Appendix I Traffic Study

LeBard Park Residential Project Traffic Study

City of Huntington Beach

Prepared for:
Atkins North America, Inc.

Prepared by:
Stantec Consulting Services Inc.

April 8, 2015

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1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has performed a traffic analysis for the proposed LeBard residential and park project, which will repurpose the Huntington Beach City School District headquarters located at the former site of the LeBard Elementary School in the City of Huntington Beach. The proposed project will replace the school site with 15 single family residential homes and retain the existing Little League baseball fields. The purpose of the study is to analyze the impacts of the project on traffic and circulation and to propose mitigation measures to reduce or eliminate those impacts if necessary. This report has been prepared for submittal to the City of Huntington Beach in support of the environmental documents for the project.

1.1 BACKGROUND

The proposed LeBard residential and park project is located at 20451 Craimer Lane. The project would repurpose the Huntington Beach City School District (HBCSD) headquarters. The site is the former LeBard Elementary School site, which serves as the current headquarters for HBCSD, and the existing LeBard Park. Figure 1-1 provides a vicinity map and illustrates the location of the proposed project.

The existing 10.6-acre site comprises a 4-acre swath that includes the school district's headquarters and a 6.6 acre parcel that is currently used for Little League baseball fields. The project would retain the existing Little League baseball fields, expand the parking lot on the eastern portion of the project area within the existing City-owned LeBard Park, and develop a low-density residential subdivision on the northern portion of the site. All existing school district buildings would be demolished. The proposed project would provide 68 parking spaces on-site for the Little League and park activities. The proposed development plan is presented in Figure 1-2.

1.2 SCOPE

The traffic analysis is presented in two settings to satisfy the requirements of the California Environmental Quality Act (CEQA). The proposed project would be developed within approximately 2 years; therefore, an existing conditions analysis is presented to represent opening year conditions. The project requires a Zone Change and General Plan Amendment; therefore, a long-range cumulative scenario is also included representing buildout of the General Plan.

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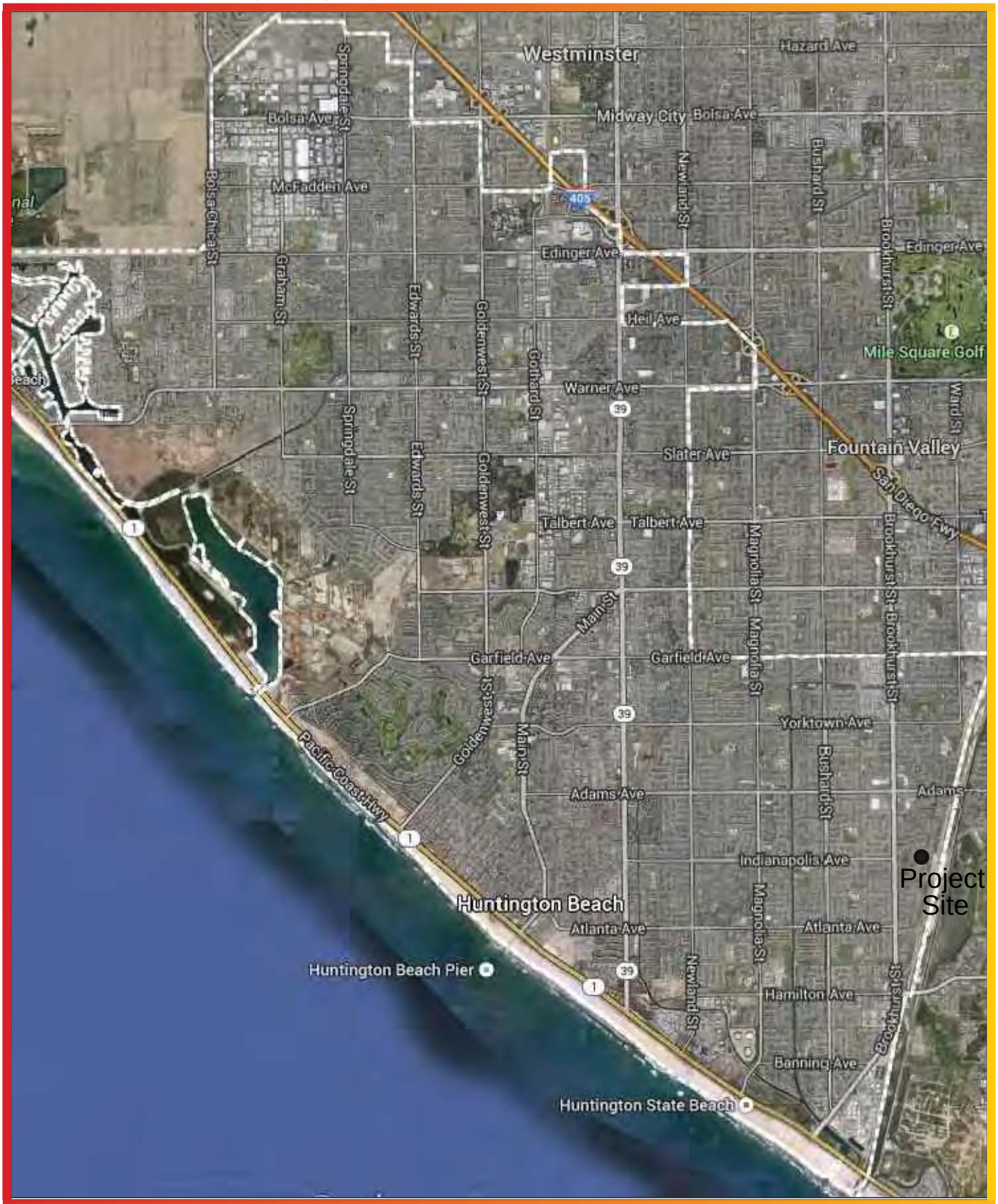

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Project Vicinity Map

Figure 1.1

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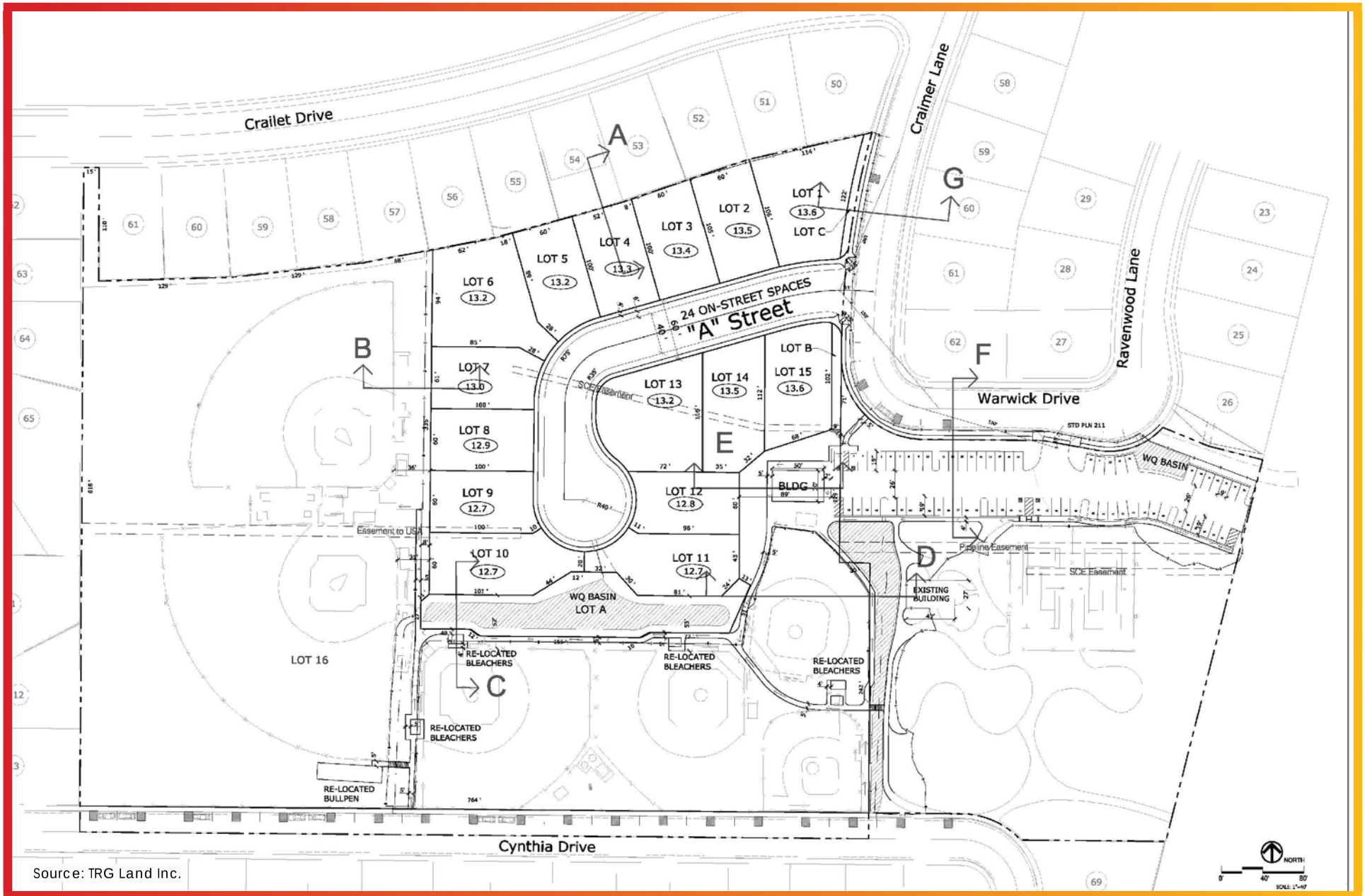

Source: TRG Land Inc.

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Proposed Site Plan

Figure 1-2

1.3 STUDY AREA

The study area for the analysis includes major intersections where project-generated traffic could potentially cause a significant impact. Three signalized intersections along Brookhurst Street north and south of the project site have been identified for analysis. The study area and the location of the study intersections are presented in Figure 1-3.

1.4 METHODOLOGY

The performance criteria used for evaluating traffic volumes and capacities on the study area street system are based on peak hour intersection volumes. Using peak hour intersection turning movement volumes and the intersection lane geometry, intersection capacity utilization (ICU) values are calculated for each of the AM and PM peak hours. The ICU values represent volume/capacity (V/C) ratios for these time periods, and thereby provide a suitable measure of system performance.

Traffic levels of service (LOS) are designated A through F, with LOS A representing free flow conditions and LOS F representing severe traffic congestion. Table 1-1 summarizes the criteria used for the intersection LOS calculations and the relationship between ICU and LOS. The significance criteria for intersections based on ICU contribution is also listed in the table.

Table 1-2 describes traffic flow quality for different V/C ranges. The City of Huntington Beach has adopted a tiered LOS standard: LOS D (ICU not to exceed .90) is the performance standard for Principal intersections (i.e., serve major thoroughfares) and LOS C (ICU not to exceed .80) is the performance standard for Secondary intersections (i.e., primarily serving local areas). The three study area intersections are classified as Principal intersections.

1.5 DEFINITIONS

Certain terms used throughout this report are defined below to clarify their intended meaning:

ADT	Average Daily Traffic. Generally used to measure the total two-directional traffic volumes passing a given point on a roadway.
CMP	Congestion Management Program. A state mandated program administered by the Orange County Transportation Authority (OCTA) that provides a mechanism for coordinating land use and development decisions.
ICU	Intersection Capacity Utilization. A measure of the volume to capacity ratio for an intersection. Typically used to determine the peak hour level of service for a given set of intersection volumes.
LOS	Level of Service. A scale used to evaluate circulation system performance based on intersection ICU values or volume/capacity ratios of arterial segments.

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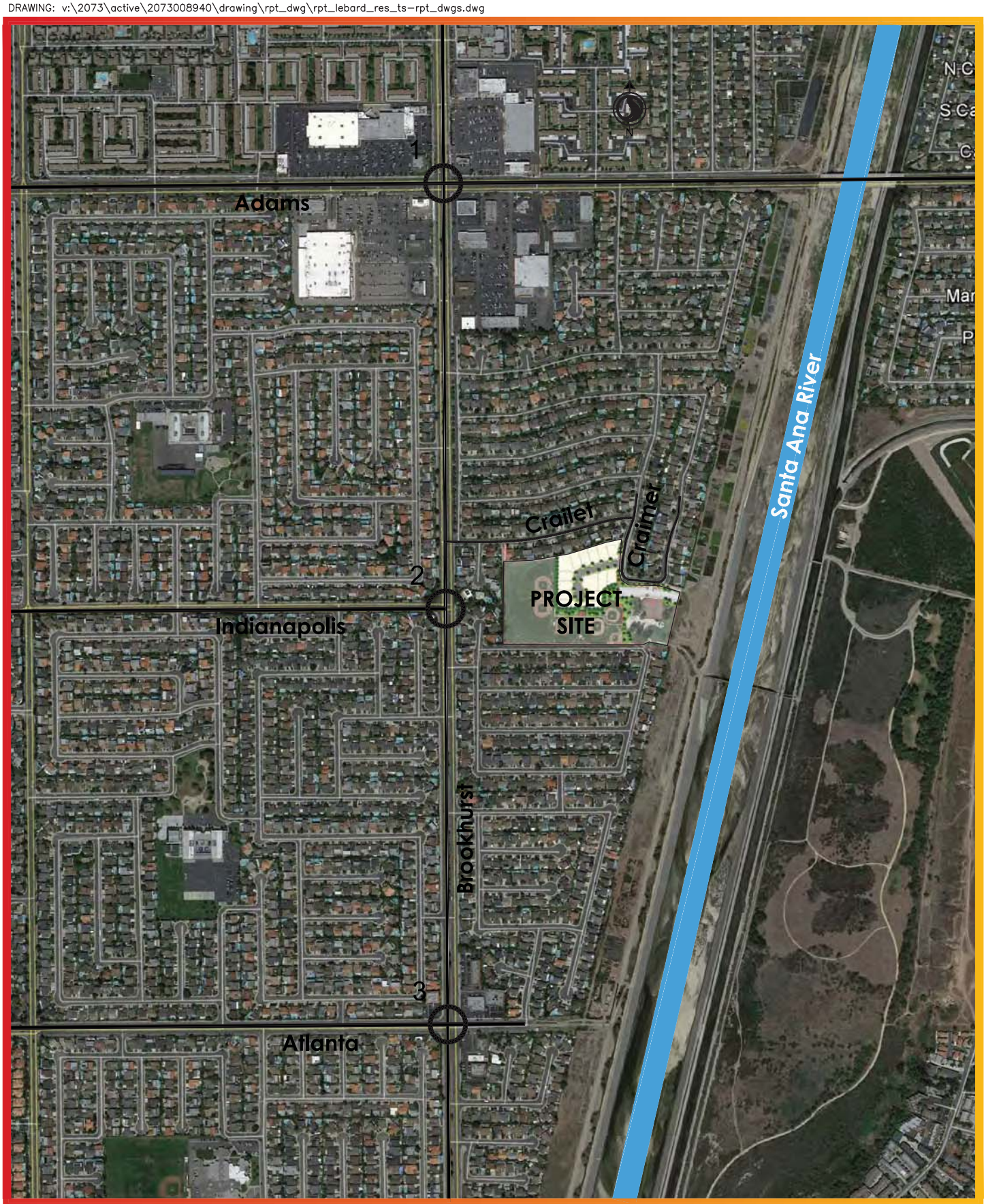

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Study Area

Figure 1-3

Table 1-1 Arterial Intersection Performance Criteria

The following are the performance criteria used for comparing volumes and capacities on the study area street system:

V/C Calculation Methodology

Level of service (LOS) to be based on peak hour intersection capacity utilization (ICU) values calculated using the following assumptions:

Saturation Flow Rate:	1,700 vehicles per hour (vph)
Clearance Interval:	0.05
Right-Turn On Red Factor:	0.50

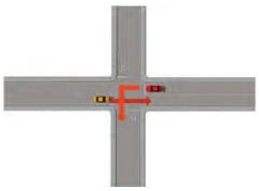
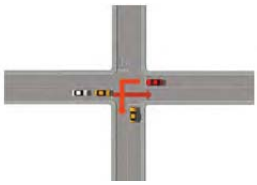
Performance Standard

Critical	LOS E (ICU less than 1.01)
Principal	LOS D (ICU less than .91)
Secondary	LOS C (ICU less than .81)

Impact Thresholds

Project causes a significant impact if it contributes 1.0 percent or more to an ICU value when the performance standard is exceeded (LOS D for Principal intersections and LOS C for Secondary intersections).

Table 1-2 Level of Service Description – Arterial Roadways and Intersections

LOS	Traffic Flow Description		V/C or ICU
A		Minimal or no vehicle delay.	0.00 – 0.60
B		Slight delay to vehicles.	0.61 – 0.70
C		Moderate vehicle delays, traffic flow remains stable.	0.71 – 0.80
D		More extensive delays at intersections.	0.81 – 0.90
E		Long queues create lengthy delays.	0.91 – 1.00
F		Severe delays and congestion.	> 1.00

Sources: HCM 2010
V/C = Volume to Capacity ratio
ICU = Intersection Capacity Utilization

Peak Hour	This refers to the hour during the AM peak period (typically 7 AM - 9 AM) or the PM peak period (typically 3 PM - 6 PM) in which the greatest number of vehicle trips are generated by a given land use or are traveling on a given roadway.
Tripend	A trip generation measure which represents the total trips entering and leaving a location.
V/C	Volume to Capacity Ratio. This is typically used to describe the percentage of capacity utilized by existing or projected traffic on a segment of an arterial or intersection.
VPH	Vehicles per Hour. Used for roadway volumes (counts or forecasts) and trip generation estimates. Measures the number of vehicles in a one-hour period, typically the AM and PM peak hour.

1.6 REFERENCES

1. Trip Generation Manual, 9th Edition, Institute of Transportation Engineers, 2012.

2. "Highway Capacity Manual 2010," Transportation Research Board, National Research Council, 2010.

3. "LeBard Parking Study – City of Huntington Beach," Stantec Consulting Services Inc., 2015.

2.0 TRANSPORTATION SETTING

This chapter describes the transportation setting for the traffic analysis. The existing roadway system and present day traffic volumes and levels of service are summarized, followed by a discussion of future traffic volumes.

2.1 EXISTING CIRCULATION SYSTEM

The project site is located on Craimer Lane east of Brookhurst Street. Access to the site is provided by Craimer Lane via Crailet Drive from Brookhurst Street.

Brookhurst Street is a 6-lane arterial highway with a raised median. Median breaks are provided at intersections and major driveways. On-street parking is prohibited on Brookhurst Street in the vicinity. Signals are provided at Adams Avenue, Indianapolis Avenue, and Atlanta Avenue.

Adams Avenue is a 6-lane arterial with a raised median. On-street parking is prohibited.

Indianapolis Avenue is a 4-lane roadway with a painted median. Indianapolis Avenue forms a t-intersection at Brookhurst Street. Bike lanes are provided on Indianapolis Avenue, and on-street parking is prohibited.

Atlanta Avenue is a 4-lane road with a painted median and bike lanes. West of Brookhurst Street, on-street parking is prohibited with the exception of a one-block segment westbound west of Brookhurst Street. East of Brookhurst Street, Atlanta Avenue provides access to the Santa Ana River Trail and on-street parking is allowed.

Crailet Drive and **Craimer Lane** are residential streets. Crailet Drive provides a stop-controlled t-intersection with Brookhurst Street. Left turns into and out of Crailet Drive from Brookhurst Street are allowed.

2.2 EXISTING TRAFFIC VOLUMES AND LEVELS OF SERVICE

The proposed project would be developed within approximately 2 years. Since no significant cumulative projects are expected within a 2-year time frame within the vicinity and the area is built out, existing conditions are used to represent opening year conditions.

Existing AM and PM peak hour intersection volumes at the study intersections were collected in October 2014 by Transportation Studies, Inc. (see Appendix B). These counts were collected while local schools were in session. Figure 2-1 illustrates the existing peak hour intersection

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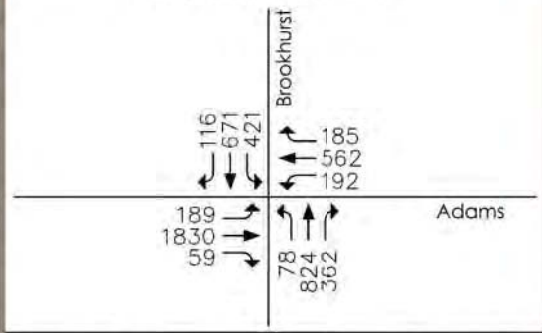
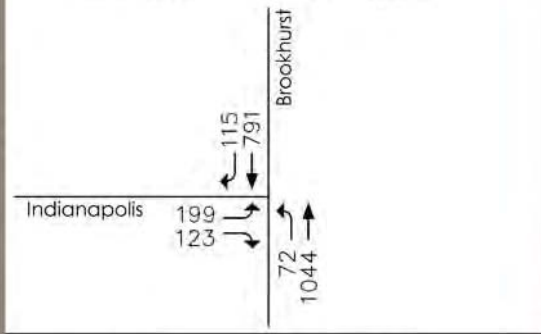
AM PEAK HOUR

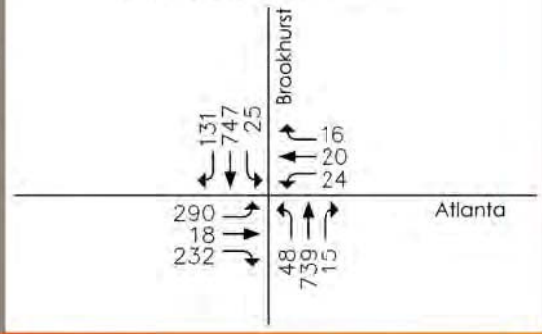
1. Brookhurst & Adams



2. Brookhurst & Indianapolis

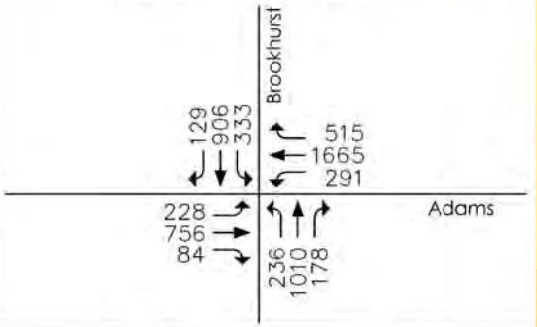


3. Brookhurst & Atlanta

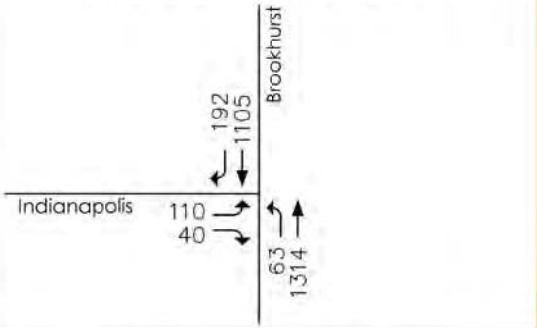


PM PEAK HOUR

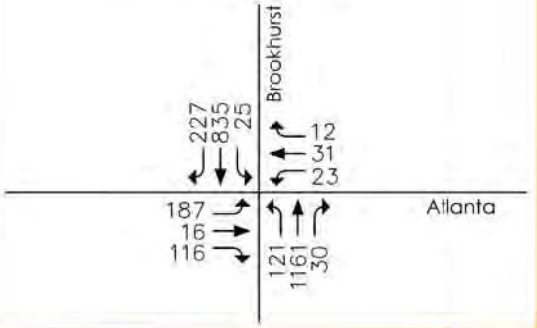
1. Brookhurst & Adams



2. Brookhurst & Indianapolis



3. Brookhurst & Atlanta



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Existing Peak Hour Intersection Volumes

Figure 2-1

volumes. ICU values were calculated using these existing turning movement volumes and existing lane configurations, and the corresponding LOS was determined for each study intersection (actual ICU calculation worksheets are included in Appendix A).

Table 2-1 summarizes the results of the ICU analysis under existing conditions. As this table shows, the study intersections are operating at an acceptable LOS (D or better) during the AM and PM peak hour under existing conditions.

Table 2-1 ICU and LOS Summary – Existing Conditions

Intersection	AM Peak Hour		PM Peak Hour		Count Date
	ICU	LOS	ICU	LOS	
1. Brookhurst & Adams	.82	D	.78	C	10/8/2014
2. Brookhurst & Indianapolis	.33	A	.37	A	10/8/2014
3. Brookhurst & Atlanta	.43	A	.45	A	10/8/2014

2.3 FUTURE CONDITIONS

The project will be developed in the very near term (i.e., within 2 years); however, the project would require a Zone Change and General Plan Amendment. Therefore potential impacts to the long-range cumulative conditions were evaluated.

The long-range cumulative condition volumes for this analysis were obtained from the General Plan buildout version of the Huntington Beach Traffic Model (HBTM). This is a subarea model derived from the Orange County Transportation Analysis Model (OCTAM), following the consistency guidelines established by the Orange County Transportation Authority (OCTA). The land use assumed on the project site is vacant in the HBTM data base; therefore, the General Plan buildout peak hour volumes from the HBTM represent the no-project scenario.

3.0 PROJECT DESCRIPTION

This section describes the project site in terms of its transportation characteristics. The project trip generation is summarized and the distribution of project trips on the adjacent roadway network is presented.

3.1 TRIP GENERATION

The proposed project consists of 15 single family dwelling units on the site of the former LeBard Elementary School, which was closed for educational purposes in 1981. In recent years, the site has been used for non-traditional educational activities and staff purposes. In addition to the residential uses, the LeBard Park school site is developed with 2 lighted tennis courts, a tot lot, passive recreational open space, and a concession/restroom building, with 6 non-lighted baseball fields used by the local Little League Baseball team (Seaview Little League). The adjacent LeBard Park site is developed as part of the project, and the existing parking lot at the LeBard Park will be expanded and a new concession building will be constructed.

Trip generation rates for the proposed residential project were obtained from the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 9th Edition*. The trip rates used for this analysis and the resulting trip generation estimates are summarized in Table 3-1. As shown, the project would generate approximately 144 average daily tripends, with approximately 11 trips generated during the AM peak hour and 16 trips generated during the PM peak hour. The existing park is not anticipated to increase the amount of traffic generated by the park uses. Credit for trips generated by the existing HBCSD use of the site was not applied to the proposed trip generation in order to analyze the worst-case scenario.

Table 3-1 Land Use and Trip Generation Summary

Land Use	Amount	Units	AM Peak Hour			PM Peak Hour			Average Daily Tripends
			In	Out	Total	In	Out	Total	
Trip Generation									
Single Family Detached	15	DU	3	8	11	10	6	16	144
Trip Rates									
Single Family Detached (ITE 210)		DU	.19	.56	.75	.64	.37	1.01	10.08

Source: "Trip Generation Manual, 9th Edition", Institute of Transportation Engineers

DU = Dwelling unit

3.2 PROJECT TRIP DISTRIBUTION

The distribution and assignment of project trips on the surrounding circulation system was based on levels and locations of development in relation to the location of the project site. Brookhurst

Street provides access to the I-405 Freeway approximately 2.5 miles north of the project site, but Harbor Boulevard also provides access to the I-405 Freeway via Adams Avenue for project traffic oriented toward the south on the freeway. Adams Avenue provides the nearest crossing of the Santa Ana River. Several schools would be accessed from Indianapolis Avenue west of the site by residents of the proposed project.

Approximately 50 percent of project traffic is estimated on Brookhurst Street north of Adams Avenue, approximately 15 percent is estimated on Adams Avenue and Indianapolis Avenue west of the project site, approximately 20 percent is estimated on Adams Avenue east of the project site, and approximately 15 percent is estimated on Brookhurst Street south of Atlanta Avenue as shown in Figure 3-1. Project trips were assigned to the roadways based on this general distribution pattern. Figure 3-2 illustrates the peak hour project-generated intersection volumes.

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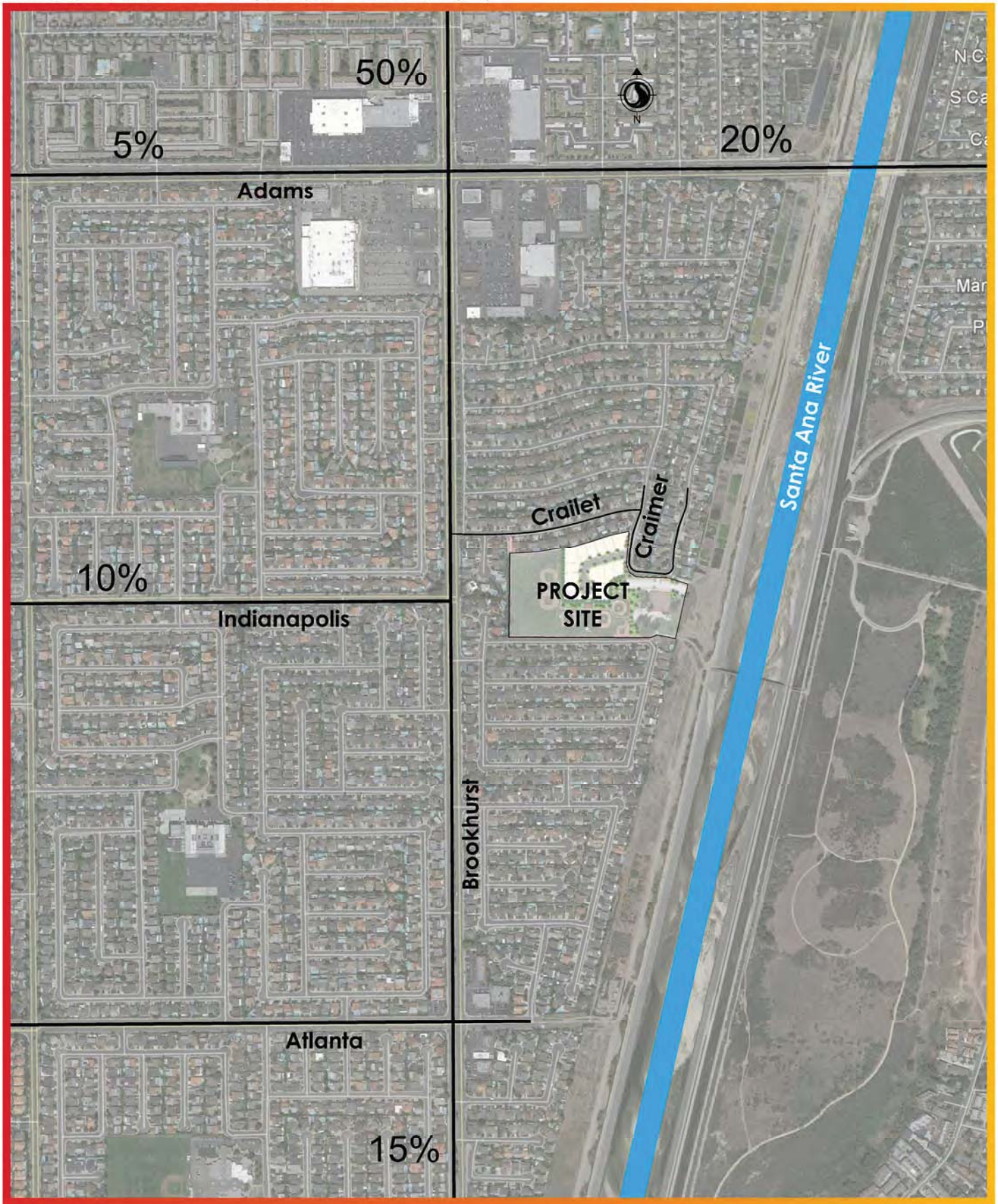

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General Project Distribution

Figure 3-1

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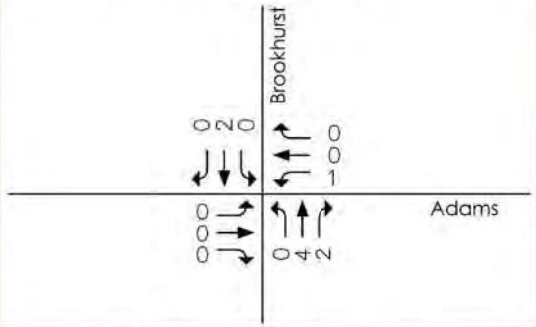
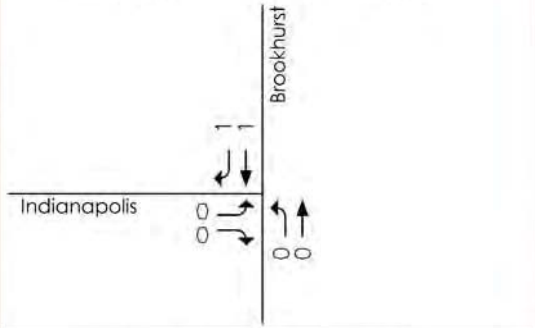
AM PEAK HOUR

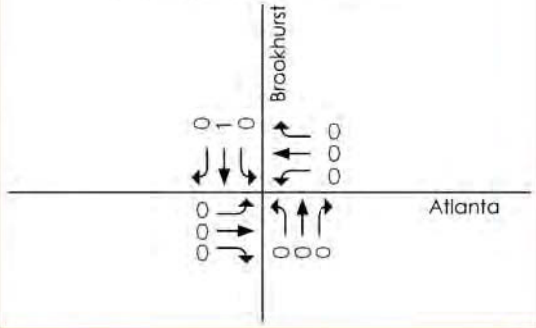
1. Brookhurst & Adams



2. Brookhurst & Indianapolis

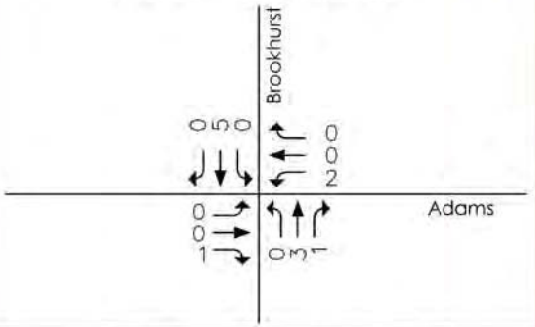


3. Brookhurst & Atlanta



PM PEAK HOUR

1. Brookhurst & Adams



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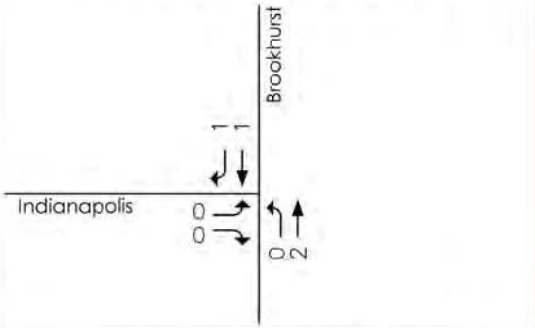
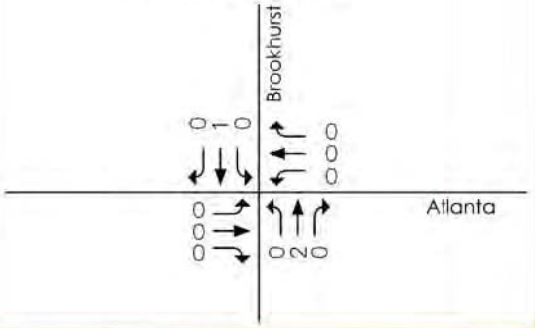


3. Brookhurst & Atlanta



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Project-Generated Peak Hour Trips

Figure 3-2

4.0 IMPACT ANALYSIS

This chapter addresses the potential traffic impacts of the proposed project. Existing and future conditions with project traffic are described in the following sections, and project impacts are identified using the criteria outlined in Chapter 1.0.

4.1 PROJECT IMPACT ANALYSIS

Existing plus project peak hour turning movement volumes are shown in Figure 4-1. Peak hour ICU values that correspond with the existing traffic conditions can be found in Table 4-1, which provides a comparison between the no-project and the with-project conditions. As shown, the study intersections are forecast to operate at LOS D or better under existing plus project conditions, and the project has no measurable impact on the ICU values at the study intersections.

Table 4-1 ICU and LOS Summary – Existing-plus-Project Conditions

	Existing				Existing + Project			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Intersection	ICU	LOS	ICU	LOS	ICU	LOS	ICU	LOS
1. Brookhurst & Adams	.82	D	.78	C	.82	D	.78	C
2. Brookhurst & Indianapolis	.33	A	.37	A	.33	A	.37	A
3. Brookhurst & Atlanta	.43	A	.45	A	.43	A	.45	A

4.2 GENERAL PLAN ANALYSIS

The project would require a Zone Change and a General Plan Amendment. Project impacts under 2030 conditions were analyzed with future volume forecasts obtained from the General Plan buildout version of the HBTM. Peak hour volumes corresponding to 2030 no-project conditions are illustrated in Figure 4-2. Peak hour volumes for the with-project conditions are shown in Figure 4-3.

Peak hour ICU values that correspond with the 2030 conditions can be found in Table 4-2, which provides a comparison between the no-project and with-project conditions. As shown, the intersection of Brookhurst Street and Adams Avenue would operate at LOS F during the AM and PM peak hours under General Plan buildout conditions; however, the project would have no measurable impact at the intersection. The project would have no significant impact on the remaining study intersections, which would continue to operate at LOS A during the AM and PM peak hours.

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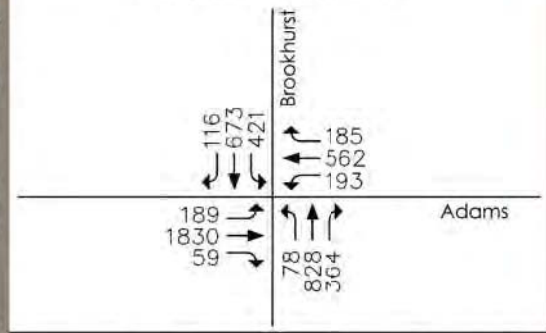
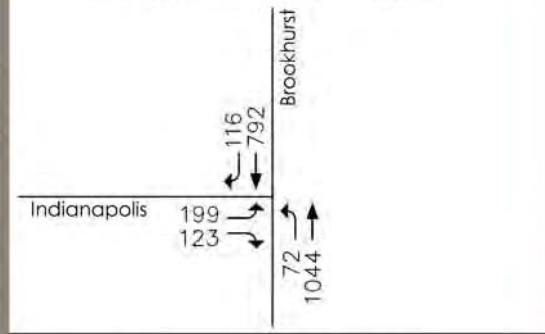
AM PEAK HOUR

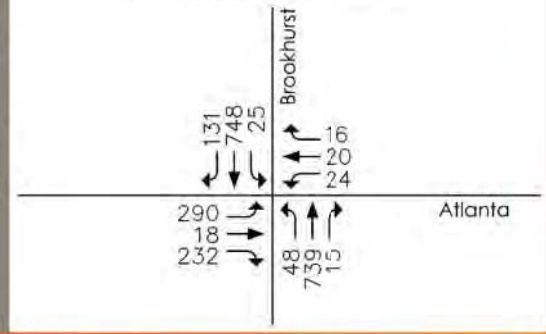
1. Brookhurst & Adams



2. Brookhurst & Indianapolis

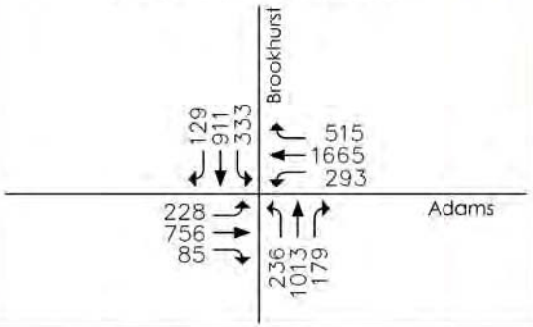


3. Brookhurst & Atlanta

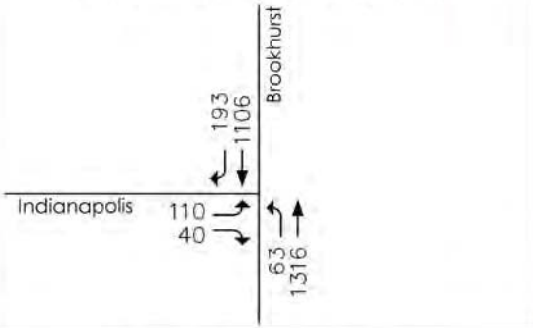


PM PEAK HOUR

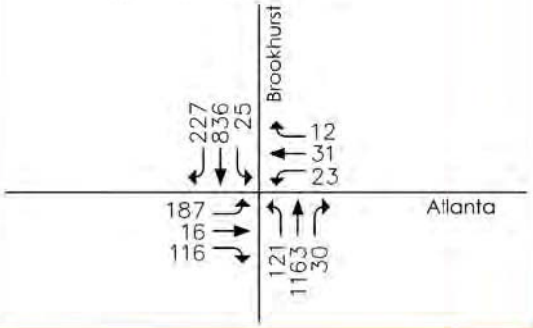
1. Brookhurst & Adams



2. Brookhurst & Indianapolis



3. Brookhurst & Atlanta



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Existing-Plus-Project Peak Hour Intersection Volumes

Figure 4-1

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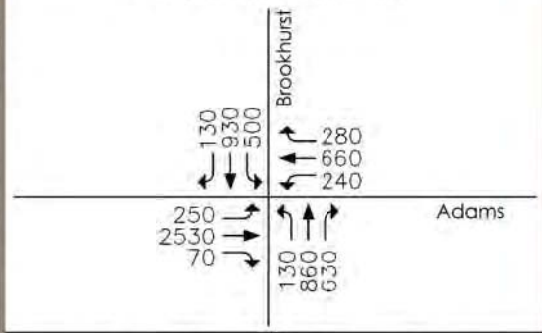
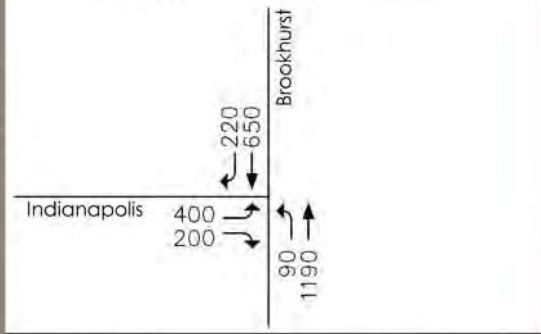
AM PEAK HOUR

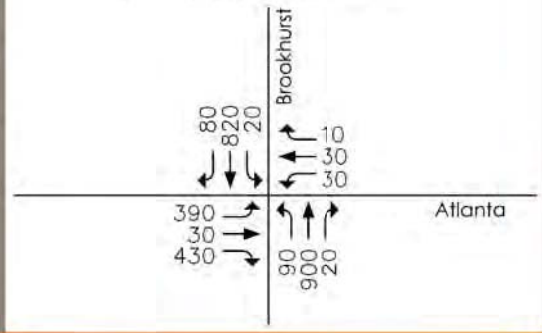
1. Brookhurst & Adams



2. Brookhurst & Indianapolis

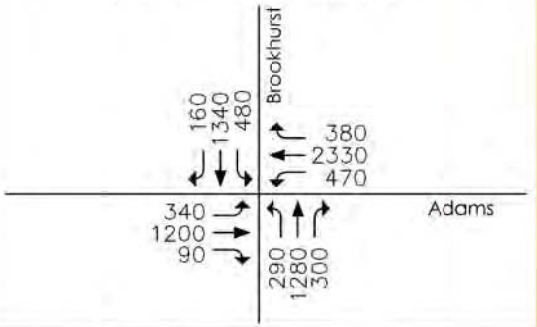


3. Brookhurst & Atlanta



PM PEAK HOUR

1. Brookhurst & Adams



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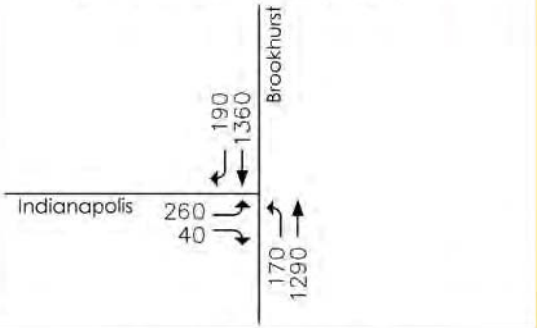
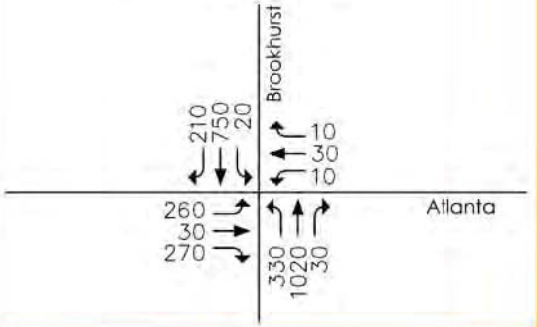


3. Brookhurst & Atlanta



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2030 No-Project Peak Hour Intersection Volumes

Figure 4-2

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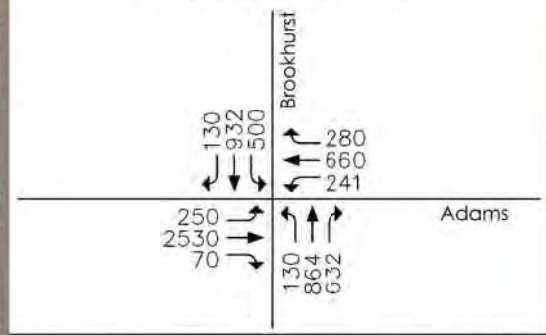
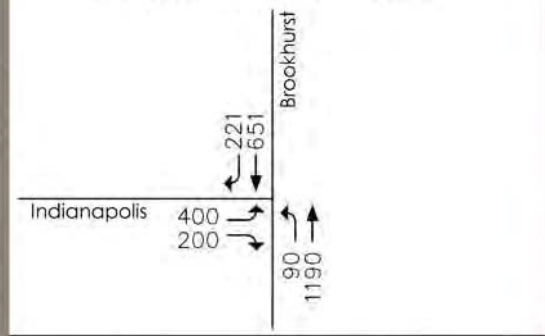
AM PEAK HOUR

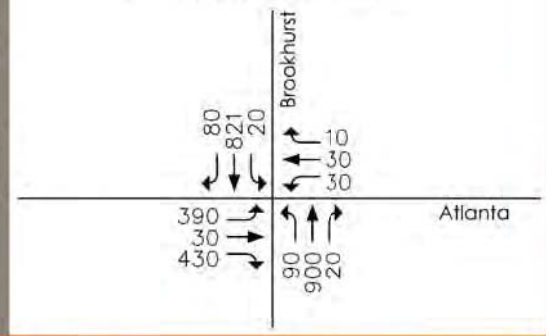
1. Brookhurst & Adams



2. Brookhurst & Indianapolis

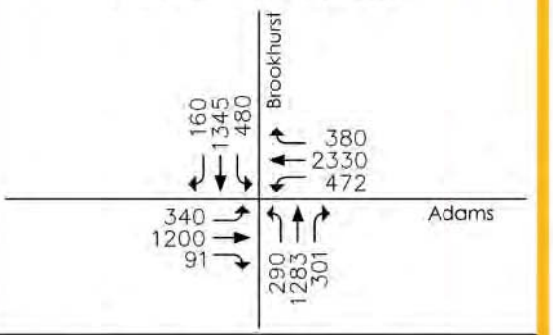


3. Brookhurst & Atlanta

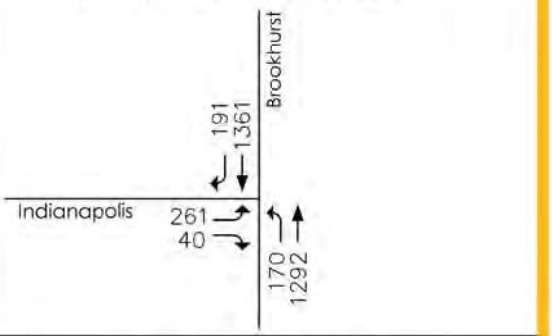


PM PEAK HOUR

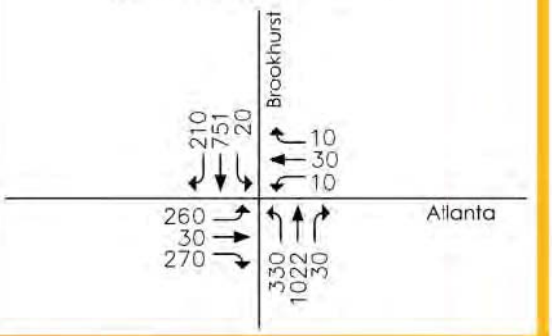
1. Brookhurst & Adams



2. Brookhurst & Indianapolis



3. Brookhurst & Atlanta



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2030 With-Project Peak Hour Intersection Volumes

Figure 4-3

Table 4-2 ICU and LOS Summary – 2030-with-Project Conditions

	2030 No-Project				2030 With-Project			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Intersection	**ICU**	**LOS**	**ICU**	**LOS**	**ICU**	**LOS**	**ICU**	**LOS**
1. Brookhurst & Adams	1.10	F	1.06	F	1.10	F	1.06	F
2. Brookhurst & Indianapolis	.40	A	.53	A	.40	A	.53	A
3. Brookhurst & Atlanta	.52	A	.59	A	.52	A	.59	A

The proposed project has no significant impact on the study intersections during the peak hours under existing or General Plan buildout conditions. Since the project has no significant impact on the study intersections, no mitigation is required.

The City of Huntington Beach has a Memorandum of Understanding (MOU), signed in 2006, between the Cities of Costa Mesa, Fountain Valley, Huntington Beach and the Orange County Transportation Authority. This MOU includes the widening of Brookhurst Street and Adams Avenue intersection as one of the improvements. The following table summarizes the with-improvements ICU values and LOS, along with a listing of the planned improvements.

	2030 With-Improvements			
	AM Peak Hour		PM Peak Hour	
Intersection	**ICU**	**LOS**	**ICU**	**LOS**
1. Brookhurst & Adams	.81	D	.88	D
Planned Improvements: • Separate eastbound right turn lane • Add 4th westbound through lane • Add double northbound right turn lanes • Add 4th eastbound through lane				

As shown, the intersection will operate at an acceptable LOS with the planned improvements.

Congestion Management Program (CMP) analysis intersections are located at Beach Boulevard and Adams Avenue west of the study area and at Harbor Boulevard and Adams Avenue east of the study area. Projects generating less than 2,400 daily trips are not required to prepare a CMP analysis. The proposed project would generate 144 daily trips and is not required to prepare a CMP analysis.

4.3 PARKING ANALYSIS

The project is located on the current site of the school district's headquarters and LeBard Park. LeBard closed school site is currently used for Little League baseball fields. The project would retain parking of the existing Little League baseball fields and provide expanded parking on the

eastern portion of the project area within LeBard Park. The proposed project would provide 68 parking spaces in a parking lot for the Little League and park activities, which represents a reduction in the amount of parking spaces provided. The adequacy of the proposed parking to accommodate the park's and Ocean View Little League's parking needs was analyzed in *LeBard Parking Study – City of Huntington Beach* by Stantec in April 2015.

Parking for the residential uses would be sufficient to meet the City's code required parking. Each home would have the Code-required parking on-site in garages and driveways. In addition, 24 on-street parking spaces would be provided along the proposed street that would serve the single-family residences as well as the public. These on-street parking spaces would be available to the public; however, these spaces were not included in the future inventory of on-street parking for the park since they are located directly in front of the homes in the proposed development.

4.3.1 Parking Data Collection and Analysis

An extensive data collection effort was performed to evaluate the existing parking conditions with and without the Little League activities, which currently uses the district's on-site parking. Vehicles have the option of parking in the parking lot or on the on-street parking located along Craimer Lane, Warwick Drive, and Cynthia Drive.

The current parking supply is provided in on-site parking lots as well as on-street. A total of 147 parking spaces are currently provided in 2 on-site parking lots, and approximately 53 spaces are provided on-street along Craimer Lane, Warwick Drive, and Cynthia Drive along the park frontage on the park side of the street per the Tentative Tract Map (TRG/MSA).

Counts of the existing on-site and on-street parking were performed in April and May 2014. Data was collected hourly for a typical weekday between 4:30 PM and 8:30 PM and for a typical weekend between 7:30 AM and 7:30 PM, with and without Little League activities.

Data was collected to illustrate how many vehicles currently park on Cynthia Drive, Warwick Drive, and Craimer Lane during Little League baseball games, as well as on Sundays when there are no events being held. The analysis assumes no change to the existing Little League activities since the existing baseball fields will be retained with the proposed project.

The results for a typical weekday with Little League events showed the overall peak parking demand for the weekday was between 5:30 PM and 6:30 PM, when a total of 141 out of 147 spaces were occupied. During this same time, the total on-street parking demand was 46 out of 53 spaces occupied. Without Little League events, the overall peak parking demand for the weekday was between 5:30 PM and 6:30 PM, with peak demand of 75 out of 141 spaces occupied. At this time, the on-street parking showed 10 out of 53 spaces occupied.

4.3.2 Parking with Proposed Project

As discussed previously, the proposed project would provide 68 marked spaces on-site. The design of the parking lot driveway and the residential project will result in the loss of one on-street space on Warwick Drive and two spaces on Craimer Lane, resulting in a total of 50 on-street spaces adjacent to the park.

A baseline parking demand for the Little League events was derived to eliminate the parking demand from the school district and park users. Without Little League events, sufficient parking is available to accommodate the weekday and weekend parking demand for both the neighborhood and City park.

The Little League events would occur during the peak three month season from March through May. Based on the current parking demand, the proposed parking lot may exceed capacity by 6 vehicles between 5:30 PM and 6:30 PM on weekdays during Little League events. The overflow demand will utilize on-street parking, with a peak demand of 6 additional cars slated for Craimer Lane/Warwick Drive and Cynthia Drive. The available on-street parking adjacent to the park is sufficient to accommodate the addition of 6 vehicles on weekdays between 5:30 and 6:30 PM.

On weekends during Little League events, based on the current parking demand, the proposed project parking lot may exceed capacity by up to 59 vehicles from 8:30 AM to 4:30 PM. The overflow demand would utilize on-street parking on Craimer Lane and Cynthia Drive during this time period, with up to 35 vehicles exceeding the amount of on-street parking adjacent to the park. This on-street spillover could impact a slightly larger portion of the local neighborhood, since portions of the on-street parking adjacent to the park are already close to capacity, and the peak demand is exceeding capacity today. The on-street spillover parking might occur on the south side of Cynthia Drive, the north side of Warwick Drive, or Crailet Drive with access to the ball fields through the walkway north of the project site, which provide a total of 46 additional on-street spaces. Parking encroachment is not expected to occur on additional residential streets in the area.

5.0 CONCLUSIONS

The proposed project consists of 15 single family dwelling units on the site of the former LeBard Elementary School. In addition to the residential uses, the LeBard Park school site is developed with 2 lighted tennis courts, a tot lot, passive recreational open space, and a concession/restroom building, with 6 non-lighted baseball fields used by the local Little League Baseball team (Seaview Little League). The adjacent LeBard park site is developed as part of the project; however, the existing LeBard parking lot will be expanded and a new concession building will be constructed.

Project trips consist of the residential uses only since the existing park is not anticipated to increase the amount of traffic generated by the park uses. The proposed residential units would generate approximately 11 AM peak hour trips, 16 PM peak hour trips, and 144 daily trips.

Three study intersections were evaluated for potential peak hour project impacts. Project traffic was assigned to the surrounding circulation system and added to existing and General Plan buildout forecast intersection volumes. The proposed project would have no significant impact on the surrounding circulation system during the peak hours, and no mitigation is required.

Currently, LeBard Park and Little League users park on the adjacent streets in addition to the on-site parking lots. The proposed project would reduce the amount of parking spaces available for park and Little League users. On weekends and weekdays without Little League events, sufficient parking would be available on-site to accommodate park users.

For conditions with Little League events, the parking lot may overflow by 6 vehicles between 5:30 and 6:30 PM; however, sufficient on-street parking is available adjacent to the park frontage to accommodate the weekday overflow parking.

For weekends with Little League events, the parking lot will exceed capacity from 9:30 AM to 4:30 PM during the peak three months in Spring, from March through May. The parking lot peak overflow demand is 59 vehicles and will utilize on-street parking, with up to 35 additional cars slated for Craimer Lane and Cynthia Drive during this time period. This on-street spillover could impact a slightly larger portion of the local neighborhood since portions of the on-street parking adjacent to the park are already close to capacity, and the peak demand is exceeding capacity today. The on-street spillover parking might occur on the south side of Cynthia Drive, the north side of Warwick Drive, or Crailet Drive with access to the ball fields through the walkway north of the project site, which provide a total of 46 additional on-street spaces. Parking encroachment is not expected to occur on additional residential streets in the area.

Appendix A ICU CALCULATION WORKSHEETS

Peak hour intersection volume/capacity ratios are calculated by means of intersection capacity utilization (ICU) values. ICU calculations were performed for the intersections shown in Figure A-1. For simplicity, signalization is assumed at each intersection. Precise ICU calculations of existing non-signalized intersections would require a more detailed analysis.

The procedure is based on the critical movement methodology, and shows the amount of capacity utilized by each critical move. A capacity of 1,700 vehicles per hour (VPH) per lane is assumed together with a .05 clearance interval. A "de-facto" right-turn lane is used in the ICU calculation for cases where a curb lane is wide enough to separately serve both through and right-turn traffic (typically with a width of 19 feet from curb to outside of through-lane with parking prohibited during peak periods). Such lanes are treated the same as striped right-turn lanes during the ICU calculations, but they are denoted on the ICU calculation worksheets using the letter "d" in place of a numerical entry for right-turn lanes.

The methodology also incorporates a check for right-turn capacity utilization. Both right-turn-on-green (RTOG) and right-turn-on-red (RTOR) capacity availability are calculated and checked against the total right-turn capacity need. If insufficient capacity is available, then an adjustment is made to the total capacity utilization value. The following example shows how this adjustment is made.

Example for Northbound Right

<u>1. Right-Turn-On-Green (RTOG)</u>

If NBT is critical move, then:

RTOG = V/C (NBT)

Otherwise,

RTOG = V/C (NBL) + V/C (SBT) - V/C (SBL)

<u>2. Right-Turn-On-Red (RTOR)</u>

If WBL is critical move, then:

RTOR = V/C (WBL)

Otherwise,

RTOR = V/C (EBL) + V/C (WBT) - V/C (EBT)

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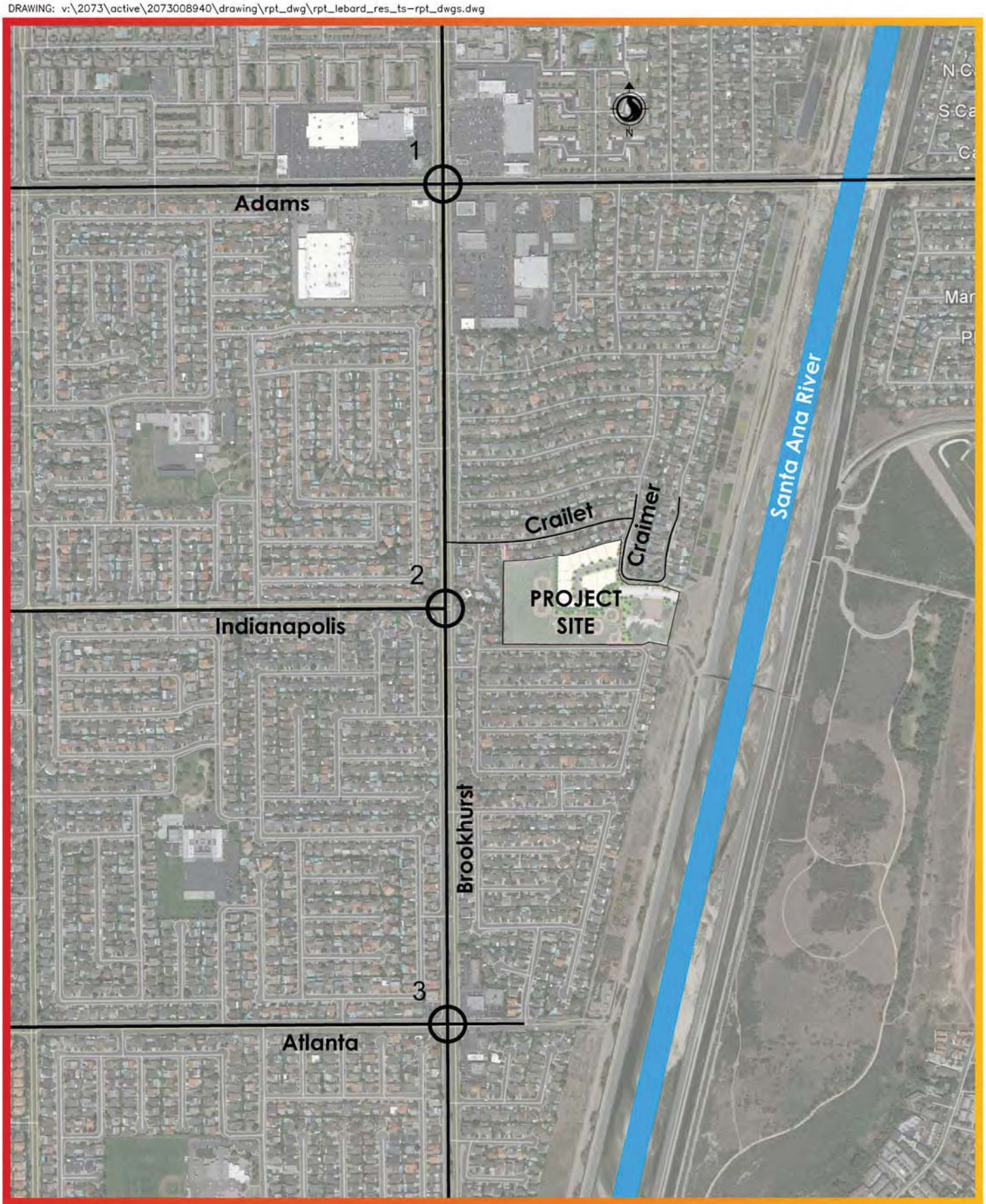


Stantec

Study Intersection Locations

Figure A-1

3. Right-Turn Overlap Adjustment

If the northbound right is assumed to overlap with the adjacent westbound left, adjustments to the RTOG and RTOR values are made as follows:

RTOG = RTOG + V/C (WBL)

RTOR = RTOR - V/C (WBL)

4. Total Right-Turn Capacity (RTC) Availability for NBR

RTC = RTOG + factor x RTOR

Where factor = RTOR saturation flow factor (50%)

Right-turn adjustment is then as follows:

Additional ICU = V/C (NBR) - RTC

A zero or negative value indicates that adequate capacity is available and no adjustment is necessary. A positive value indicates that the available RTOR and RTOG capacity does not adequately accommodate the right-turn V/C; therefore, the right-turn is essentially considered to be a critical movement. In such cases, the right-turn adjustment is noted on the ICU worksheet and it is included in the total capacity utilization value. When it is determined that a right-turn adjustment is required for more than one right-turn movement, the word "multi" is printed on the worksheet instead of an actual right-turn movement reference, and the right-turn adjustments are cumulatively added to the total capacity utilization value. In such cases, further operational evaluation is typically carried out to determine if under actual operational conditions, the critical right-turns would operate simultaneously, and therefore a right-turn adjustment credit should be applied.

Shared Lane V/C Methodology

For intersection approaches where shared usage of a lane is permitted by more than one turn movement (e.g., left/through, through/right, left/through/right), the individual turn volumes are evaluated to determine whether dedication of the shared lane is warranted to any one given turn movement. The following example demonstrates how this evaluation is carried out:

Example for Shared Left/Through Lane

1. Average Lane Volume (ALV)

$$ALV = \frac{\text{Left-Turn Volume + Through Volume}}{\text{Total Left + Through Approach Lanes (including shared lane)}}$$

2. ALV for Each Approach

$$\text{ALV (Left)} = \frac{\text{Left-Turn Volume}}{\text{Left Approach Lanes (including shared lane)}}$$

$$\text{ALV (Through)} = \frac{\text{Through Volume}}{\text{Through Approach Lanes (including shared lane)}}$$

3. Lane Dedication is Warranted

If ALV (Left) is greater than ALV, then full dedication of the shared lane to the left-turn approach is warranted. Left-turn and through V/C ratios for this case are calculated as follows:

$$\text{V/C (Left)} = \frac{\text{Left-Turn Volume}}{\text{Left Approach Capacity (including shared lane)}}$$

$$\text{V/C (Through)} = \frac{\text{Through Volume}}{\text{Through Approach Capacity (excluding shared lane)}}$$

Similarly, if ALV (Through) is greater than ALV then full dedication to the through approach is warranted, and left-turn and through V/C ratios are calculated as follows:

$$\text{V/C (Left)} = \frac{\text{Left-Turn Volume}}{\text{Left Approach Capacity (excluding shared lane)}}$$

$$\text{V/C (Through)} = \frac{\text{Through Volume}}{\text{Through Approach Capacity (including shared lane)}}$$

4. Lane Dedication is not Warranted

If ALV (Left) and ALV (Through) are both less than ALV, the left/through lane is assumed to be truly shared and each left, left/through or through approach lane carries an evenly distributed volume of traffic equal to ALV. A combined left/through V/C ratio is calculated as follows:

$$\text{V/C (Left/Through)} = \frac{\text{Left-Turn Volume + Through Volume}}{\text{Total Left + Through Approach Capacity (including shared lane)}}$$

This V/C (Left/Through) ratio is assigned as the V/C (Through) ratio for the critical movement analysis and ICU summary listing.

If split phasing has not been designated for this approach, the relative proportion of V/C (Through) that is attributed to the left-turn volume is estimated as follows:

If approach has more than one left-turn lane (including shared lane), then:

V/C (Left) = V/C (Through)

If approach has only one left-turn lane (shared lane), then:

$$\text{V/C (Left)} = \frac{\text{Left-Turn Volume}}{\text{Single Approach Lane Capacity}}$$

If this left-turn movement is determined to be a critical movement, the V/C (Left) value is posted in brackets on the ICU summary printout.

These same steps are carried out for shared through/right lanes. If full dedication of a shared through/right lane to the right-turn movement is warranted, the right-turn V/C value calculated in step three is checked against the RTOR and RTOG capacity availability if the option to include right-turns in the V/C ratio calculations is selected. If the V/C value that is determined using the shared lane methodology described here is reduced due to RTOR and RTOG capacity availability, the V/C value for the through/right lanes is posted in brackets.

When an approach contains more than one shared lane (e.g., left/through and through/right), steps one and two listed above are carried out for the three turn movements combined. Step four is carried out if dedication is not warranted for either of the shared lanes. If dedication of one of the shared lanes is warranted to one movement or another, step three is carried out for the two movements involved, and then steps one through four are repeated for the two movements involved in the other shared lane.

1. Brookhurst & Adams

Existing

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	3400	78	.02	236	.07
NBT	3	5100	824	.23*	1010	.23*
NBR	0	0	362		178	
SBL	2	3400	421	.12*	333	.10*
SBT	3	5100	671	.15	906	.20
SBR	0	0	116		129	
EBL	2	3400	189	.06	228	.07*
EBT	3	5100	1830	.36*	756	.15
EBR	1	1700	59	.03	84	.05
WBL	2	3400	192	.06*	291	.09
WBT	3	5100	562	.11	1665	.33*
WBR	1	1700	185	.11	515	.30
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**.82**		**.78**

Existing + Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	3400	78	.02	236	.07
NBT	3	5100	828	.23*	1013	.23*
NBR	0	0	364		179	
SBL	2	3400	421	.12*	333	.10*
SBT	3	5100	673	.15	911	.20
SBR	0	0	116		129	
EBL	2	3400	189	.06	228	.07*
EBT	3	5100	1830	.36*	756	.15
EBR	1	1700	59	.03	85	.05
WBL	2	3400	193	.06*	293	.09
WBT	3	5100	562	.11	1665	.33*
WBR	1	1700	185	.11	515	.30
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**.82**		**.78**

2030 No-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	3400	130	.04	290	.09
NBT	3	5100	860	.25*	1280	.31*
NBR	0	0	630	.37	300	
SBL	2	3400	500	.15*	480	.14*
SBT	3	5100	930	.21	1340	.29
SBR	0	0	130		160	
EBL	2	3400	250	.07	340	.10*
EBT	3	5100	2530	.50*	1200	.24
EBR	1	1700	70	.04	90	.05
WBL	2	3400	240	.07*	470	.14
WBT	3	5100	660	.13	2330	.46*
WBR	1	1700	280	.16	380	.22
Right Turn Adjustment			NBR	.08*		
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**1.10**		**1.06**

2030 with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	3400	130	.04	290	.09
NBT	3	5100	864	.25*	1283	.31*
NBR	0	0	632	.37	301	
SBL	2	3400	500	.15*	480	.14*
SBT	3	5100	932	.21	1345	.30
SBR	0	0	130		160	
EBL	2	3400	250	.07	340	.10*
EBT	3	5100	2530	.50*	1200	.24
EBR	1	1700	70	.04	91	.05
WBL	2	3400	241	.07*	472	.14
WBT	3	5100	660	.13	2330	.46*
WBR	1	1700	280	.16	380	.22
Right Turn Adjustment			NBR	.08*		
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**1.10**		**1.06**

1. Brookhurst & Adams

2030 with Project w/Planned Improvements

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	3400	130	.04	290	.09*
NBT	3	5100	864	.17*	1283	.25
NBR	2	3400	632	.19	301	.09
SBL	2	3400	500	.15*	480	.14
SBT	3	5100	932	.21	1345	.30*
SBR	0	0	130		160	
EBL	2	3400	250	.07	340	.10*
EBT	4	6800	2530	.37*	1200	.18
EBR	1	1700	70	.04	91	.05
WBL	2	3400	241	.07*	472	.14
WBT	4	6800	660	.10	2330	.34*
WBR	1	1700	280	.16	380	.22
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**.81**		**.88**

2. Brookhurst & Indianapolis

Existing

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	72	.04*	63	.04*
NBT	3	5100	1044	.20	1314	.26
NBR	0	0	0		0	
SBL	0	0	0		0	
SBT	3	5100	791	.18*	1105	.25*
SBR	0	0	115		192	
EBL	2	3400	199	.06*	110	.03*
EBT	0	0	0		0	
EBR	1	1700	123	.07	40	.02
WBL	0	0	0		0	
WBT	0	0	0		0	
WBR	0	0	0		0	
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**.33**		**.37**

Existing + Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	72	.04*	63	.04*
NBT	3	5100	1044	.20	1316	.26
NBR	0	0	0		0	
SBL	0	0	0		0	
SBT	3	5100	792	.18*	1106	.25*
SBR	0	0	116		193	
EBL	2	3400	199	.06*	111	.03*
EBT	0	0	0		0	
EBR	1	1700	123	.07	40	.02
WBL	0	0	0		0	
WBT	0	0	0		0	
WBR	0	0	0		0	
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**.33**		**.37**

2030 No-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	90	.05	170	.10*
NBT	3	5100	1190	.23*	1290	.25
NBR	0	0	0		0	
SBL	0	0	0		0	
SBT	3	5100	650	.17	1360	.30*
SBR	0	0	220		190	
EBL	2	3400	400	.12*	260	.08*
EBT	0	0	0		0	
EBR	1	1700	200	.12	40	.02
WBL	0	0	0		0	
WBT	0	0	0		0	
WBR	0	0	0		0	
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**.40**		**.53**

2030 with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	90	.05	170	.10*
NBT	3	5100	1190	.23*	1292	.25
NBR	0	0	0		0	
SBL	0	0	0		0	
SBT	3	5100	651	.17	1361	.30*
SBR	0	0	221		191	
EBL	2	3400	400	.12*	261	.08*
EBT	0	0	0		0	
EBR	1	1700	200	.12	40	.02
WBL	0	0	0		0	
WBT	0	0	0		0	
WBR	0	0	0		0	
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**.40**		**.53**

3. Brookhurst & Atlanta

Existing

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	48	.03*	121	.07*
NBT	3	5100	739	.15	1161	.23
NBR	0	0	15		30	
SBL	1	1700	25	.01	25	.01
SBT	3	5100	747	.17*	835	.21*
SBR	0	0	131		227	
EBL	1	1700	290	.17*	187	.11*
EBT	1	1700	18	.01	16	.01
EBR	1	1700	232	.14	116	.07
WBL	1	1700	24	.01	23	.01
WBT	2	3400	20	.01*	31	.01*
WBR	0	0	16		12	
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .43 .45

Existing + Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	48	.03*	121	.07*
NBT	3	5100	739	.15	1163	.23
NBR	0	0	15		30	
SBL	1	1700	25	.01	25	.01
SBT	3	5100	748	.17*	836	.21*
SBR	0	0	131		227	
EBL	1	1700	290	.17*	187	.11*
EBT	1	1700	18	.01	16	.01
EBR	1	1700	232	.14	116	.07
WBL	1	1700	24	.01	23	.01
WBT	2	3400	20	.01*	31	.01*
WBR	0	0	16		12	
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .43 .45

2030 No-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	90	.05*	330	.19*
NBT	3	5100	900	.18	1020	.21
NBR	0	0	20		30	
SBL	1	1700	20	.01	20	.01
SBT	3	5100	820	.18*	750	.19*
SBR	0	0	80		210	
EBL	1	1700	390	.23*	260	.15*
EBT	1	1700	30	.02	30	.02
EBR	1	1700	430	.25	270	.16
WBL	1	1700	30	.02	10	.01
WBT	2	3400	30	.01*	30	.01*
WBR	0	0	10		10	
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .52 .59

2030 with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	90	.05*	330	.19*
NBT	3	5100	900	.18	1022	.21
NBR	0	0	20		30	
SBL	1	1700	20	.01	20	.01
SBT	3	5100	821	.18*	751	.19*
SBR	0	0	80		210	
EBL	1	1700	390	.23*	260	.15*
EBT	1	1700	30	.02	30	.02
EBR	1	1700	430	.25	270	.16
WBL	1	1700	30	.02	10	.01
WBT	2	3400	30	.01*	30	.01*
WBR	0	0	10		10	
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .52 .59

Appendix B INTERSECTION COUNT DATA

Transportation Studies, Inc.
2640 Walnut Avenue, Suite H
Tustin, CA. 92780

City: HUNTINGTON BEACH
N-S- Direction: BROOKHURST STREET
E-W Direction: ADAMS AVENUE

File Name : H1410005
Site Code : 00000000
Start Date : 10/8/2014
Page No : 1

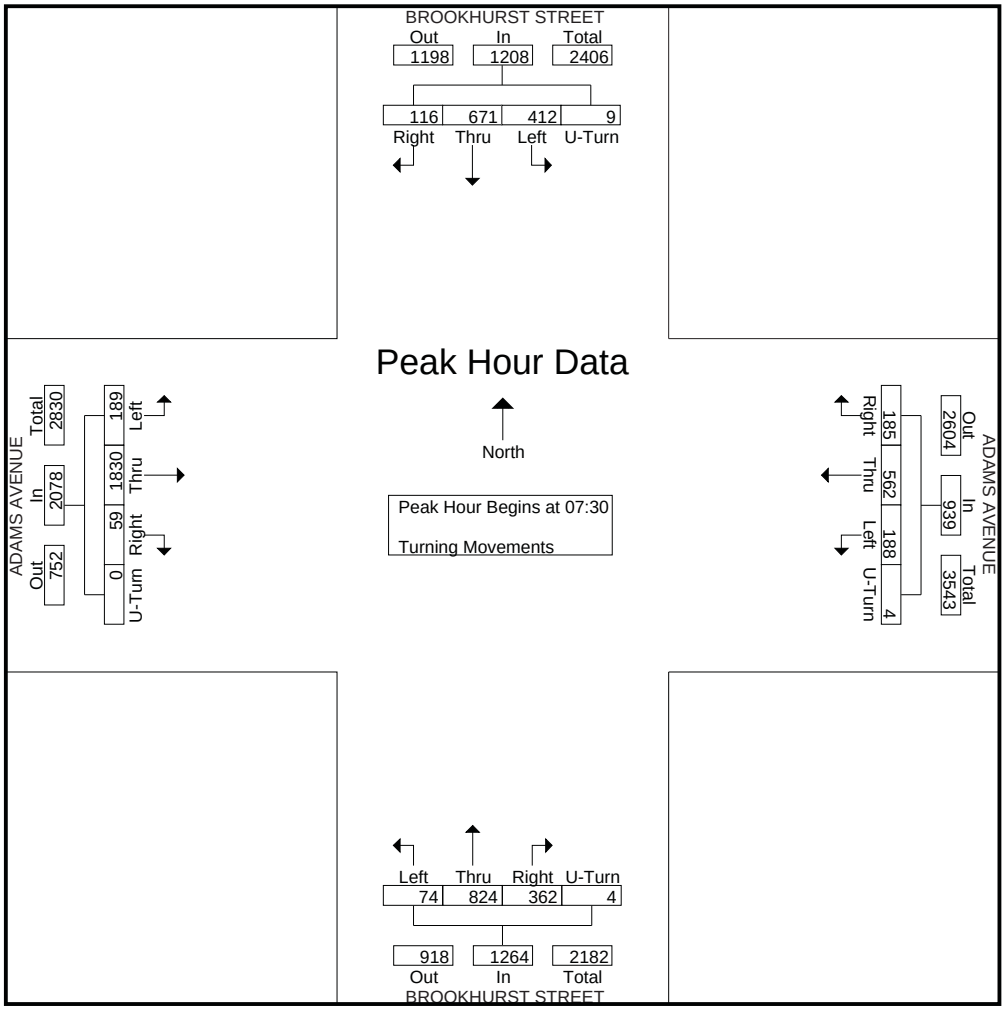
Groups Printed- Turning Movements

	BROOKHURST STREET Southbound				ADAMS AVENUE Westbound				BROOKHURST STREET Northbound				ADAMS AVENUE Eastbound				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00	14	74	46	3	33	69	14	0	46	148	8	0	14	329	47	0	845
07:15	18	128	64	1	39	82	35	1	68	155	10	0	10	407	37	2	1057
07:30	18	142	99	1	49	134	36	1	99	213	20	0	7	497	37	0	1353
07:45	36	172	113	1	44	141	40	3	90	221	18	0	19	459	43	0	1400
Total	86	516	322	6	165	426	125	5	303	737	56	0	50	1692	164	2	4655
08:00	35	181	103	3	41	160	51	0	79	165	20	1	21	424	44	0	1328
08:15	27	176	97	4	51	127	61	0	94	225	16	3	12	450	65	0	1408
08:30	22	155	76	3	45	113	41	0	90	198	29	1	25	397	57	0	1252
08:45	24	174	86	2	43	121	34	0	70	214	30	2	23	369	62	0	1254
Total	108	686	362	12	180	521	187	0	333	802	95	7	81	1640	228	0	5242
16:00	26	169	78	6	135	382	67	0	36	184	41	6	27	170	49	3	1379
16:15	51	234	66	6	125	337	62	0	40	249	53	2	22	152	54	0	1453
16:30	36	197	47	8	132	422	78	1	31	232	45	4	25	182	66	3	1509
16:45	28	217	88	4	141	379	62	0	43	270	68	3	21	168	56	0	1548
Total	141	817	279	24	533	1520	269	1	150	935	207	15	95	672	225	6	5889
17:00	23	215	88	3	142	435	82	0	50	222	48	5	20	184	59	2	1578
17:15	33	242	70	7	148	422	67	0	44	289	52	12	20	187	52	2	1647
17:30	38	210	79	2	107	348	73	0	49	255	45	7	23	207	57	1	1501
17:45	35	239	77	7	118	460	69	0	35	244	57	10	21	178	55	0	1605
Total	129	906	314	19	515	1665	291	0	178	1010	202	34	84	756	223	5	6331
Grand Total	464	2925	1277	61	1393	4132	872	6	964	3484	560	56	310	4760	840	13	22117
Apprch %	9.8	61.9	27	1.3	21.8	64.5	13.6	0.1	19	68.8	11.1	1.1	5.2	80.4	14.2	0.2	
Total %	2.1	13.2	5.8	0.3	6.3	18.7	3.9	0	4.4	15.8	2.5	0.3	1.4	21.5	3.8	0.1	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite H
Tustin, CA. 92780

File Name : H1410005
Site Code : 00000000
Start Date : 10/8/2014
Page No : 2

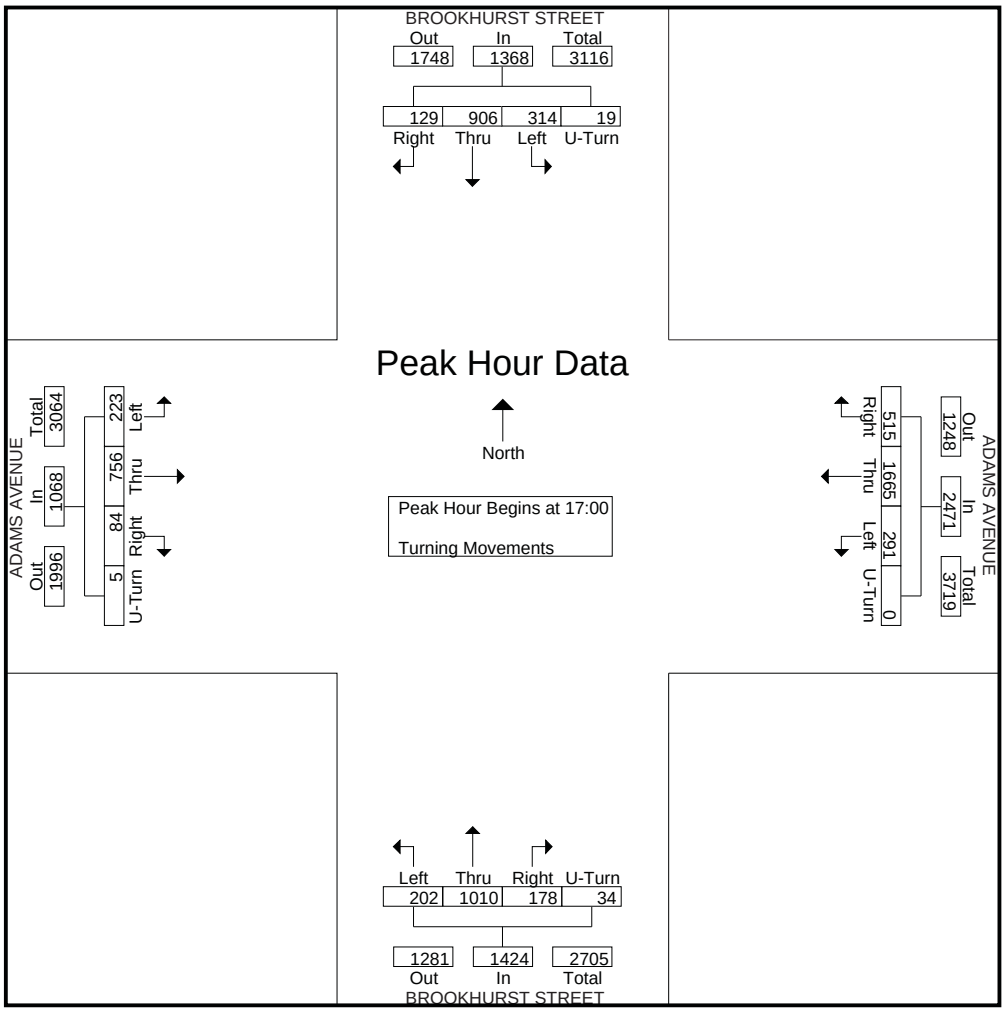
	BROOKHURST STREET Southbound					ADAMS AVENUE Westbound					BROOKHURST STREET Northbound					ADAMS AVENUE Eastbound					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30																					
07:30	18	142	99	1	260	49	134	36	1	220	**99**	213	**20**	0	332	7	**497**	37	0	**541**	1353
07:45	**36**	172	**113**	1	**322**	44	141	40	**3**	228	90	221	18	0	329	19	459	43	0	521	1400
08:00	35	**181**	103	3	322	41	**160**	51	0	**252**	79	165	20	1	265	**21**	424	44	0	489	1328
08:15	27	176	97	**4**	304	**51**	127	**61**	0	239	94	**225**	16	**3**	**338**	12	450	**65**	0	527	**1408**
Total Volume	116	671	412	9	1208	185	562	188	4	939	362	824	74	4	1264	59	1830	189	0	2078	5489
% App. Total	9.6	55.5	34.1	0.7		19.7	59.9	20	0.4		28.6	65.2	5.9	0.3		2.8	88.1	9.1	0		
PHF	.806	.927	.912	.563	.938	.907	.878	.770	.333	.932	.914	.916	.925	.333	.935	.702	.921	.727	.000	.960	.975



Transportation Studies, Inc.
2640 Walnut Avenue, Suite H
Tustin, CA. 92780

File Name : H1410005
Site Code : 00000000
Start Date : 10/8/2014
Page No : 3

	BROOKHURST STREET Southbound					ADAMS AVENUE Westbound					BROOKHURST STREET Northbound					ADAMS AVENUE Eastbound					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 17:00																					
17:00	23	215	**88**	3	329	142	435	**82**	0	**659**	**50**	222	48	5	325	20	184	**59**	**2**	265	1578
17:15	33	**242**	70	**7**	352	**148**	422	67	0	637	44	**289**	52	**12**	**397**	20	187	52	2	261	**1647**
17:30	**38**	210	79	2	329	107	348	73	0	528	49	255	45	7	356	**23**	**207**	57	1	**288**	1501
17:45	35	239	77	7	**358**	118	**460**	69	0	647	35	244	**57**	10	346	21	178	55	0	254	1605
Total Volume	129	906	314	19	1368	515	1665	291	0	2471	178	1010	202	34	1424	84	756	223	5	1068	6331
% App. Total	9.4	66.2	23	1.4		20.8	67.4	11.8	0		12.5	70.9	14.2	2.4		7.9	70.8	20.9	0.5		
PHF	.849	.936	.892	.679	.955	.870	.905	.887	.000	.937	.890	.874	.886	.708	.897	.913	.913	.945	.625	.927	.961



Transportation Studies, Inc.
2640 Walnut Avenue, Suite H
Tustin, CA. 92780

City: HUNTINGTON BEACH
N-S- Direction: BROOKHURST STREET
E-W Direction: INDIANAPOLIS AVENUE

File Name : h1410006
Site Code : 00000000
Start Date : 10/8/2014
Page No : 1

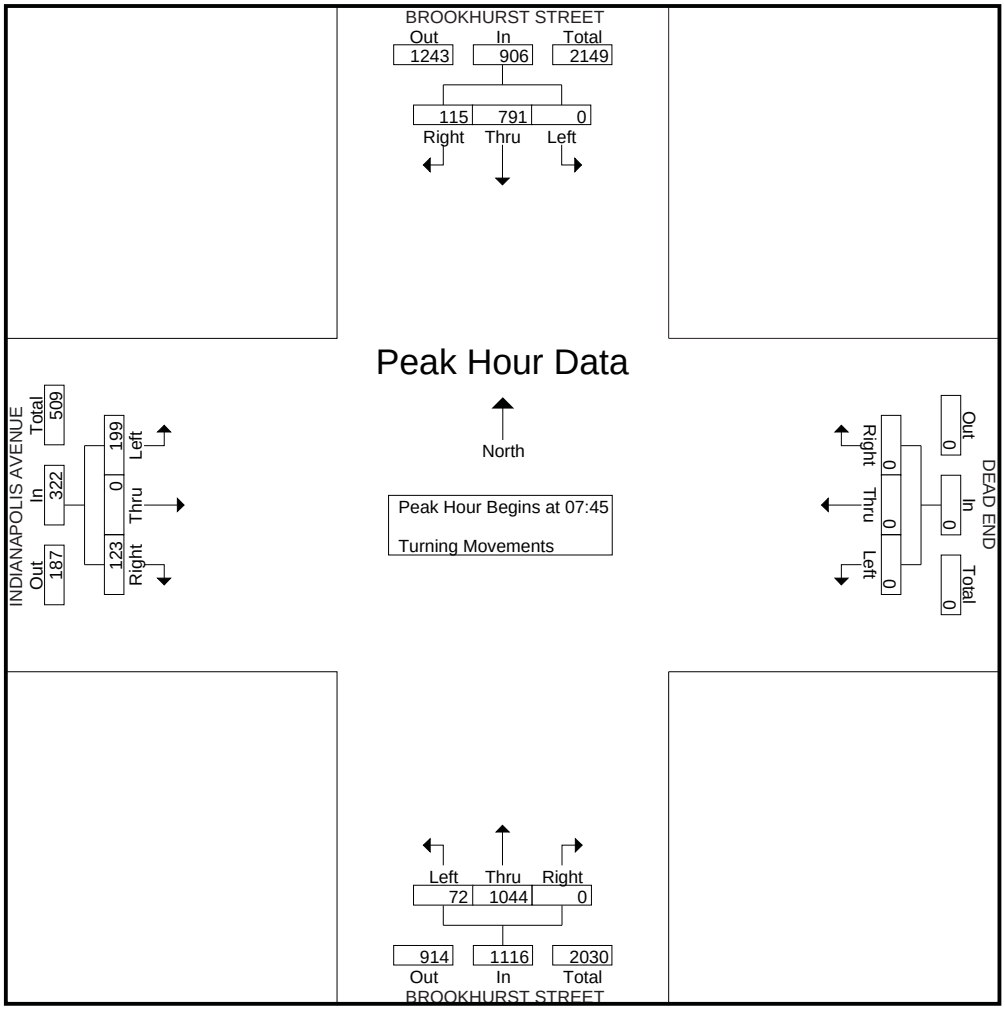
Groups Printed- Turning Movements

	BROOKHURST STREET Southbound			DEAD END Westbound			BROOKHURST STREET Northbound			INDIANAPOLIS AVENUE Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00	5	106	0	0	0	0	0	175	2	8	0	29	325
07:15	16	161	0	0	0	0	0	190	4	6	0	26	403
07:30	34	154	0	0	0	0	0	258	10	16	0	37	509
07:45	23	192	0	0	0	0	0	277	14	16	0	46	568
Total	78	613	0	0	0	0	0	900	30	46	0	138	1805
08:00	39	192	0	0	0	0	0	230	26	24	0	35	546
08:15	34	215	0	0	0	0	0	272	22	46	0	70	659
08:30	19	192	0	0	0	0	0	265	10	37	0	48	571
08:45	19	202	0	0	0	0	0	227	2	12	0	70	532
Total	111	801	0	0	0	0	0	994	60	119	0	223	2308
16:00	47	228	0	0	0	0	0	258	5	10	0	26	574
16:15	42	234	0	0	0	0	0	288	7	18	0	28	617
16:30	40	282	0	0	0	0	0	294	15	10	0	23	664
16:45	47	239	0	0	0	0	0	319	12	10	0	23	650
Total	176	983	0	0	0	0	0	1159	39	48	0	100	2505
17:00	51	274	0	0	0	0	0	323	18	10	0	22	698
17:15	50	264	0	0	0	0	0	365	15	10	0	34	738
17:30	42	258	0	0	0	0	0	305	14	9	0	31	659
17:45	49	309	0	0	0	0	0	321	16	11	0	23	729
Total	192	1105	0	0	0	0	0	1314	63	40	0	110	2824
Grand Total	557	3502	0	0	0	0	0	4367	192	253	0	571	9442
Apprch %	13.7	86.3	0	0	0	0	0	95.8	4.2	30.7	0	69.3	
Total %	5.9	37.1	0	0	0	0	0	46.3	2	2.7	0	6	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite H
Tustin, CA. 92780

File Name : h1410006
Site Code : 00000000
Start Date : 10/8/2014
Page No : 2

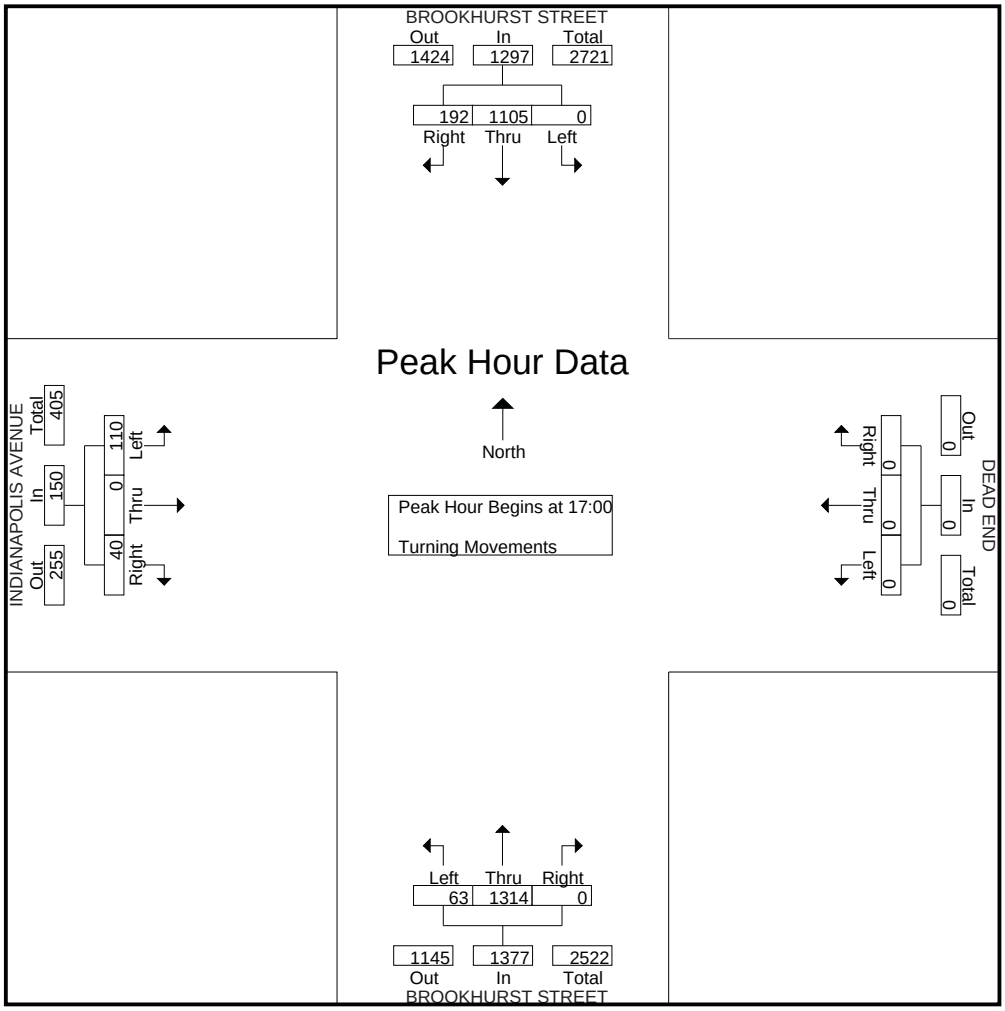
	BROOKHURST STREET Southbound				DEAD END Westbound				BROOKHURST STREET Northbound				INDIANAPOLIS AVENUE Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45																	
07:45	23	192	0	215	0	0	0	0	0	**277**	14	291	16	0	46	62	568
08:00	**39**	192	0	231	0	0	0	0	0	230	**26**	256	24	0	35	59	546
08:15	34	**215**	0	**249**	0	0	0	0	0	272	22	**294**	**46**	0	**70**	**116**	**659**
08:30	19	192	0	211	0	0	0	0	0	265	10	275	37	0	48	85	571
Total Volume	115	791	0	906	0	0	0	0	0	1044	72	1116	123	0	199	322	2344
% App. Total	12.7	87.3	0		0	0	0		0	93.5	6.5		38.2	0	61.8		
PHF	.737	.920	.000	.910	.000	.000	.000	.000	.000	.942	.692	.949	.668	.000	.711	.694	.889



Transportation Studies, Inc.
2640 Walnut Avenue, Suite H
Tustin, CA. 92780

File Name : h1410006
Site Code : 00000000
Start Date : 10/8/2014
Page No : 3

	BROOKHURST STREET Southbound				DEAD END Westbound				BROOKHURST STREET Northbound				INDIANAPOLIS AVENUE Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 17:00																	
17:00	**51**	274	0	325	0	0	0	0	0	323	**18**	341	10	0	22	32	698
17:15	50	264	0	314	0	0	0	0	0	**365**	15	**380**	10	0	**34**	**44**	**738**
17:30	42	258	0	300	0	0	0	0	0	305	14	319	9	0	31	40	659
17:45	49	**309**	0	**358**	0	0	0	0	0	321	16	337	**11**	0	23	34	729
Total Volume	192	1105	0	1297	0	0	0	0	0	1314	63	1377	40	0	110	150	2824
% App. Total	14.8	85.2	0		0	0	0		0	95.4	4.6		26.7	0	73.3		
PHF	.941	.894	.000	.906	.000	.000	.000	.000	.000	.900	.875	.906	.909	.000	.809	.852	.957



Transportation Studies, Inc.
2640 Walnut Avenue, Suite H
Tustin, CA. 92780

City: HUNTINGTON BEACH
N-S- Direction: BROOKHURST STREET
E-W Direction: ATLANTA AVENUE

File Name : H1410007
Site Code : 00000000
Start Date : 10/8/2014
Page No : 1

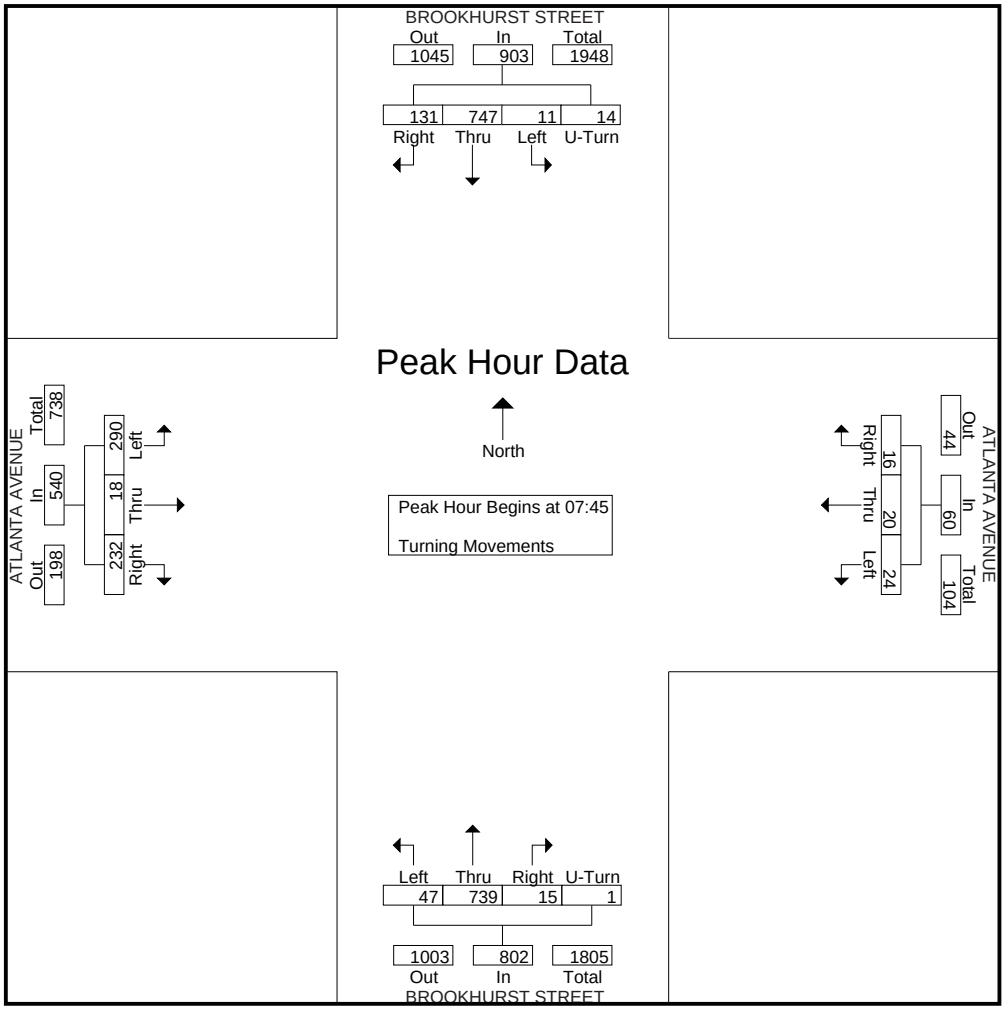
Groups Printed- Turning Movements

	BROOKHURST STREET Southbound				ATLANTA AVENUE Westbound			BROOKHURST STREET Northbound				ATLANTA AVENUE Eastbound			
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	Right	Thru	Left	U-Turn	Right	Thru	Left	Int. Total
07:00	14	95	2	1	0	3	4	2	125	7	0	50	3	31	337
07:15	31	122	3	2	2	4	4	3	140	1	0	44	1	33	390
07:30	31	136	1	1	7	1	10	1	185	10	0	41	1	62	487
07:45	42	166	3	3	5	2	7	4	179	7	0	52	1	82	553
Total	118	519	9	7	14	10	25	10	629	25	0	187	6	208	1767
08:00	28	173	1	5	2	3	4	1	158	10	0	54	2	65	506
08:15	37	211	4	2	3	10	6	5	199	11	0	67	7	76	638
08:30	24	197	3	4	6	5	7	5	203	19	1	59	8	67	608
08:45	26	187	2	5	2	2	7	3	172	14	0	37	2	36	495
Total	115	768	10	16	13	20	24	14	732	54	1	217	19	244	2247
16:00	50	185	3	1	4	4	9	5	244	21	1	28	6	28	589
16:15	46	186	5	2	6	4	4	4	243	17	0	33	3	43	596
16:30	50	215	5	2	4	9	6	5	281	35	0	32	4	35	683
16:45	47	185	1	7	1	7	8	7	264	21	1	28	6	42	625
Total	193	771	14	12	15	24	27	21	1032	94	2	121	19	148	2493
17:00	46	195	2	9	2	7	9	9	277	26	1	30	3	59	675
17:15	70	221	1	3	0	12	4	9	324	19	1	32	2	44	742
17:30	46	169	3	2	5	9	8	8	266	34	0	32	6	45	633
17:45	65	250	2	3	5	3	2	4	294	40	0	22	5	39	734
Total	227	835	8	17	12	31	23	30	1161	119	2	116	16	187	2784
Grand Total	653	2893	41	52	54	85	99	75	3554	292	5	641	60	787	9291
Apprch %	17.9	79.5	1.1	1.4	22.7	35.7	41.6	1.9	90.5	7.4	0.1	43.1	4	52.9	
Total %	7	31.1	0.4	0.6	0.6	0.9	1.1	0.8	38.3	3.1	0.1	6.9	0.6	8.5	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite H
Tustin, CA. 92780

File Name : H1410007
Site Code : 00000000
Start Date : 10/8/2014
Page No : 2

	BROOKHURST STREET Southbound					ATLANTA AVENUE Westbound				BROOKHURST STREET Northbound					ATLANTA AVENUE Eastbound				
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 07:45																			
07:45	**42**	166	3	3	214	5	2	**7**	14	4	179	7	0	190	52	1	**82**	135	553
08:00	28	173	1	**5**	207	2	3	4	9	1	158	10	0	169	54	2	65	121	506
08:15	37	**211**	**4**	2	**254**	3	**10**	6	**19**	**5**	199	11	0	215	**67**	7	76	**150**	**638**
08:30	24	197	3	4	228	**6**	5	7	18	5	**203**	**19**	**1**	**228**	59	**8**	67	134	608
Total Volume	131	747	11	14	903	16	20	24	60	15	739	47	1	802	232	18	290	540	2305
% App. Total	14.5	82.7	1.2	1.6		26.7	33.3	40		1.9	92.1	5.9	0.1		43	3.3	53.7		
PHF	.780	.885	.688	.700	.889	.667	.500	.857	.789	.750	.910	.618	.250	.879	.866	.563	.884	.900	.903



Transportation Studies, Inc.
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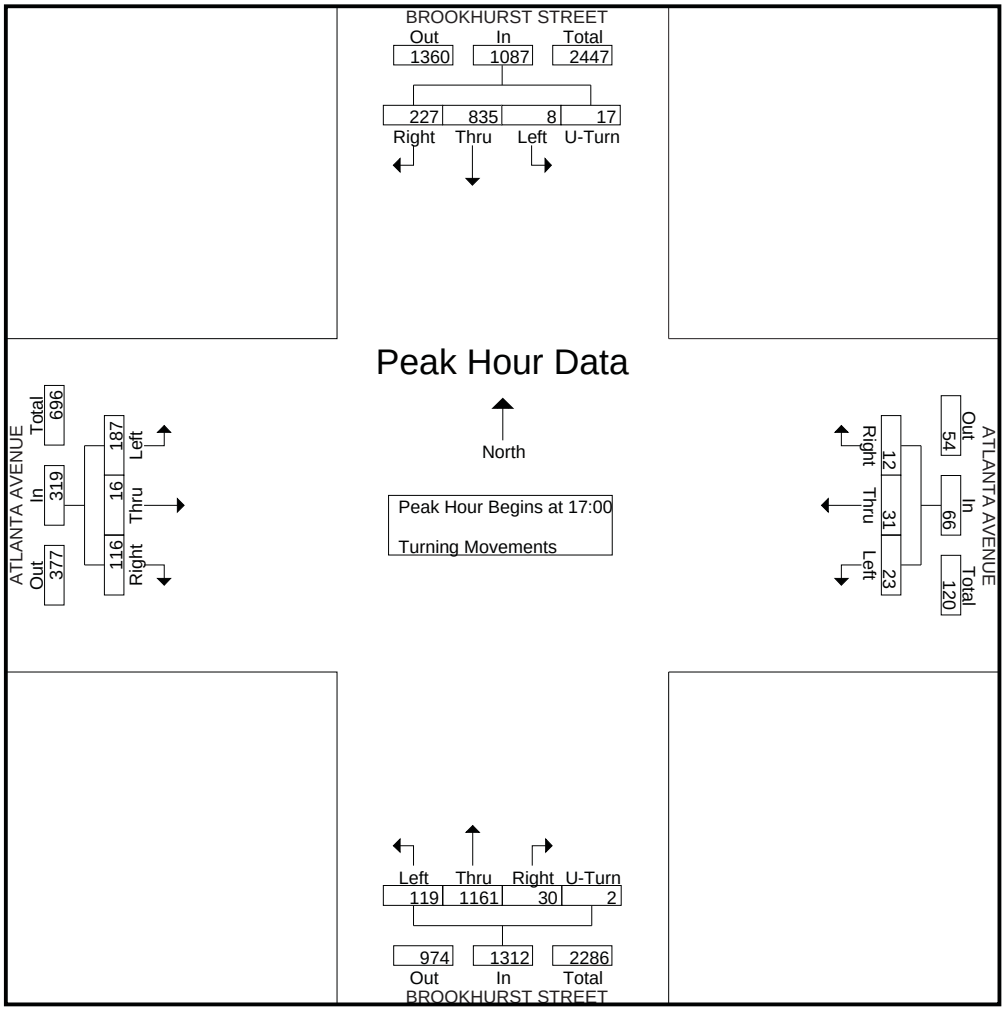
Tustin, CA. 92780

File Name : H1410007
Site Code : 00000000
Start Date : 10/8/2014
Page No : 3

	BROOKHURST STREET Southbound					ATLANTA AVENUE Westbound				BROOKHURST STREET Northbound					ATLANTA AVENUE Eastbound				
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 17:00																			
17:00	46	195	2	**9**	252	2	7	**9**	18	**9**	277	26	**1**	313	30	3	**59**	**92**	675
17:15	**70**	221	1	3	295	0	**12**	4	16	9	**324**	19	1	**353**	**32**	2	44	78	**742**
17:30	46	169	**3**	2	220	**5**	9	8	**22**	8	266	34	0	308	32	**6**	45	83	633
17:45	65	**250**	2	3	**320**	5	3	2	10	4	294	**40**	0	338	22	5	39	66	734
Total Volume	227	835	8	17	1087	12	31	23	66	30	1161	119	2	1312	116	16	187	319	2784
% App. Total	20.9	76.8	0.7	1.6		18.2	47	34.8		2.3	88.5	9.1	0.2		36.4	5	58.6		
PHF	.811	.835	.667	.472	.849	.600	.646	.639	.750	.833	.896	.744	.500	.929	.906	.667	.792	.867	.938