



Approved
as NOTED
8/21/17
MAL

MAL

Memo
RECEIVED
JUN 24 2017
DELAWARE COUNTY ENGINEER

To: Mike Love, Delaware County Engineers Office; John Piccin, Delaware County Engineers Office; Perry Morgan, Stantec; Joe Looby, Stantec

From: Doug Iles, Stantec

(to all via email)

Columbus, Ohio

File: 1734-09307

Date: June 23, 2017

Reference: Casto North Site Traffic Study

This memorandum summarizes traffic analysis required by the Delaware County Engineers Office for the proposed North Casto Site. The required analyses, study years (2018 and 2028) and other requirements are discussed in the approved memo of understanding (MOU) attached.

The attached site plan shows the proposed development is to include 90 single-family dwelling units. As such a traffic impact study is not required. Only analyses of the site driveway will be required. All of the site traffic will access the site via existing Olivero Drive.

Trip Generation & Site Trip Assignment

The trip generation is based on the *ITE Trip Generation Manual, 9th Edition* for land use 210 Single-Family Detached Housing and is summarized in the table below.

| Trip Generation Table | | | | |
|--|----|-----|----|-----|
| ITE 210: Single-Family Detached Housing (90 units) | | | | |
| | AM | | PM | |
| | In | Out | In | Out |
| ITE 210 | 18 | 55 | 60 | 36 |

Trips are assigned to be split 75% to/from the south and 25% to/from the north, based on the turning movement count. See the attached figure showing site and total trips.

NOTE: ① Olivero Drive will be non-loaded as shown in the TIS. The exhibit for zoning shows lots fronting Olivero Drive.
② If zoning documents differ significantly from TIS, then TIS will need to be updated (i.e. TIS shows two roads connecting to the northern properties but zoning exhibit only shows one)

June 23, 2017

Mike Love, Delaware County Engineers Office; John Piccin, Delaware County Engineers Office; Perry Morgan, Stantec; Joe Looby, Stantec

Page 2 of 3

Reference: Casto North Site Traffic Study

Background Traffic Volumes

Stantec collected AM and PM peak hour turning movement counts May 17, 2017, attached. Background traffic volumes are based on a 3% growth rate from the October 2012 *Traffic Impact Study For The Diersing Yarnell And Vinmar North Sites* study. A straight line 3% growth rate is applied to the 2017 turning movement counts (Figure 1) to obtain the 2018 and 2028 background volumes (Figure 2 & 3).

To account for trips discussed in the 2012 study but not constructed at the time the turn counts were taken the difference between the volumes in the 2012 study and the turn counts is added to the background traffic (Figures 4-6). Site trips are shown in Figure 7. Total trips, existing plus background are shown in Figures 8 & 9.

Internal Roadway ADT

For internal site roadway ADT it is assumed that undeveloped land north of the site and south of Lewis Center Road is developed, as residential, with a density similar to the site. This area is shown shaded in cyan on the attached figure. The area is approximately 1.27 times the size of the proposed site with 90 units, which results in 114 additional units, using the ITE trip generation rate this would produce 1085 weekday trips.

Per Delaware County Engineers Office instruction, the distribution of those trips assumes Lewis Center Road will not be connected for through traffic between North State Street (SR 3) and Old 3C. The attached figure shows the estimated ADT volumes on the site streets.

June 23, 2017

Mike Love, Delaware County Engineers Office; John Piccin, Delaware County Engineers Office; Perry Morgan, Stantec; Joe Looby, Stantec

Page 3 of 3

Reference: Casto North Site Traffic Study

Analysis Results

The following analyses are at the site driveway, include all full build site trips year 2028 total traffic.

- Stop control capacity analysis
 - LOS B for both AM & PM peak hour
- Signal warrant
 - A traffic signal warrant was not evaluated for this intersection. The volumes indicate a traffic signal is not warranted.
- Southbound right turn lane warrant
 - Southbound right turn lane not warranted
- Northbound left turn lane length
 - The calculated turn lane length is 175 feet, the same length recommended in the October 2012 *Traffic Impact Study For the Diersing Yarnell and Vinmar North Sites*.

If you have any questions please feel free to contact me.

STANTEC CONSULTING SERVICES INC.



Douglas Iles, PE
Senior Traffic Engineer
Phone: (614) 643-4373
Doug.Iles@stantec.com

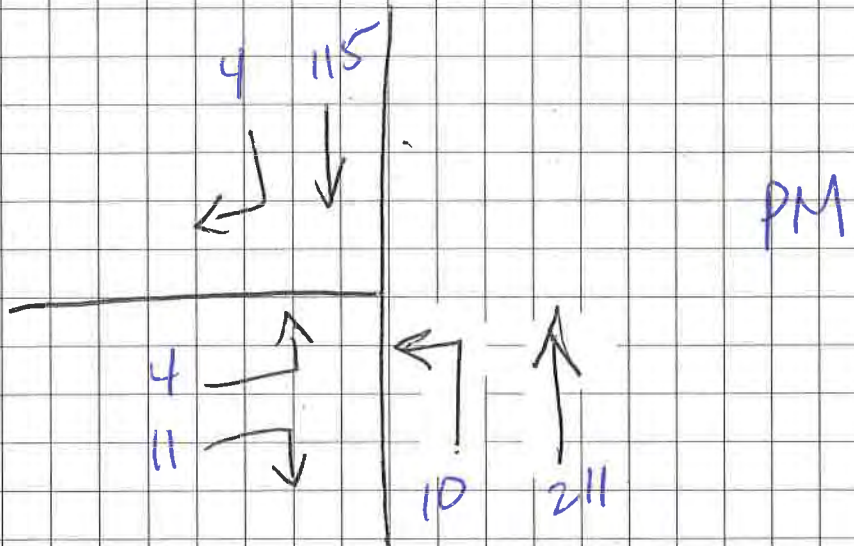
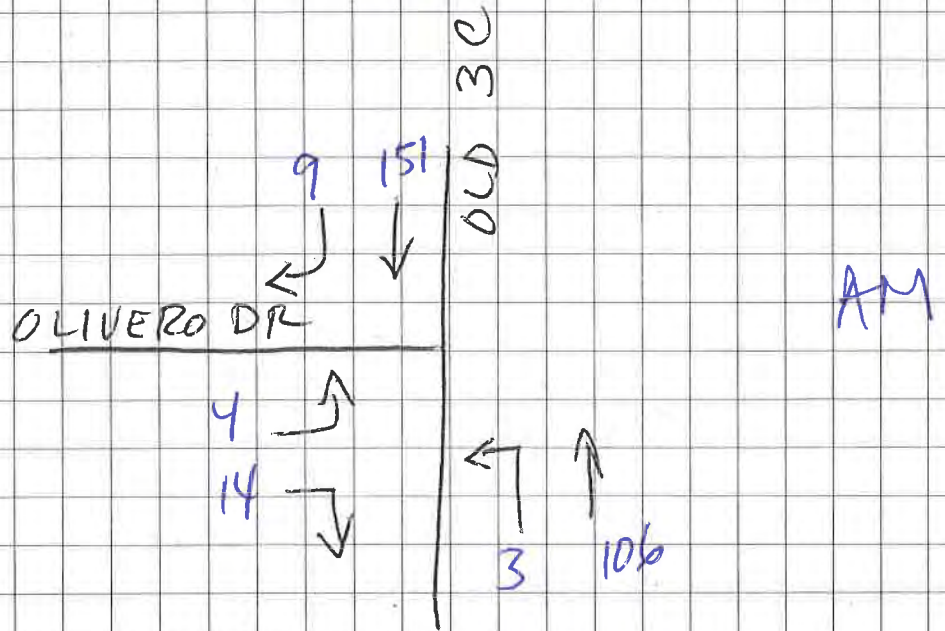
Attachment: Approved MOU, Figures, Analyses

List of Figures

- 1- Year 2017 Turn Count Volumes
- 2- 2018 Background Volumes ($1.03 \times \text{Year 2017 Count}$)
- 3- 2028 Background Volumes ($1.33 \times \text{Year 2017 Count}$)
- 4- AM Site Trips From 2012 Study
- 5- PM Site Trips From 2012 Study
- 6- Volumes to Add From 2012 Study (Figure 4 or 5 minus Figure 1)
- 7- Site Trips
- 8- 2018 Total (Background+Site+2012 Study Trips)
- 9- 2028 Total (Background+Site+2012 Study Trips)

CASTO NORTH

2017 TURN COUNTS



AG1

CASTO NORTH

2018 BR (2017)(1.03)

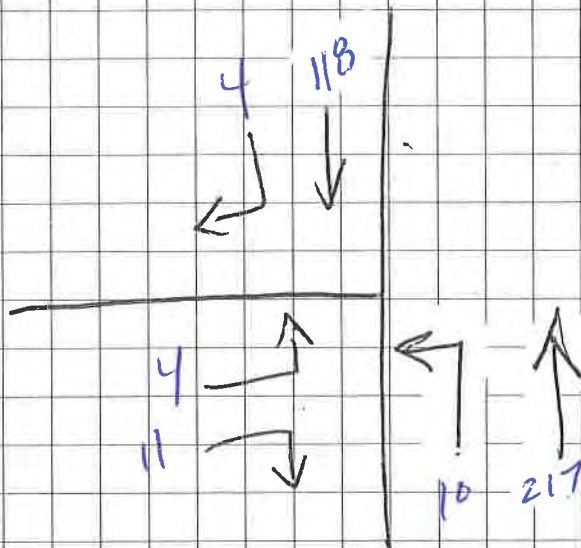
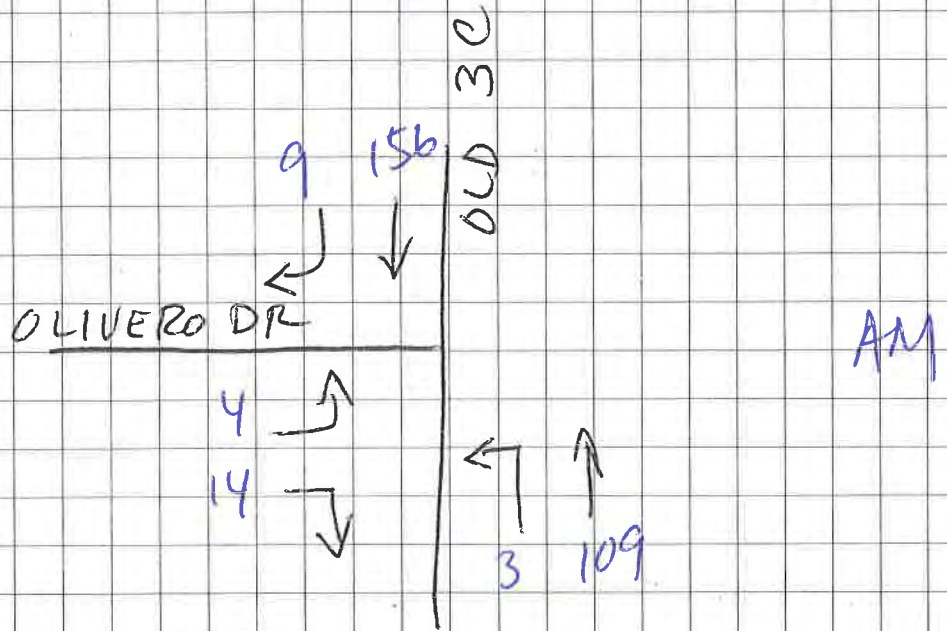
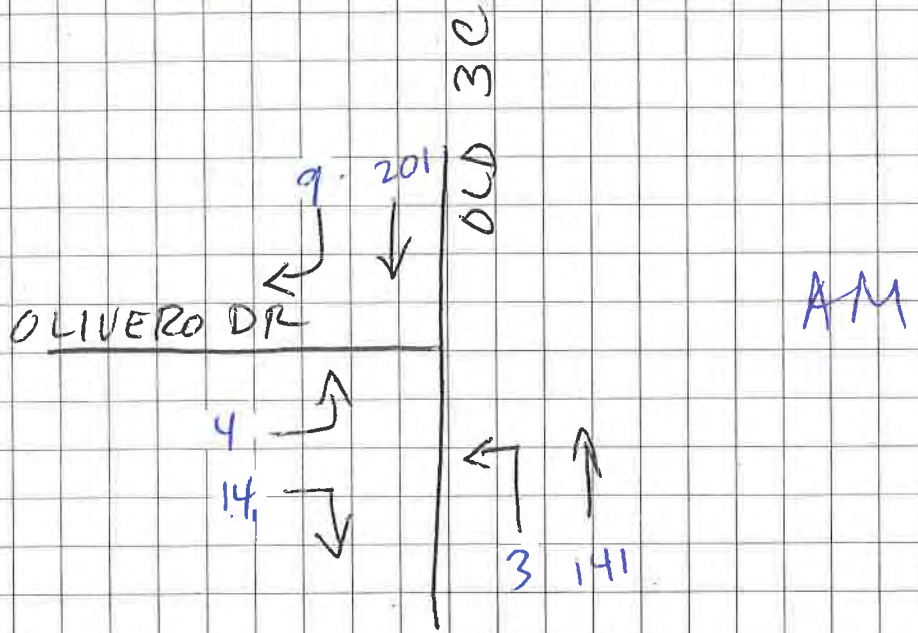


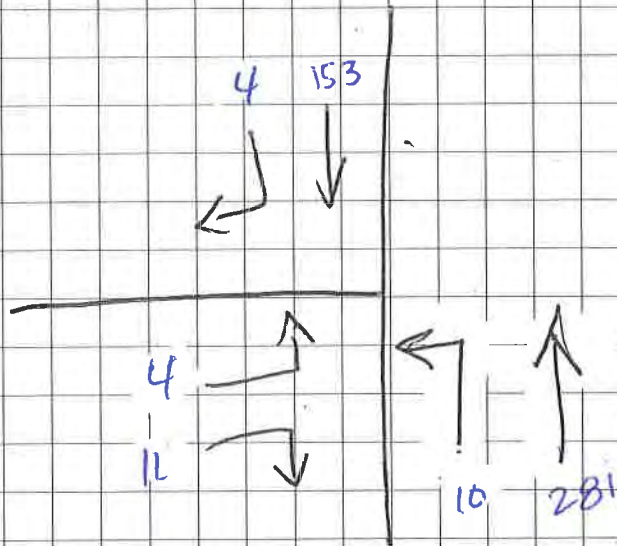
FIG 2

CASTO NORTH

2028 BG (2017)(1.33)

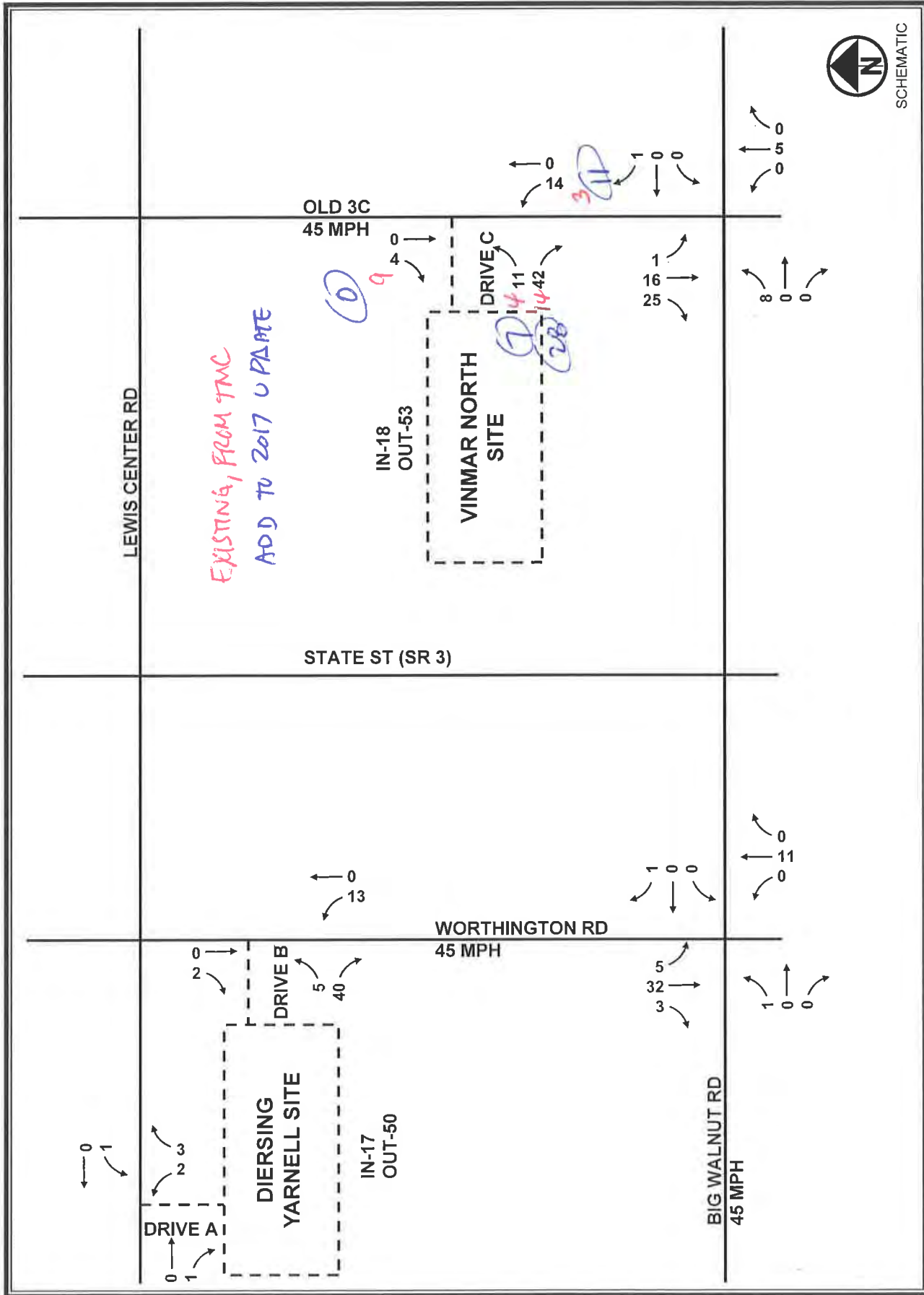


AM



PM

FIG 3



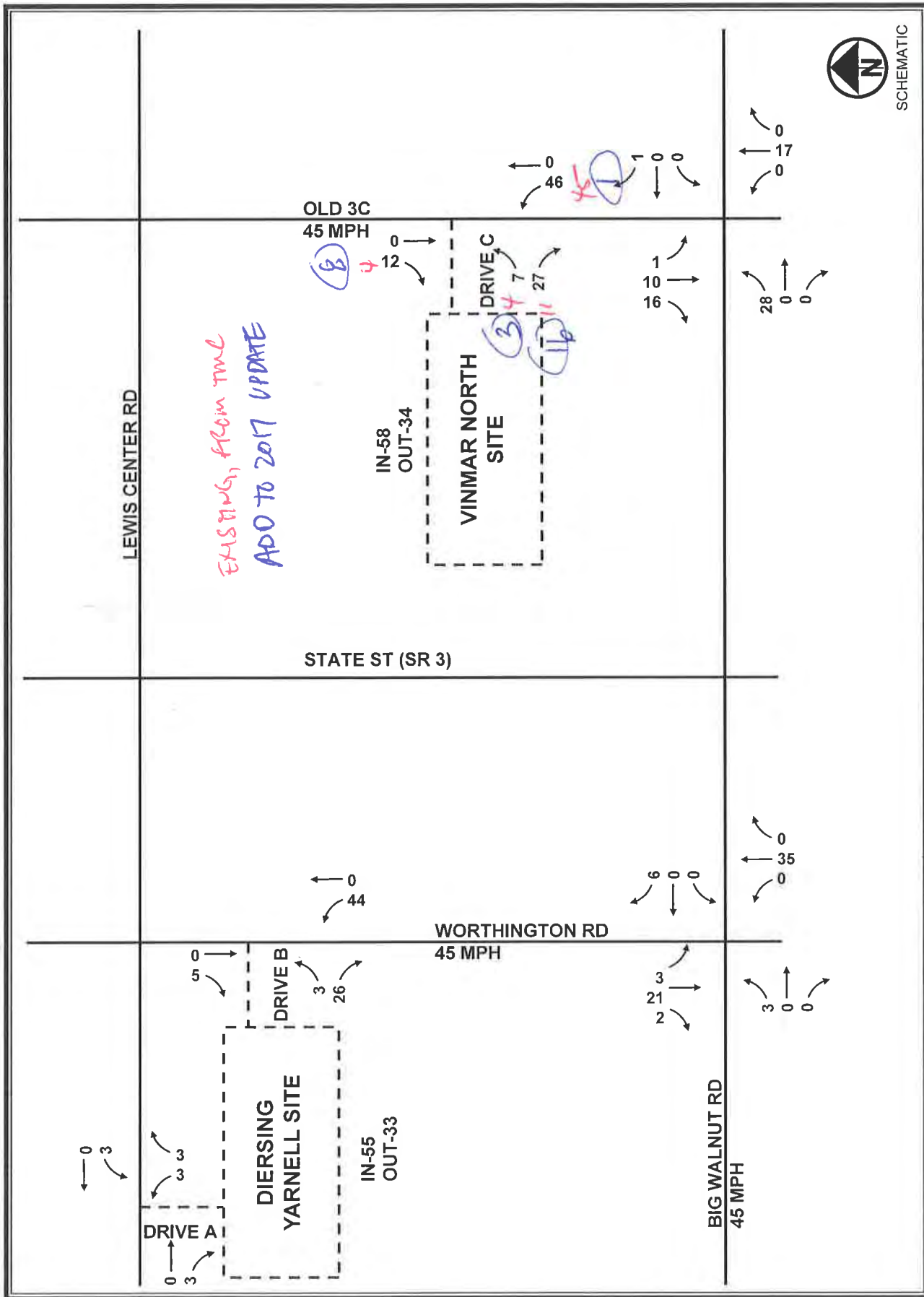
Diersing Yarnell and Vinmar Sites
Delaware, Ohio

FIGURE 4 – AM SITE TRIPS



FIG 4

173408823; u:/6081/2012/Traffic



Diersing Yarnell and Vinmar Sites
Delaware, Ohio

FIGURE 5 – PM SITE TRIPS



Stantec

Fig 15

CASTO NORTH

TRIPS TO ADD FROM 2012 STUDY

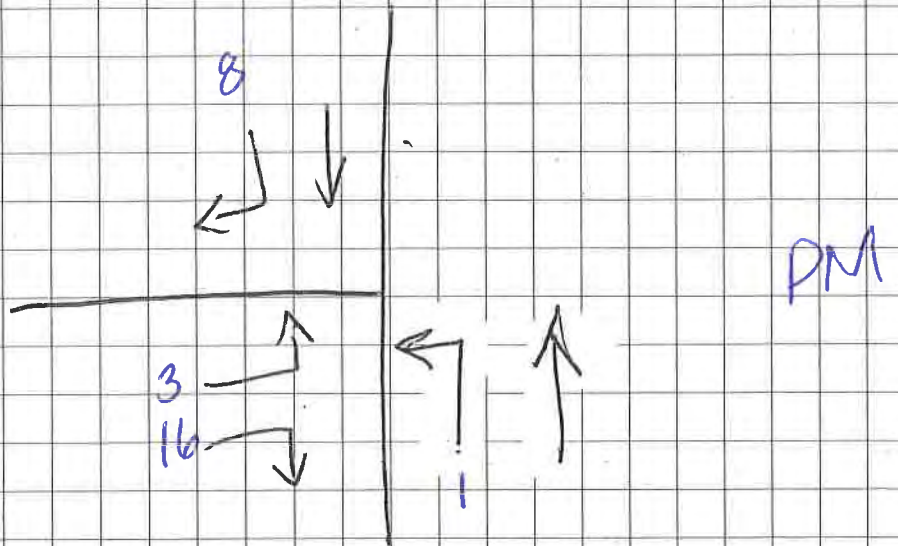
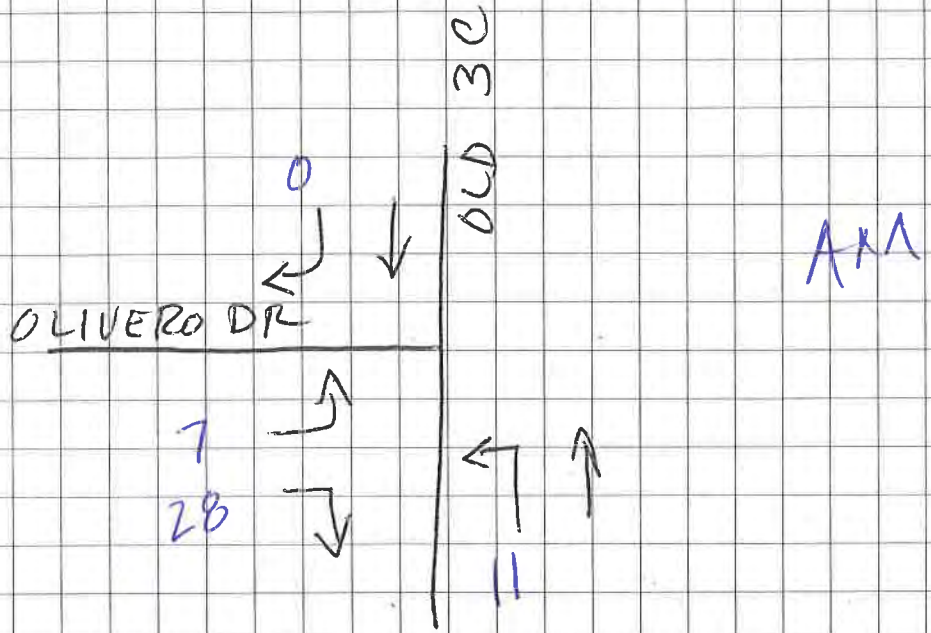


FIG 6

CASTO NORTH
SIDE TRIPS

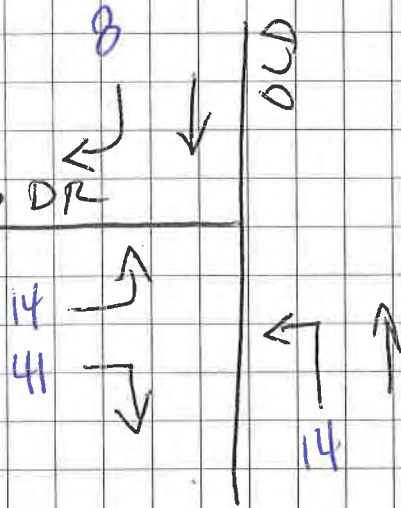
BASED ON 75% T/F FROM SOUTH

IN 18
OUT 55

OLIVERO DR

OLD 30

AM



IN 60
OUT 36

PM

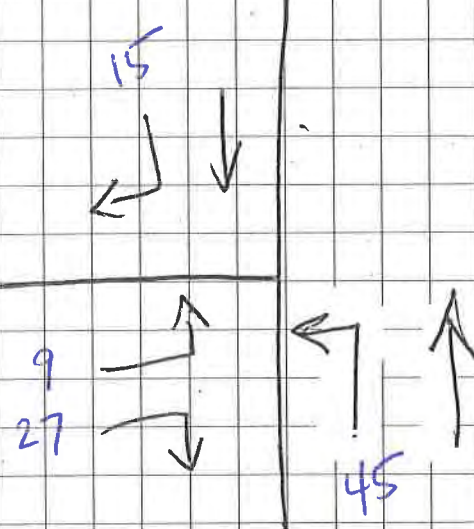


FIG 7

CASO NORTH

2018 TOTAL TRIPS = 2012 STUDY + SITE + BACKGROUND

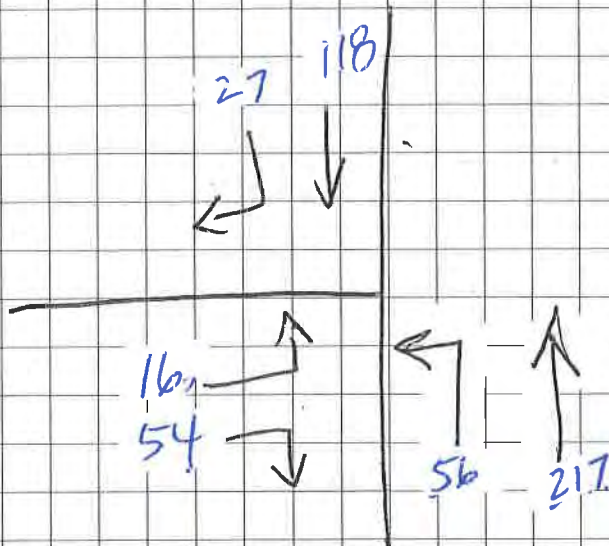
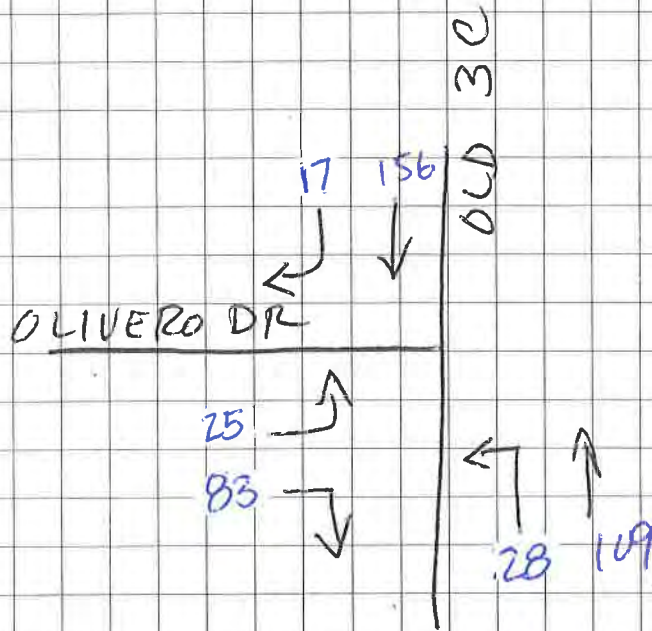


FIG 8

CASO NORTH

2028 TOTAL

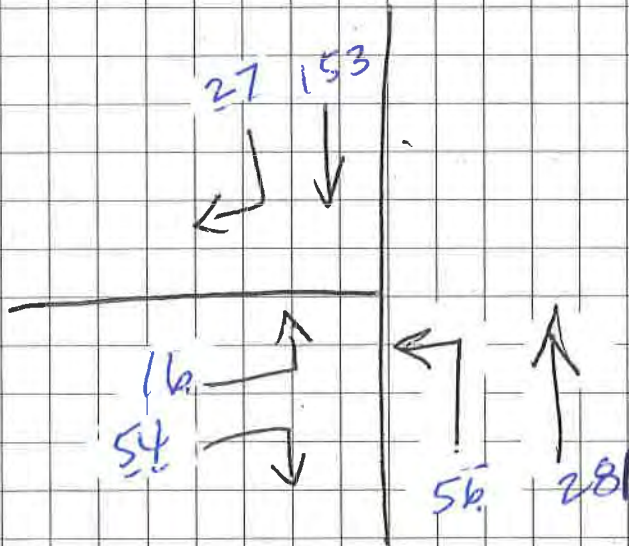
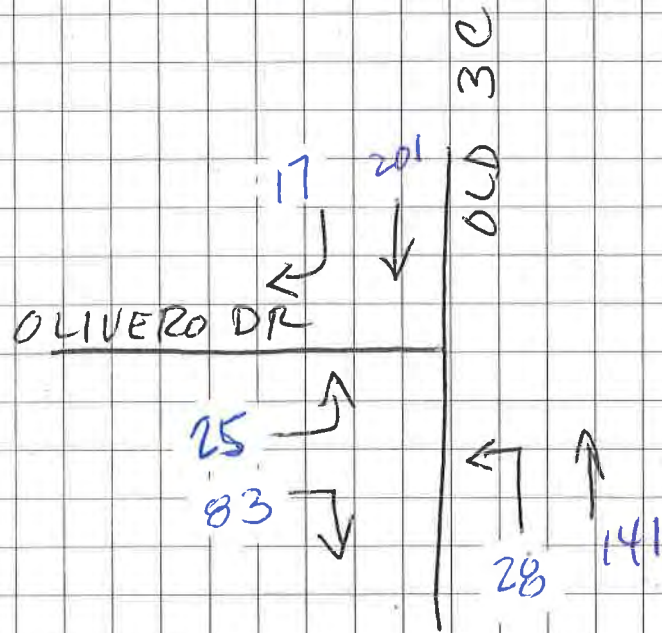


FIG 9

1085 ADT

THIS AREA TO BE DEVELOPED BY OTHERS WITH SINGLE FAMILY HOUSING AT A DENSITY SIMILAR TO THE PROPOSED SITE.



PARK
DEDICATION

| CASTO SITE | |
|----------------------|----------------|
| March 23, 2017 | |
| Proposed Zoning: R2D | |
| SP Units | 80 |
| Net Acreage | 57.29 ac |
| Net Acreage | 53.32 ac |
| Units Density | 1.12 units/ac |
| Net Density | 1.43 units/ac |
| Open Space Req. | 30.01 ac (50%) |
| Open Space Provided | 36.7 ac |
| Typical SF Lot | 57' x 132' |
| Scale | 1" = 50' |
| Sheet | 5-1 |
| Sheet | 5-2 |

Meeting Notes

Approved
6/19/17
MAL



Stantec

Project: Casto North Site (1734-09307)

Purpose: Traffic Study Memo Of Understanding

Date: May 11, 2017 (Rev 6/9/17)
Place/Time: Via telephone, 10:00 AM
Next Meeting: NA
Attendees: Mike Love- Delaware County
Doug Iles- Stantec Consulting
Absentees: NA
Distribution: to attendees and John Piccin, Delaware County; Perry Morgan, Stantec; Joe Looby, Stantec (via e-mail)

This memorandum summarizes a conversation with the Delaware County Engineers Office to discuss traffic study requirements for the proposed North Casto Site, site plan attached. Key points are summarized below.

The site plan shows the proposed development is for 90 single family dwelling units. As such a traffic impact study is not required. Only analyses of the site driveway will be required. All of the site traffic will access the site via existing Olivero Drive.

Trip Generation will be based on ITE Trip Generation Manual, 9th Edition.

For internal site roadway ADT Stantec will assume the undeveloped land north of the site and south of Lewis Center Road is developed, as residential, with density similar to the site. Also, assume Lewis Center Road will not be connected for through traffic between North State Street (SR 3) and Old 3C. An exhibit will be prepared showing the estimated ADT volumes on the site streets.

The following is the existing roadway classification and posted speed limits:

- Old 3C Highway, Major Collector, 45 MPH
- Olivero Drive, Minor Collector, 35 MPH

A peak hour turning movement count will be done at the intersection of Old 3C & Olivero Drive. Based on this count, attached, trips are assumed to be split 75% to/from the south and 25% to/from the north. Background traffic will also include traffic development discussed in the Diersing Yarnell & Vinmar TIS dated 12/19/12. The growth rate from this study will also be used.

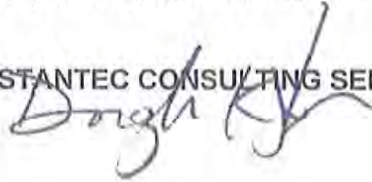
One Team. Infinite Solutions.

The following analyses will be done for the site driveway, using the existing traffic volume and site traffic (total traffic) for the opening year 2018 and design year 2028, build and no build condition, as required.

- Stop control capacity analysis
- Signal warrant (as needed, 8 hour volumes will be estimated based on 4-hour count)
- Southbound right turn lane warrant (length if warranted)
- Northbound left turn lane length (compare existing to length required for full build)

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

STANTEC CONSULTING SERVICES INC.



Douglas K. Iles, PE
Senior Traffic Engineer
doug.iles@stantec.com

Attachments: Site plan, others as discussed.



THIS AREA TO BE DEVELOPED BY OTHERS WITH SINGLE FAMILY HOUSING AT A DENSITY SIMILAR TO THE PROPOSED SITE.

CASTO SITE

Map No. 04, 0877

Proposed Zoning: FRD

| | |
|---------------------|----------------|
| SF Units | 90 |
| Gross Area | 75,200 ac |
| Net Area | 63,920 ac |
| Gross Density | 1.19 du/ac |
| Net Density | 1.40 du/ac |
| Open Space Req. | 30.01 ac (40%) |
| Open Space Provided | 35.7 ac |
| Typical SF Lot | 80' x 150' |

Setbacks

| | |
|-------|------|
| Front | 25' |
| Side | 5.5' |
| Rear | 30' |

PARK DEDICATION
10 acres

Doug
 W 5/17/17

File Name : Old3C_Olivero_AM
 Site Code : 1A
 Start Date : 5/17/2017
 Page No : 1

Groups Printed- cars - trucks

| Start Time | Old 3C | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|------------|------|------|------|-----------|------|------|------|------------|------|------|------|----------------------|------|------|------|------------|------------|---|------|---|---|------|------|----|
| | From North | | | | From East | | | | From South | | | | Olivero Dr From West | | | | | | | | | | | | |
| | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | App. Total | Int. Total | | | | | | | |
| 07:00 AM | 2 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 29 | 3 | 0 | 2 | 0 | 0 | 5 | 63 | |
| 07:15 AM | 2 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 0 | 0 | 41 | 6 | 0 | 0 | 0 | 0 | 6 | 89 | |
| 07:30 AM | 2 | 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 54 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 72 | |
| 07:45 AM | 3 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 21 | 5 | 0 | 2 | 0 | 0 | 7 | 63 | |
| Total | 9 | 151 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 160 | 0 | 0 | 106 | 14 | 0 | 4 | 0 | 0 | 18 | 287 | |
| 08:00 AM | 2 | 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 0 | 0 | 14 | 2 | 0 | 0 | 0 | 0 | 0 | 5 | 57 |
| 08:15 AM | 2 | 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 | 0 | 0 | 17 | 1 | 0 | 1 | 0 | 0 | 2 | 50 | |
| 08:30 AM | 1 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 14 | 0 | 0 | 1 | 0 | 0 | 1 | 42 | |
| 08:45 AM | 2 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 0 | 0 | 20 | 1 | 0 | 2 | 0 | 0 | 3 | 52 | |
| Total | 7 | 112 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 119 | 0 | 0 | 65 | 7 | 0 | 4 | 0 | 0 | 11 | 201 | |
| Grand Total | 16 | 263 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 279 | 0 | 0 | 171 | 9 | 0 | 8 | 0 | 0 | 29 | 488 | |
| Approch % | 5.7 | 94.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57.2 | 0 | 0 | 95 | 5 | 0 | 27.6 | 0 | 0 | 5.9 | | |
| Total % | 3.3 | 53.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57.2 | 0 | 0 | 35 | 1.8 | 0 | 1.6 | 0 | 0 | 5.9 | | |
| % cars | 8 | 244 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 252 | 0 | 0 | 158 | 5 | 0 | 7 | 0 | 0 | 25 | 440 | |
| % cars | 50 | 92.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 90.3 | 0 | 0 | 92.4 | 55.6 | 0 | 87.5 | 0 | 0 | 86.2 | 90.2 | |
| % trucks | 8 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 0 | 0 | 13 | 4 | 0 | 1 | 0 | 0 | 4 | 48 | |
| % trucks | 50 | 7.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9.7 | 0 | 0 | 7.6 | 44.4 | 0 | 12.5 | 0 | 0 | 13.8 | 9.8 | |

| Start Time | Old 3C | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|------------|------|------|------|-----------|------|------|------|------------|------|------|------|----------------------|------|------|------|------------|------------|------|------|------|------|------|------|
| | From North | | | | From East | | | | From South | | | | Olivero Dr From West | | | | | | | | | | | |
| | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | Right | Thru | Left | Peds | App. Total | Int. Total | | | | | | |
| 07:00 AM | 2 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 29 | 3 | 0 | 2 | 0 | 0 | 5 | 63 |
| 07:15 AM | 2 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 0 | 0 | 39 | 6 | 0 | 0 | 0 | 0 | 6 | 89 |
| 07:30 AM | 2 | 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 54 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 72 |
| 07:45 AM | 3 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 21 | 5 | 0 | 2 | 0 | 0 | 7 | 63 |
| Total Volume | 9 | 151 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 160 | 0 | 0 | 106 | 14 | 0 | 4 | 0 | 0 | 18 | 287 |
| % App. Total | 5.6 | 94.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57.2 | 0 | 0 | 97.2 | 2.8 | 0 | 22.2 | 0 | 0 | 0 | 6.43 |
| PHF | .750 | .726 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .679 | .375 | .000 | .665 | .583 | .000 | .500 | .000 | .000 | .643 | .806 |

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
 Peak Hour for Entire Intersection Begins at 07:00 AM

Stantec Consulting

1500 Lakeshore Dr Suite 100
Columbus, Ohio 43123

Design With Community In Mind

Doug
W 5/17/17

File Name : Old3C_Olivero_AM
Site Code : 1A
Start Date : 5/17/2017
Page No : 1

Groups Printed - trucks

| Start Time | Old 3C | | | | | | | | | | | | Olivero Dr | | | | | | | | |
|-------------|------------|------|------|------------|-----------|------|------|------|------------|-------|------|------|------------|------------|-------|------|------|------|------------|------------|-----|
| | From North | | | | From East | | | | From South | | | | From West | | | | | | | | |
| | Thru | Left | Peds | App. Total | Right | Thru | Left | Peds | App. Total | Right | Thru | Left | Peds | App. Total | Right | Thru | Left | Peds | App. Total | Int. Total | |
| 07:00 AM | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 4 |
| 07:15 AM | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 07:30 AM | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| 07:45 AM | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| Total | 3 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 23 |
| 08:00 AM | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| 08:15 AM | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| 08:30 AM | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 08:45 AM | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| Total | 5 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 |
| Grand Total | 8 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 4 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 48 |
| Approch % | 29.6 | 70.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 76.5 | 23.5 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 8.3 |
| Total % | 15.7 | 39.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27.1 | 8.3 | 0 | 0 | 0 | 0 | 2.1 | 0 | 0 | 0 | 8.3 |

| Start Time | Old 3C | | | | | | | | | | | | Olivero Dr | | | | | | | | |
|--------------|------------|------|------|------------|-----------|------|------|------|------------|-------|------|------|------------|------------|-------|------|------|------|------------|------------|------|
| | From North | | | | From East | | | | From South | | | | From West | | | | | | | | |
| | Thru | Left | Peds | App. Total | Right | Thru | Left | Peds | App. Total | Right | Thru | Left | Peds | App. Total | Right | Thru | Left | Peds | App. Total | Int. Total | |
| 07:30 AM | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| 07:45 AM | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| 08:00 AM | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| 08:15 AM | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| Total Volume | 7 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 |
| % App. Total | 36.8 | 63.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 71.4 | 28.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| PHF | .875 | .750 | .000 | .000 | .000 | .792 | .000 | .000 | .000 | .000 | .625 | .500 | .000 | .583 | .250 | .000 | .000 | .000 | .250 | .000 | .776 |

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:30 AM

Doug
 W 5/17/17

File Name : Old3C_Olivero_PM
 Site Code : 1B
 Start Date : 5/17/2017
 Page No : 1

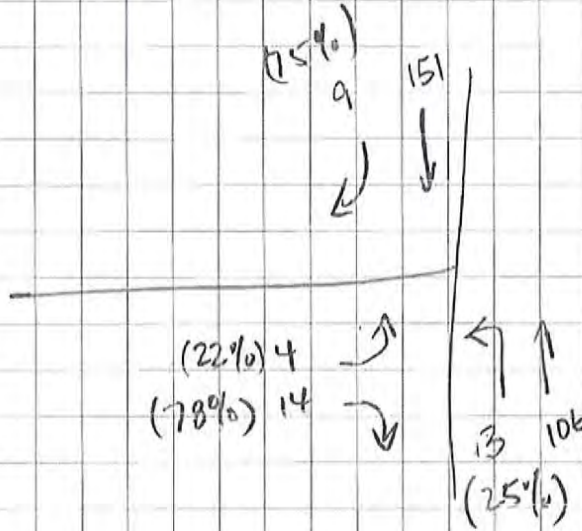
Groups Printed - cars

| Start Time | Old 3C From North | | | | | | Old 3C From South | | | | | | Olivero Dr From West | | | | | | | |
|-------------|-------------------|------|----|------|------------|-------|-------------------|------|---|------|------------|-------|----------------------|------|---|------|------------|------------|----|-----|
| | Right | Thru | | Peds | App. Total | Right | Thru | Left | | Peds | App. Total | Right | Thru | Left | | Peds | App. Total | Int. Total | | |
| | | 1 | 23 | | | | | 0 | 0 | | | | | 0 | 0 | | | | 29 | 2 |
| 04:00 PM | 1 | 23 | 0 | 0 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 2 | 0 | 0 | 31 | 0 | 1 | 56 |
| 04:15 PM | 0 | 20 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 30 | 0 | 0 | 50 |
| 04:30 PM | 0 | 18 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 | 4 | 0 | 56 | 3 | 2 | 0 | 79 |
| 04:45 PM | 2 | 19 | 0 | 0 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 3 | 0 | 41 | 2 | 0 | 0 | 64 |
| Total | 3 | 80 | 0 | 0 | 83 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 149 | 9 | 0 | 158 | 5 | 3 | 0 | 249 |
| 05:00 PM | 1 | 28 | 0 | 0 | 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 2 | 0 | 50 | 4 | 1 | 0 | 84 |
| 05:15 PM | 1 | 29 | 0 | 0 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 49 | 0 | 0 | 49 | 3 | 0 | 0 | 82 |
| 05:30 PM | 0 | 31 | 0 | 0 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60 | 4 | 0 | 64 | 6 | 0 | 0 | 95 |
| 05:45 PM | 2 | 24 | 0 | 0 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 53 | 3 | 0 | 56 | 3 | 0 | 0 | 86 |
| Total | 4 | 112 | 0 | 0 | 116 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 210 | 9 | 0 | 219 | 10 | 2 | 0 | 347 |
| Grand Total | 7 | 192 | 0 | 0 | 199 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 359 | 18 | 0 | 377 | 15 | 5 | 0 | 596 |
| Approach % | 3.5 | 96.5 | 0 | 0 | 33.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 95.2 | 4.8 | 0 | 63.3 | 7.5 | 2.5 | 0 | 3.4 |
| Total % | 1.2 | 32.2 | 0 | 0 | 33.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60.2 | 3 | 0 | 63.3 | 2.5 | 0.8 | 0 | 3.4 |

| Start Time | Old 3C From North | | | | | | Old 3C From South | | | | | | Olivero Dr From West | | | | | | | |
|--------------|-------------------|--|---|------|------------|-------|-------------------|---|--|------|------------|-------|----------------------|---|--|------|------------|------------|--|---|
| | Right | Thru | | Peds | App. Total | Right | Thru | Left | | Peds | App. Total | Right | Thru | Left | | Peds | App. Total | Int. Total | | |
| | | 1 <th>28 <th>0 <th>0 <th>0 <th>29 <th>2 <th>0 <th>0 <th>50 <th>4 <th>1 <th>0 <th>5 </th></th></th></th></th></th></th></th></th></th></th></th></th> | 28 <th>0 <th>0 <th>0 <th>29 <th>2 <th>0 <th>0 <th>50 <th>4 <th>1 <th>0 <th>5 </th></th></th></th></th></th></th></th></th></th></th></th> | | | | | 0 <th>0 <th>0 <th>29 <th>2 <th>0 <th>0 <th>50 <th>4 <th>1 <th>0 <th>5 </th></th></th></th></th></th></th></th></th></th></th> | 0 <th>0 <th>29 <th>2 <th>0 <th>0 <th>50 <th>4 <th>1 <th>0 <th>5 </th></th></th></th></th></th></th></th></th></th> | | | | | 0 <th>29 <th>2 <th>0 <th>0 <th>50 <th>4 <th>1 <th>0 <th>5 </th></th></th></th></th></th></th></th></th> | 29 <th>2 <th>0 <th>0 <th>50 <th>4 <th>1 <th>0 <th>5 </th></th></th></th></th></th></th></th> | | | | 2 <th>0 <th>0 <th>50 <th>4 <th>1 <th>0 <th>5 </th></th></th></th></th></th></th> | 0 <th>0 <th>50 <th>4 <th>1 <th>0 <th>5 </th></th></th></th></th></th> |
| 05:00 PM | 1 | 28 | 0 | 0 | 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 2 | 0 | 50 | 4 | 1 | 0 | 84 |
| 05:15 PM | 1 | 29 | 0 | 0 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 49 | 0 | 0 | 49 | 3 | 0 | 0 | 82 |
| 05:30 PM | 0 | 31 | 0 | 0 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60 | 4 | 0 | 64 | 0 | 0 | 0 | 95 |
| 05:45 PM | 2 | 24 | 0 | 0 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 53 | 3 | 0 | 56 | 3 | 1 | 0 | 86 |
| Total | 4 | 112 | 0 | 0 | 116 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 210 | 9 | 0 | 219 | 10 | 2 | 0 | 347 |
| % App. Total | 3.4 | 96.6 | 0 | 0 | 33.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 95.9 | 4.1 | 0 | 63.3 | 7.5 | 2.5 | 0 | 3.4 |
| PHF | .500 | .903 | .000 | .000 | .935 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .875 | .563 | .000 | .855 | .625 | .500 | .000 | .600 |

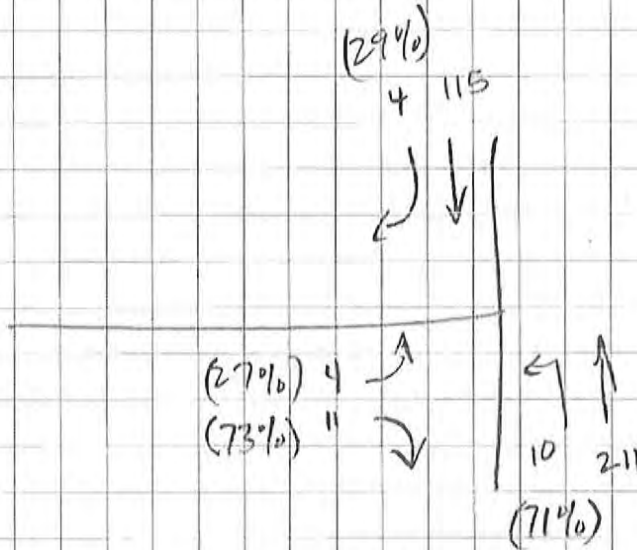
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
 Peak Hour for Entire Intersection Begins at 05:00 PM

IN 9+3=12
OUT 4+14=18



AM

IN = 14
OUT = 15



5:00 PM
PM

1734-09307

2-LANE RIGHT TURN LANE WARRANT (HIGH SPEED)

401-6bE

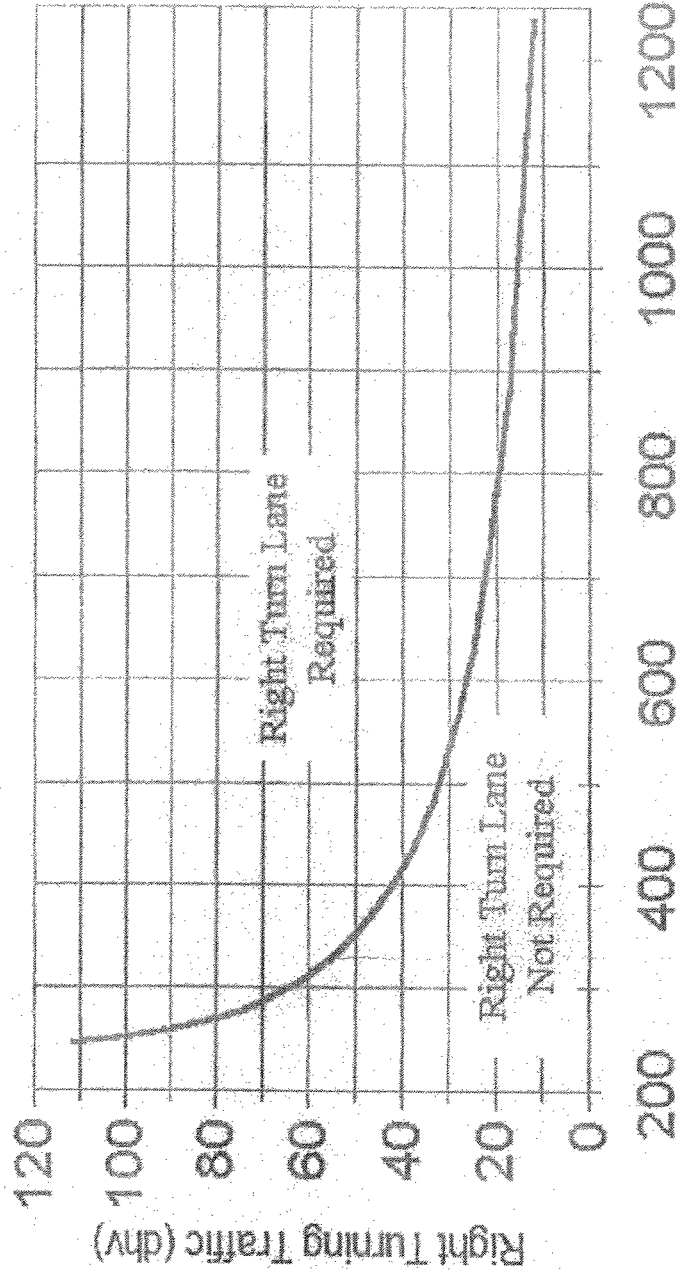
REFERENCE SECTION

401.6.3

Old 3C & Olivero Drive
2028 Total Traffic
Advancing AM 218 PM 180
Right Turn AM 17 PM 27
No Right Turn Lane Warranted

2-Lane Highway Right Turn Lane Warrant

> 40 mph or 70 kph Posted Speed

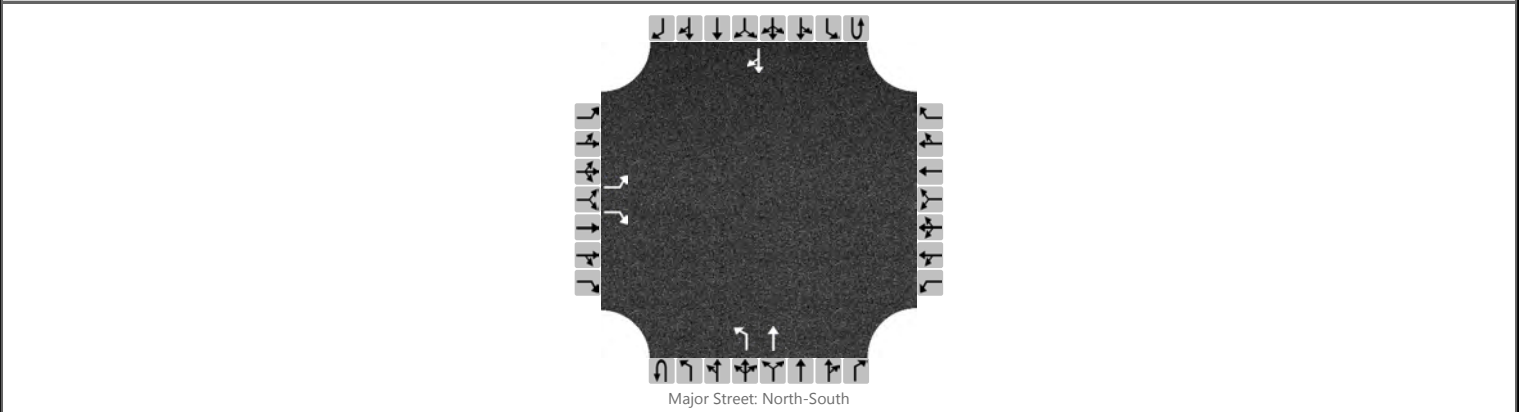


* Includes Right Turns Advancing Traffic*(dhv)

HCS 2010 Two-Way Stop Control Summary Report

| General Information | | Site Information | |
|--------------------------|------------------------|----------------------------|------------------------|
| Analyst | doug iles | Intersection | Old 3C & Olivero Drive |
| Agency/Co. | stantec | Jurisdiction | |
| Date Performed | 5/26/2017 | East/West Street | Olivero Drive |
| Analysis Year | 2028 | North/South Street | Old 3C |
| Time Analyzed | AM TOTAL | Peak Hour Factor | 0.92 |
| Intersection Orientation | North-South | Analysis Time Period (hrs) | 0.25 |
| Project Description | Casto North 1734-09307 | | |

Lanes



Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|-------------------------|-----------|----|----|----|-----------|---|---|---|------------|----|-----|---|------------|---|-----|----|
| | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Movement | | | | | | | | | | | | | | | | |
| Priority | | 10 | 11 | 12 | | 7 | 8 | 9 | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 |
| Number of Lanes | | 1 | 0 | 1 | | 0 | 0 | 0 | | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| Configuration | | L | | R | | | | | | L | T | | | | | TR |
| Volume (veh/h) | | 25 | | 83 | | | | | | 28 | 141 | | | | 201 | 17 |
| Percent Heavy Vehicles | | 10 | | 3 | | | | | | 10 | | | | | | |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Right Turn Channelized | No | | | | No | | | | No | | | | No | | | |
| Median Type | Undivided | | | | | | | | | | | | | | | |
| Median Storage | | | | | | | | | | | | | | | | |

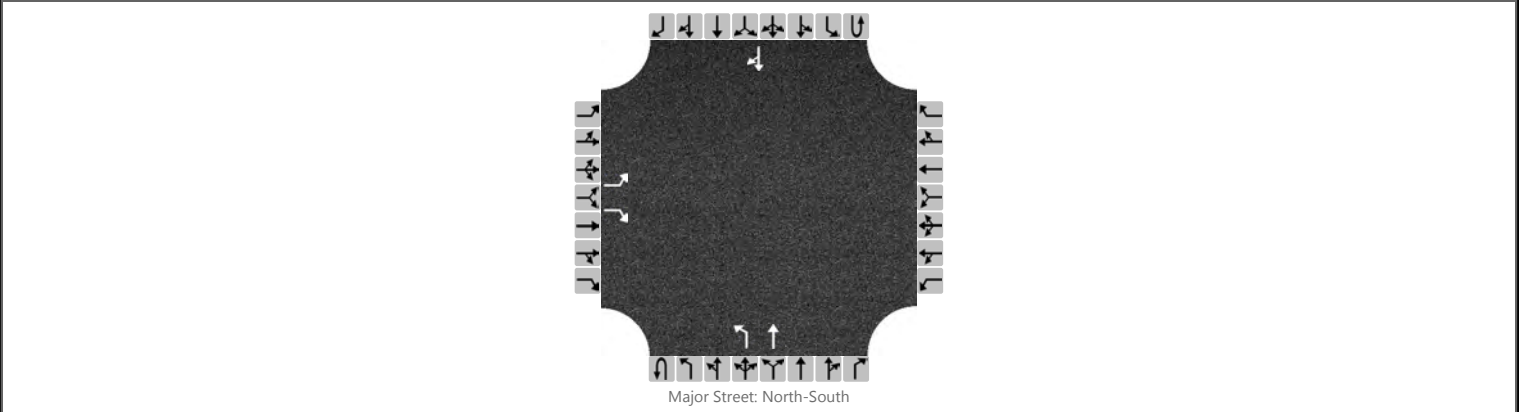
Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|------------------------|------|------|--|------|--|--|--|--|-----|------|--|--|--|--|--|--|
| Flow Rate (veh/h) | | 27 | | 90 | | | | | | 30 | | | | | | |
| Capacity | | 547 | | 809 | | | | | | 1286 | | | | | | |
| v/c Ratio | | 0.05 | | 0.11 | | | | | | 0.02 | | | | | | |
| 95% Queue Length | | 0.2 | | 0.4 | | | | | | 0.1 | | | | | | |
| Control Delay (s/veh) | | 11.9 | | 10.0 | | | | | | 7.9 | | | | | | |
| Level of Service (LOS) | | B | | B | | | | | | A | | | | | | |
| Approach Delay (s/veh) | 10.4 | | | | | | | | 1.3 | | | | | | | |
| Approach LOS | B | | | | | | | | | | | | | | | |

HCS 2010 Two-Way Stop Control Summary Report

| General Information | | Site Information | |
|--------------------------|------------------------|----------------------------|------------------------|
| Analyst | doug iles | Intersection | Old 3C & Olivero Drive |
| Agency/Co. | stantec | Jurisdiction | |
| Date Performed | 5/26/2017 | East/West Street | Olivero Drive |
| Analysis Year | 2028 | North/South Street | Old 3C |
| Time Analyzed | PM TOTAL | Peak Hour Factor | 0.92 |
| Intersection Orientation | North-South | Analysis Time Period (hrs) | 0.25 |
| Project Description | Casto North 1734-09307 | | |

Lanes



Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | | | |
|-------------------------|-----------|----|----|----|-----------|---|---|---|------------|----|-----|---|------------|---|---|-----|----|---|
| | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R | | |
| Movement | | | | | | | | | | | | | | | | | | |
| Priority | | 10 | 11 | 12 | | 7 | 8 | 9 | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 | | |
| Number of Lanes | | 1 | 0 | 1 | | 0 | 0 | 0 | | 0 | 1 | 1 | 0 | | 0 | 0 | 1 | 0 |
| Configuration | | L | | R | | | | | | L | T | | | | | | TR | |
| Volume (veh/h) | | 16 | | 54 | | | | | | 56 | 281 | | | | | 153 | 27 | |
| Percent Heavy Vehicles | | 4 | | 4 | | | | | | 4 | | | | | | | | |
| Proportion Time Blocked | | | | | | | | | | | | | | | | | | |
| Right Turn Channelized | No | | | | No | | | | No | | | | No | | | | | |
| Median Type | Undivided | | | | | | | | | | | | | | | | | |
| Median Storage | | | | | | | | | | | | | | | | | | |

Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|------------------------|------|------|--|------|--|--|--|--|-----|------|--|--|--|--|--|--|
| Flow Rate (veh/h) | | 17 | | 59 | | | | | | 61 | | | | | | |
| Capacity | | 435 | | 857 | | | | | | 1364 | | | | | | |
| v/c Ratio | | 0.04 | | 0.07 | | | | | | 0.04 | | | | | | |
| 95% Queue Length | | 0.1 | | 0.2 | | | | | | 0.1 | | | | | | |
| Control Delay (s/veh) | | 13.6 | | 9.5 | | | | | | 7.8 | | | | | | |
| Level of Service (LOS) | | B | | A | | | | | | A | | | | | | |
| Approach Delay (s/veh) | 10.4 | | | | | | | | 1.3 | | | | | | | |
| Approach LOS | B | | | | | | | | | | | | | | | |

INTERSECTION - Olivero Drive & Old 3C

| Analysis Year | Cycle Length (Secs.) | Movement | Design Speed (mph) | # of Lanes | | Analysis Peak Period | Thru Lane DHV | Turn Lane DHV | Calculated Turn Lane (FT) | Thru Movement Backup (FT) | Blocked | Required Turn Lane (FT) | |
|--------------------|----------------------|----------|--------------------|------------|------|----------------------|---------------|---------------|---------------------------|---------------------------|---------|-------------------------|---------|
| | | | | Thru | Turn | | | | | | | | |
| 2028 Total Traffic | 60 | EBL | 35 | 0 | 1 | AM | 0 | 25 | 100 | #DIV/0! | #DIV/0! | #DIV/0! | |
| | | | | | | PM | 0 | 16 | 100 | #DIV/0! | #DIV/0! | #DIV/0! | |
| | | EBR | 35 | 0 | 1 | AM | 0 | 83 | 150 | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| | | | | | | PM | 0 | 54 | 100 | #DIV/0! | #DIV/0! | #DIV/0! | |
| | | WBL | 35 | 0 | 0 | AM | 0 | 0 | N/A | N/A | N/A | N/A | N/A |
| | | | | | | PM | 0 | 0 | N/A | N/A | N/A | N/A | |
| | | WBR | 35 | 0 | 0 | AM | 0 | 0 | N/A | N/A | N/A | N/A | N/A |
| | | | | | | PM | 0 | 0 | N/A | N/A | N/A | N/A | |
| | | NBL | 45 | 1 | 1 | AM | 141 | 28 | 175 | 200 | N/A | N/A | 175 |
| | | | | | | PM | 281 | 56 | 175 | 250 | N/A | N/A | |
| | | NBR | 45 | 1 | 0 | AM | 141 | 0 | N/A | N/A | N/A | N/A | N/A |
| | | | | | | PM | 281 | 0 | N/A | N/A | N/A | N/A | |
| SBL | 45 | 1 | 0 | AM | 218 | 0 | N/A | N/A | N/A | N/A | N/A | | |
| | | | | PM | 180 | 0 | N/A | N/A | N/A | N/A | | | |
| SBR | 45 | 1 | 0 | AM | 201 | 17 | N/A | N/A | N/A | N/A | N/A | | |
| | | | | PM | 153 | 27 | N/A | N/A | N/A | N/A | | | |