanes could potentially be needed for access alternative 1 (although not considered in the analysis), which would require protected-only left turn phasing at all times. This would limit the ability to adjust timings to benefit northbound College Road traffic.

Improvements are needed to mitigate site traffic impacts at the study intersections. Specific geometric improvements and signal modifications at the study intersections are discussed in detail for each access scenario in Section 7 of this report.

Based on the projected traffic volumes and capacity analysis, the U-Turn north of Site Drive #5 (SB to NB) is not expected to be necessary to provide acceptable operations. This U-Turn does not carry Whiskey Branch site trips and the existing SB to NB U-Turn volume is relatively low.

If future development occurs along College Road north of Whiskey Branch, the future development may benefit from the U-Turn intersection. This future development could construct the U-Turn in a location that accommodates development trips better.

9. RECOMMENDATIONS

Based on the findings of this study, specific geometric improvements have been identified and are recommended to reasonably accommodate future traffic conditions. These recommendations are detailed below. Refer to Figures 22A and 22B for an illustration of the recommended lane configuration for the proposed development under Access Scenarios 1 and 4.

Although recommendations are provided for each access scenario, access scenario 4 is the preferred (and recommended) alternative.

Recommended Improvements by Developer – Access Scenario 1

S. College Road and Site Drive #3 [Phase 1B]

- Provide site access via westbound approach with one ingress lane and one egress lane via a right-in/right-out intersection.
- Provide stop control for the westbound approach
- Construct a northbound right-turn lane on S. College Road with a minimum of 100 feet of storage and appropriate taper.

S. College Road and Existing Northbound U-Turn North of Mohican Trail [Phase 2]

- Monitor for signalization and install once warranted and approved by NCDOT.

S. College Road and Site Drive #5 [Phase 2]

- Provide site access via westbound approach with one ingress lane and one egress lane via a left-over intersection.
- Monitor for signalization and install once warranted and approved by NCDOT. Prior to signalization, provide stop control for the westbound approach.
- Construct a northbound right-turn lane on S. College Road with a minimum of 200 feet of storage and appropriate taper.
- Construct a southbound left-turn lane on S. College Road with a minimum of 350 feet of storage and appropriate taper.

S. College Road and Southbound U-Turn North of Site Drive #5 [Phase 2]

- Construct a southbound U-turn north of Site Drive #5. Provide a minimum of 250 feet of storage and appropriate taper for the southbound U-turn lane.
- Provide yield control for the U-turn movement.

S. College Road and Northbound U-Turn North of Weybridge Lane [Phase 2]

- Construct a northbound U-turn north of Weybridge Lane. Provide a minimum of 200 feet of storage and appropriate taper for the northbound U-turn lane.
- Monitor for signalization and install once warranted and approved by NCDOT. Provide yield control for the U-turn movement prior to signalization.

Recommended Improvements by Developer – Access Scenario 4

S. College Road and Site Drive #3 [Phase 1B]

- Provide site access via westbound approach with one ingress lane and one egress lane via a right-in/right-out intersection.
- Provide stop control for the westbound approach
- Construct a northbound right-turn lane on S. College Road with a minimum of 100 feet of storage and appropriate taper.

S. College Road and Existing Northbound U-Turn North of Mohican Trail [Phase 2]

- Monitor for signalization and install once warranted and approved by NCDOT.

S. College Road and Site Drive #5 [Phase 2]

- Provide site access via westbound approach with one ingress lane and one egress lane via a left-over intersection.
- Monitor for signalization and install once warranted and approved by NCDOT. Prior to signalization, provide stop control for the westbound approach.
- Construct a northbound right-turn lane on S. College Road with a minimum of 200 feet of storage and appropriate taper.
- Construct a southbound left-turn lane on S. College Road with a minimum of 250 feet of storage and appropriate taper.

S. College Road and Southbound U-Turn North of Site Drive #5 [Phase 2]

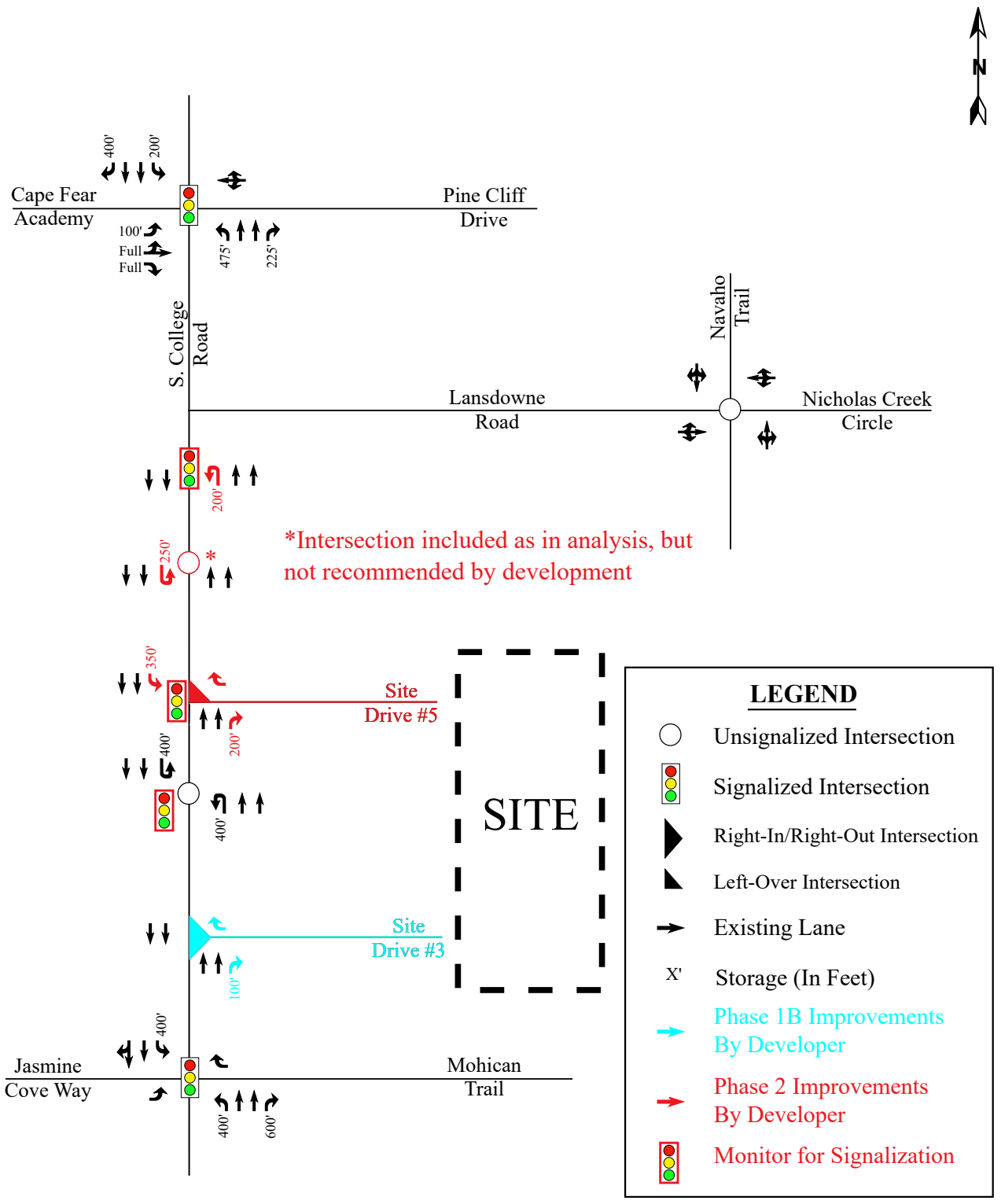
- Construct a southbound U-turn north of Site Drive #5. Provide a minimum of 250 feet of storage and appropriate taper for the southbound U-turn lane.
- Provide yield control for the U-turn movement.

S. College Road and Northbound U-Turn North of Weybridge Lane [Phase 2]

- Construct a northbound U-turn north of Weybridge Lane. Provide a minimum of 200 feet of storage and appropriate taper for the northbound U-turn lane.
- Monitor for signalization and install once warranted and approved by NCDOT. Provide yield control for the U-turn movement prior to signalization.

S. College Road and Existing Southbound U-Turn North of Mohican Trail / Site Drive #4

- Provide site access via westbound approach with one ingress lane via an ingress only intersection. [Phase 1B]
- Construct a northbound right-turn lane on S. College Road with a minimum of 100 feet of storage and appropriate taper. [Phase 1B]
- Monitor for signalization and install once warranted and approved by NCDOT. [Phase 2]



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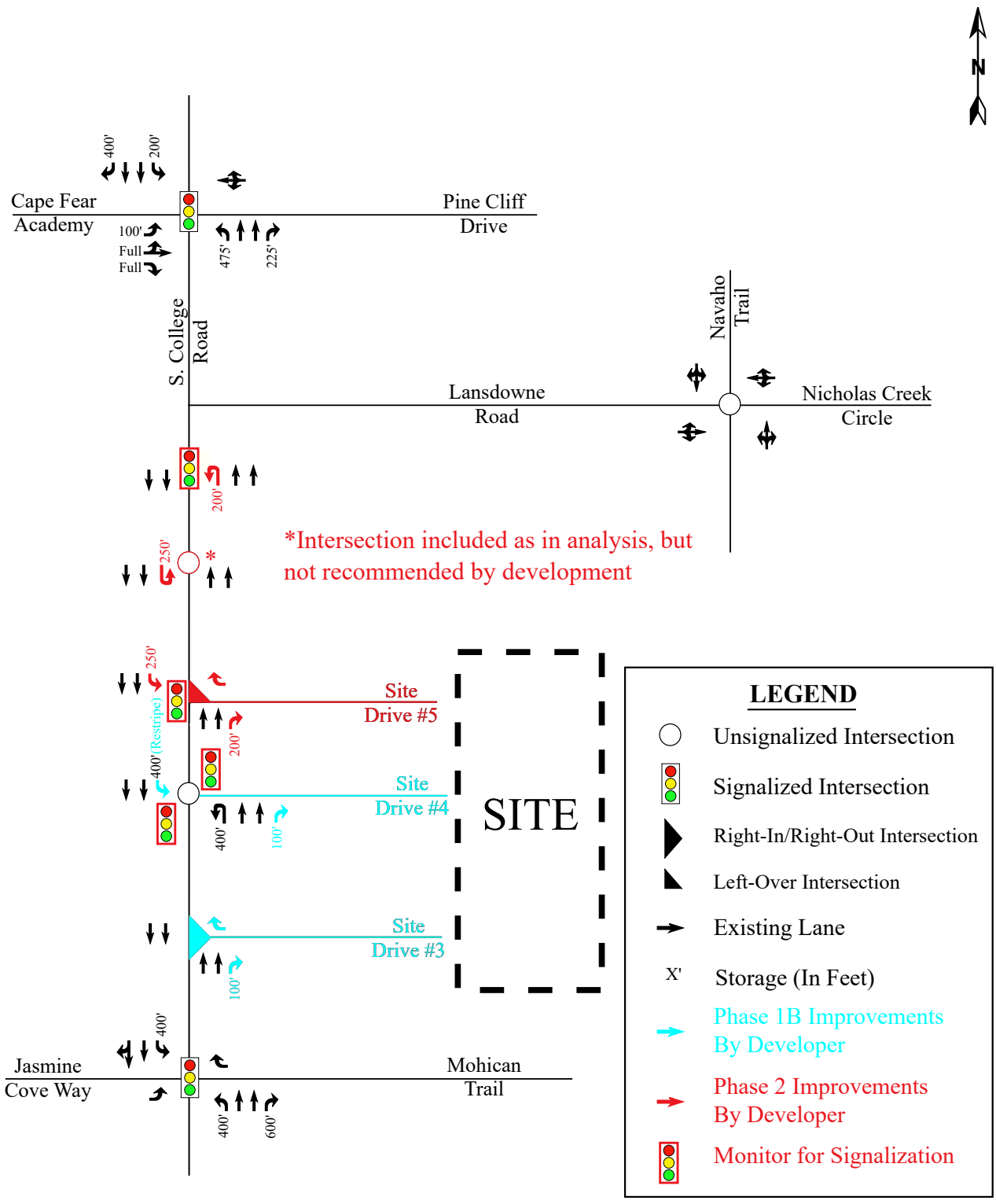
TRANSPORTATION ENGINEERS

Whiskey Branch Development
Wilmington, NC

Recommended Lane Configurations - Access Alternative 1

Scale: Not to Scale | Figure 22A



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Recommended Lane Configurations - Access Alternative 4

Scale: Not to Scale | Figure 22B

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