

# TECHNICAL REPORT



**CLARKSVILLE**  
**METROPOLITAN PLANNING**  
**ORGANIZATION**




**TENNESSEE**  
**DEPARTMENT OF TRANSPORTATION**

## STATE ROUTE 374

***From: Madison Street (US-41A S.R. 112) in Clarksville to Dunbar Cave Road,  
Log Mile 0.00 to 2.85 Montgomery County***

**PREPARED BY**  
**TRC Worldwide Engineering, Inc.**  
**for Clarksville MPO**  
**in coordination with TDOT Strategic Transportation Investments Division**

Recommended by:	Signature	DATE
TRANSPORTATION DIRECTOR STRATEGIC TRANSPORTATION INVESTMENTS DIVISION	 Steven Allen (Mar 26, 2021 05:35 CDT)	Mar 26, 2021
TRANSPORTATION DIRECTOR CLARKSVILLE MPO		

## **Executive Summary**

### **Purpose of Report**

This Technical Report was initiated at the request of the Clarksville Metropolitan Planning Organization. The purpose of this Technical Report is to provide an overview of the existing route deficiencies, define the preliminary purpose and need for the project, and provides conceptual design that is feasible, cost effective, and improves mobility for this segment of State Route (S.R.) 374 from Log Mile (L.M.) 0.00 to L.M. 2.85 in Clarksville, Montgomery County Tennessee. In addition, any modifications to the existing improvements strive to provide a safer facility for all users and a regional route which fits the needs of the community.

### **Description of the Existing Route**

The portion of S.R. 374 under study begins at the intersection of Madison Street (US-41A S.R. 112) at L.M. 0.00 and extends north to Dunbar Cave Road intersection at L.M. 2.85. The terrain is rolling along this section and there is variable right of way (ROW) and shoulder width.

The speed limit varies between 40 and 50 mph. There is a 20 mph school speed limit in effect from L.M. 0.23 to L.M. 0.90 when school is in session.

This section is illuminated and is a designated a Tennessee Bicycle Route per information from the Tennessee Roadway Information Management System (TRIMS). Land use is classified as mixed residential commercial from L.M. 0.00 to L.M. 0.23, residential from L.M. 0.23 to L.M. 1.10 and rural from L.M. 1.1 to the end of the study section.

This 2.85 mile section has been divided into three (3) segments for analysis.

- Segment one extends from L.M. 0.00 (Madison Street, US-41A S.R. 112) to L.M. 0.78 (Memorial Drive). Section one has a 40 mph speed limit with a 20 mph school zone speed limit. The AADT is 16,015 VPD. Madison Street at the intersection of S.R. 374 is a five (5) lane urban minor arterial with a 45 mph speed limit and AADT of 20,830 VPD. The south approach of the Madison Street intersection is S. Richview Road, a local dead end street serving three businesses and a residential neighborhood. Segment one is a three (3) lane section with two (2) eleven (11) foot travel lanes and an eleven (11) foot continuous left turn lane. Clarksville High School and Richview Middle school are located along this segment. Turning lanes are present at the Madison Street intersection, school entrances, and Memorial Drive intersection.
- Segment two extends from L.M. 0.78 (Memorial Drive) to L.M. 1.32. This is a three (3) lane section (auxiliary truck climbing lane in southbound direction) with twelve (12) foot lane widths from L.M. 0.78 to L.M. 1.1 and transitions to a two (2) lane section before crossing the Red River at L.M. 1.16. The segment transitions to a three lane section with two (2) 12 (twelve) foot travel lanes and a twelve (12) foot continuous left turn lane at L.M. 1.32. The speed limit is 40 mph to L.M. 1.27 then raises to 50 mph.

- Segment three extends from L.M. 1.32 to L.M. 2.85 (Dunbar Cave Road). This is a three (3) lane section with two (2) 12 (twelve) foot travel lanes and a twelve (12) foot continuous left turn lane. Turning lanes are present at the Dunbar Cave Road intersection. The speed limit is 50 mph. The AADT for segments 2 and 3 increase to 27,825 VPD in the 2023 base year.

### Existing Traffic and Safety Conditions

#### S.R. 374 Annual Average Daily Traffic (AADT)

L.M.	2018 Cycle Count AADT	Base Year (2023) AADT	Design Year (2043) AADT
0 to 0.78	12,840	16,015	23,850
0.78 to 2.85	20,700	27,825	48,165
2.85 to 3.75	14,820	-	-

The base year (2023) annual average daily traffic (AADT) for the section of S.R. 374 under study is 21,920 vehicles per day. The design year (2043) AADT is projected to be 36,010 vehicles per day.

Crash rates were calculated for the three segments of the route. Crash rates were calculated based on TDOT 2018 cycle counts and using crash data from the dates of January 1, 2017 to December 31, 2019.

Segment one had a total crash rate of 7.66 versus a statewide average of 2.978. There were no severe (Fatal+Incapacitating) injuries in that segment. Segment two had a crash rate of 3.032 versus a statewide average of 2.574. There were no severe injuries in that segment as well. Segment three had a crash rate of 3.028 versus a statewide average of 2.978. The severe crash rate for this segment was 0.058 versus a statewide severe crash rate of 0.08.

The intersection of S.R. 374 with S.R. 112 had a crash rate of 2.995 versus a statewide average of 0.682. There were no severe injuries at that intersection. The intersection of S.R. 374 with Memorial Drive has a crash rate of 2.589 versus a statewide average of 0.682. There were no severe injuries at this intersection. The intersection of S.R. 374 with Dunbar Cave Road had a crash rate of 2.549 versus a statewide average of 0.682. It had a severe crash rate of 0.07 versus a statewide average of 0.014.

The total crash rate is higher than the statewide average for all three segments and for each of the three analyzed intersections. The severe crash rate is lower than the statewide average for all three segments and for two of the three analyzed intersections. Dunbar Cave Road intersection severe crash rate is higher than the statewide average.

Most of the crashes within the study section occurred during daylight hours. Most were property damage or non-incapacitating injury type crashes. Only one (1) percent were incapacitating type crashes and there were no fatalities. The predominant type of crash was rear-end.

### **Conceptual Alternative**

After evaluating the safety, operational, and geometric conditions on existing S.R. 374 within the study limits, two options were considered to address the deficiencies: The Build and the No Build Alternative. The Build alternative for S.R. 374 is a five (5) lane roadway with ten (10) foot shoulders, curb and gutter, and five (5) foot sidewalks based on TDOT Design Standard Drawing RD11-TS-6B and MM-SW-1. The area in front of the schools will have six (6) foot sidewalks. The thru lanes are twelve (12) feet and the two-way left turn lane is fourteen (14) feet. As the roadway approaches the major intersections, the cross section is widened to accommodate traffic demands.

### **Intersection and Roadway Analysis**

Capacity analyses were conducted on the northern section so S.R. 374 between Memorial Drive and Dunbar Cave Road. For the base year 2023 with the No Build scenario, the roadway operates at a Level of Service (LOS) E. For both the 2033 and 2043 design years, the roadway will operate at a LOS F. Under the Build scenario, the roadway will operate at a LOS C for the 2033 design year and LOS D for the 2043 design year.

Capacity analyses were also conducted on the two major intersections; US- 41A with S.R. 374 and S.R. 374 with Memorial Drive. Traffic counts were taken to develop Design Hourly Volumes (DHVs) for both intersections. The DHV's were developed for the base year 2023, and future design years 2033 and 2043.

The intersection of S.R. 374 with Madison Street (US 41-A S.R. 112) is operating at a LOS F for the 2023 base year. With the proposed laneage, the intersection will operate at a LOS B for the morning peak and LOS C for the afternoon peak in the baseline 2023 year. For the design year 2033, the intersection will operate at a LOS C for the morning peak and LOS D in the afternoon peak. In design year 2043, the intersection will operate at a LOS C for morning peak. In the afternoon peak the intersection will operate at a LOS E.

The intersection of S.R. 374 with Memorial Drive is operating at a LOS F for the 2023 base year. With the proposed lane configuration , a capacity analysis for the 2023 base line year was improved to LOS B for both the morning and afternoon peaks. For the design year 2033, the LOS will operate at a LOS C for both the morning and afternoon peaks. For the design year 2043, the intersection will operate at a LOS E for both the morning and afternoon peak hours.

### Traffic and Safety Comparison

The Build Alternative adds additional capacity, improves safety, and reduces the overall density and delay along the route. Below is a table showing the LOS difference between the No Build and the Build Alternative.

LEVEL OF SERVICE COMPARISON TABLE												
Description	No Build Alternative						Build Alternative					
	2023		2033		2043		2023		2033		2043	
Memorial Drive to Dunbar Cave Road	E		F		F		A-B		B-C		C-D	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
S.R. 374/US-41A Intersection	F	F	F	F	F	F	B	C	C	D	C	E
S.R. 374/Memorial Dr. Intersection	F	F	F	F	F	F	B	B	C	C	E	E

Crash Modification Factors (CMF) and Crash Reduction Factors (CRF) from the Highway Safety Manual (HSM) provide a good example of how roadway improvements impact safety. For the Conceptual Alternatives, the CMF for converting a 2 lane roadway to a 4 lane divided roadway is 0.714 and the CRF is 29% for all crash severities. Providing a right turn lane on both major road approaches yields a CMF of 0.92 and a CRF of 26% for all crash severities. Adding a right turn lane on both major road approaches yields a CMF of 0.59 and a CRF of 49% for fatal and severe injury crashes.

### Cost Estimate

The total estimated planning level estimate required for preliminary engineering, ROW and utilities, and construction for this project is approximately \$51,000,000 based on 2020 costs. The 5 year inflated cost is approximately \$65,000,000 and the 10 year inflated cost is approximately \$83,000,000. These costs were based on a five percent (5%) inflation rate.

COST ESTIMATE SUMMARY (2020)						
PIN	Project Type of Work	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Project Cost (2020):
0.00	Widen	\$ 2,470,000	\$ 4,840,000	\$ 6,190,000	\$ 40,800,000	\$ 50,900,000

INFLATED COST ESTIMATE SUMMARY						Report Type:	Technical Report
No. of Years	Year	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Inflated Project Cost	
5	2025	\$ 3,150,000	\$ 6,180,000	\$ 7,900,000	\$ 52,100,000	\$ 65,000,000	
10	2030	\$ 4,020,000	\$ 7,880,000	\$ 10,100,000	\$ 66,500,000	\$ 82,900,000	

## **Conclusions**

After analysis, the Build scenario is recommended for the study limits of S.R. 374. The Build scenario consists of five (5) lane roadway with ten (10) foot shoulders, curb and gutter, and five (5) foot sidewalks. The thru lanes are twelve (12) feet and the two-way left turn lane is fourteen (14) feet. The shoulder will be striped with a five (5) foot bicycle lane and a five (5) foot buffer. The sidewalk will be expanded to six (6) foot within the school zone area. In addition, right turn lanes will be added at both the high school and the middle school entrances. Additional study may be required to determine the optimal school entrance configurations. The major intersections will include right and left turn lanes with ten (10) foot shoulders, curb and gutter, and five (5) foot sidewalks. At the intersection of S.R. 374 with U.S. 41-A, S.R. 374 will have a raised median for positive access control near the intersection. Signal control at the major intersections will be upgraded to accommodate the new cross-section and traffic demands. The roadway and signals should provide acceptable levels of service up to the 2043 design year.

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## 1.0 Introduction

The Technical Report process involves a comprehensive study of historic, current, and projected highway data. An assembled team reviews the project to validate identified deficiencies and determine cost effective measures to resolve those deficiencies with an emphasis placed on mobility and motorist safety.

The purpose of this Technical Report is to provide an overview of the existing route deficiencies, define the preliminary purpose and need for the project, and to provide preliminary design that is feasible, cost effective, and improves mobility for this segment of S.R. 374.

### 1.1 Study Area, Vicinity, Existing Roadway Network Maps

S.R. 374 in Clarksville is an urban arterial route 16.20 miles in length that extends from Madison Street (US-41A S.R. 112) to S.R. 76. TDOT is currently developing a separate project that will extend S.R. 374 south of S.R. 76 and across the Cumberland River to connect with S.R. 149.

**S.R. 374 Road Names**

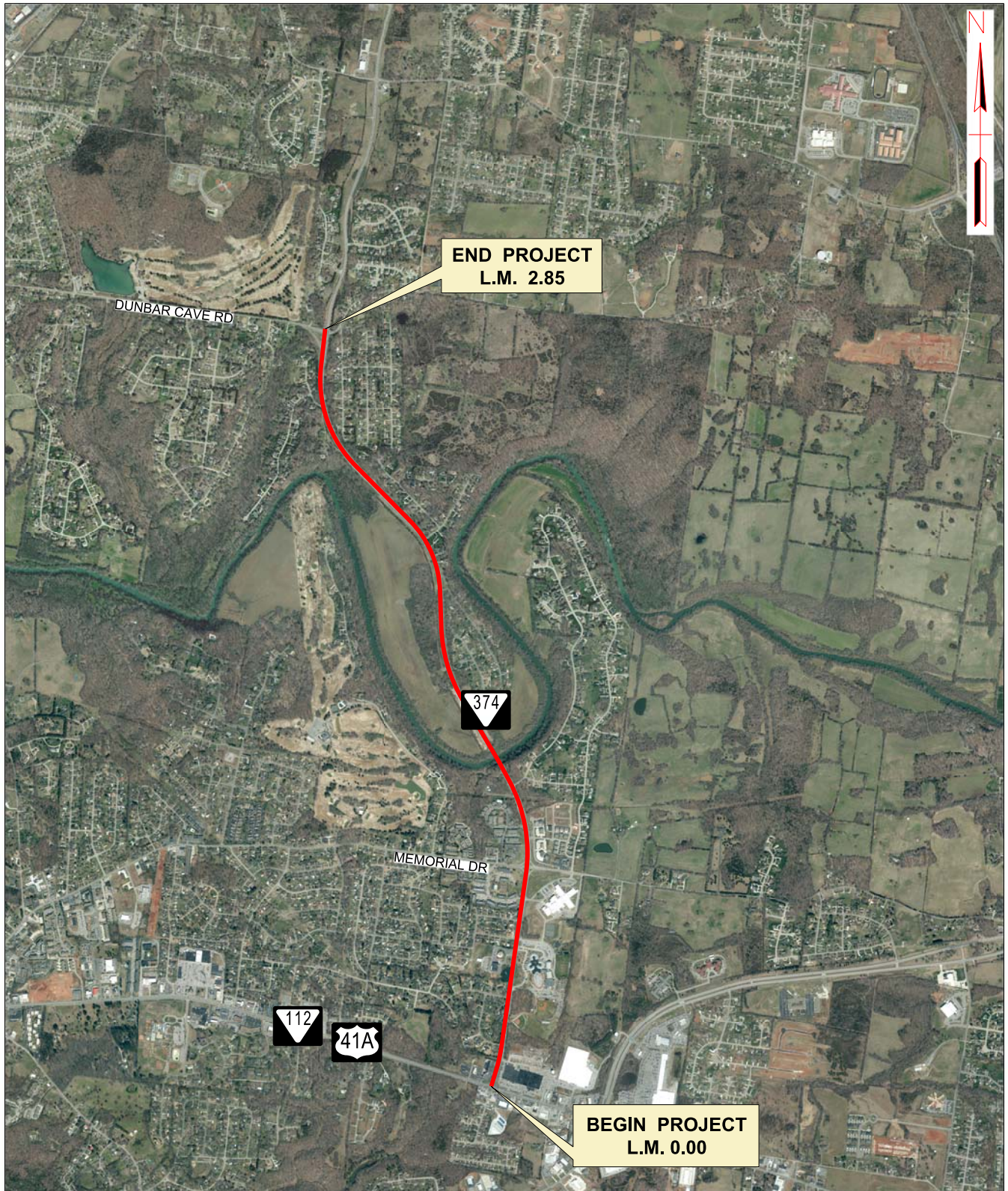
L.M.			Road Name
0	to	0.78	Richview Road
0.78	to	5.32	Warfield Blvd.
5.32	to	11.66	101st Airborne Division Parkway
11.66	to	13.91	Purple Heart Parkway
13.91	to	16.2	Paul B. Huff Memorial Parkway

The portion of S.R. 374 under study begins at the intersection of Madison Street at L.M. 0.00 and extends north to Dunbar Cave Road intersection at L.M. 2.85.

The terrain is rolling along this section and there is variable right of way (ROW) width.

The speed limit is 40 mph from L.M. 0.00 to L.M. 1.27 and 50 mph from L.M. 1.27 to L.M. 2.85. There is a 20 mph school speed limit in effect from L.M. 0.23 to L.M. 0.90 when school is in session.

The section of S.R. 374 in the study is illuminated and is a designated Tennessee Bicycle Route per information from the Tennessee Roadway Information Management System (TRIMS).

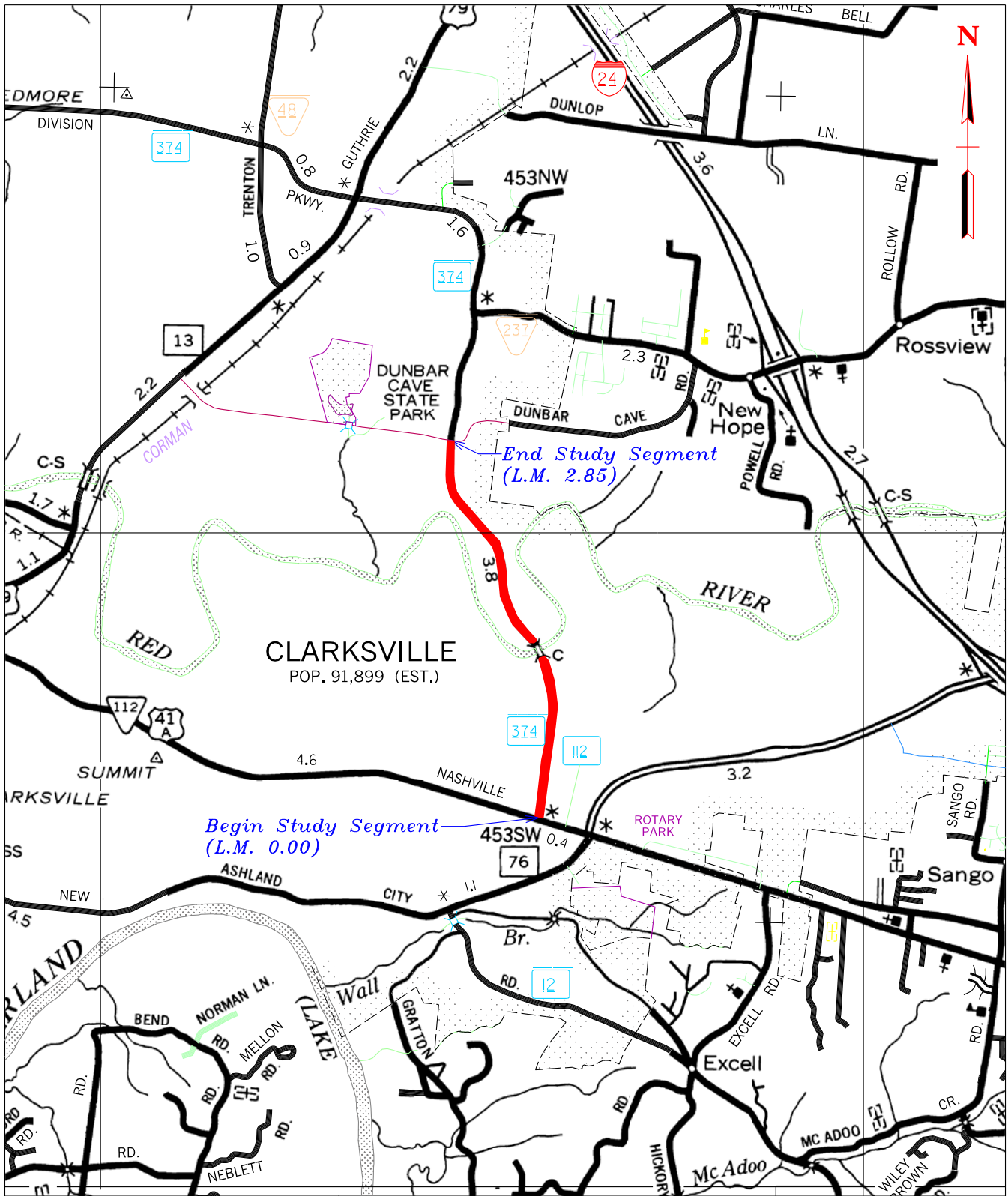


# *LOCATION MAP*

STATE ROUTE 374  
FROM MADISON STREET  
(US-41A S.R. 112)  
TO DUNBAR CAVE ROAD  
MONTGOMERY COUNTY

Scale: 1"=2,640'

PIN



## AREA MAP

### STATE ROUTE 374

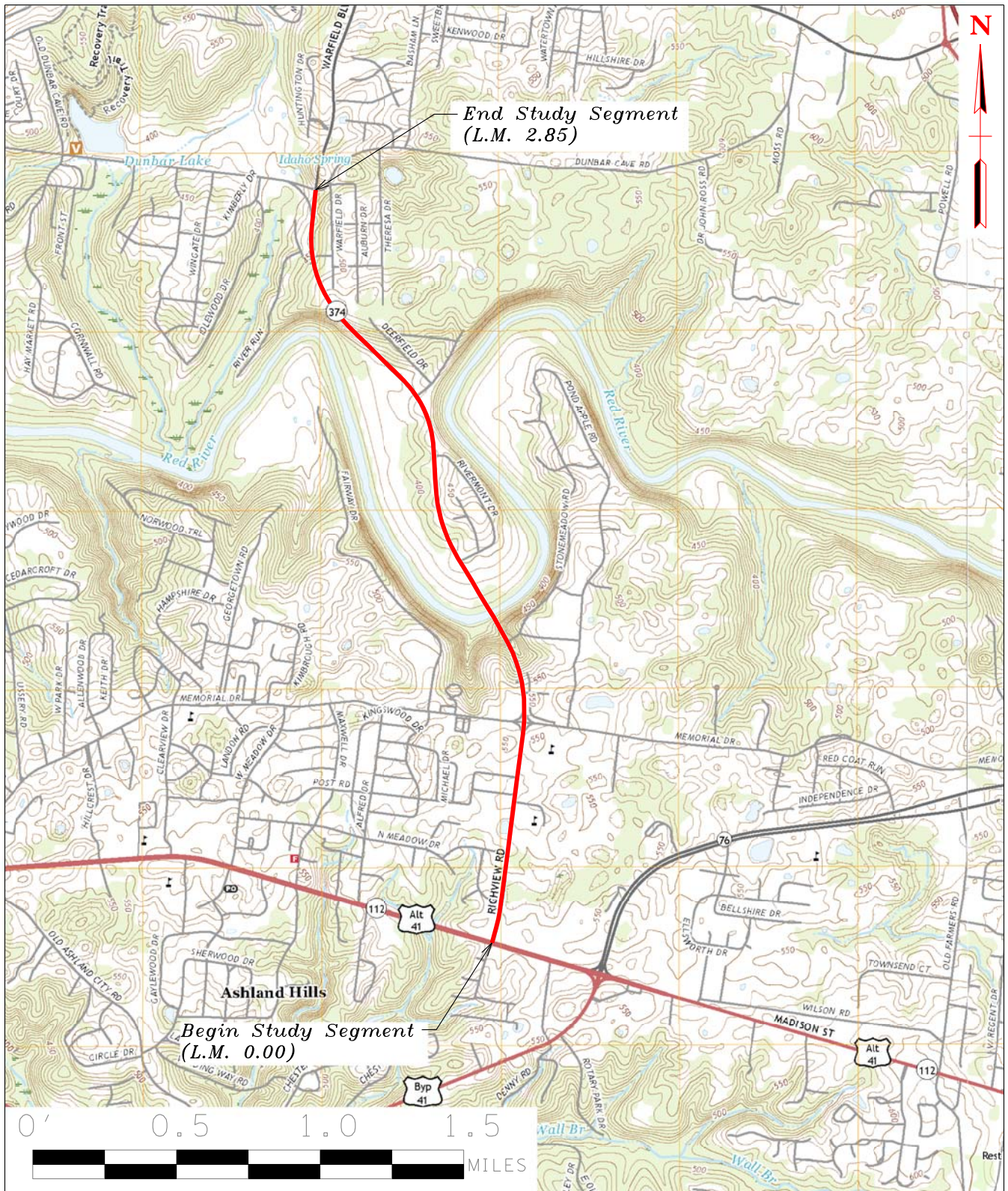
FROM MADISON STREET  
(US-41A S.R. 112)

TO DUNBAR CAVE ROAD

MONTGOMERY COUNTY

Scale: 1"=5,280'

PIN



## VICINITY MAP

STATE ROUTE 374  
FROM MADISON STREET  
(US-41A S.R. 112)  
TO DUNBAR CAVE ROAD  
MONTGOMERY COUNTY

Scale: 1"=2,640'

PIN

CONTINUED, SEE  
SHEET 2 OF 5



MAP SCALE 1" = 500'

PANEL 0244D

**FIRM**

FLOOD INSURANCE RATE MAP

**MONTGOMERY COUNTY  
TENNESSEE  
AND INCORPORATED AREAS**

**PANEL 244 OF 491**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLARKSVILLE, CITY OF	470137	0244	D
MONTGOMERY COUNTY	470136	0244	D

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



**MAP NUMBER**  
**47125C0244D**  
**EFFECTIVE DATE**  
**MARCH 18, 2008**

Federal Emergency Management Agency

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JOINS PANEL 0243

40  
41 000M N

CHICKASAW  
DRIVE

DEWITT DRIVE

SENTINEL DRIVE

ZONE X

**CITY OF CLARKSVILLE**  
**470137**

BEGIN LM 0.00

41A

SHEET 1 OF 5

CONTINUED, SEE  
SHEET 3 OF 5

ZONE X

ZONE AE

40° 42' 00" N

SAINT-BETHELEHEM  
CIVILIAN BRIDGE

ZONE X

ZONE X

MEMORIAL DRIVE

HAYSTACK  
ROAD

SPRINGLOT ROAD

POND APPLE ROAD

WOO

MAP SCALE 1" = 500'



PANEL 0244D

**FIRM**

**FLOOD INSURANCE RATE MAP**

**MONTGOMERY COUNTY  
TENNESSEE  
AND INCORPORATED AREAS**

**PANEL 244 OF 491**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

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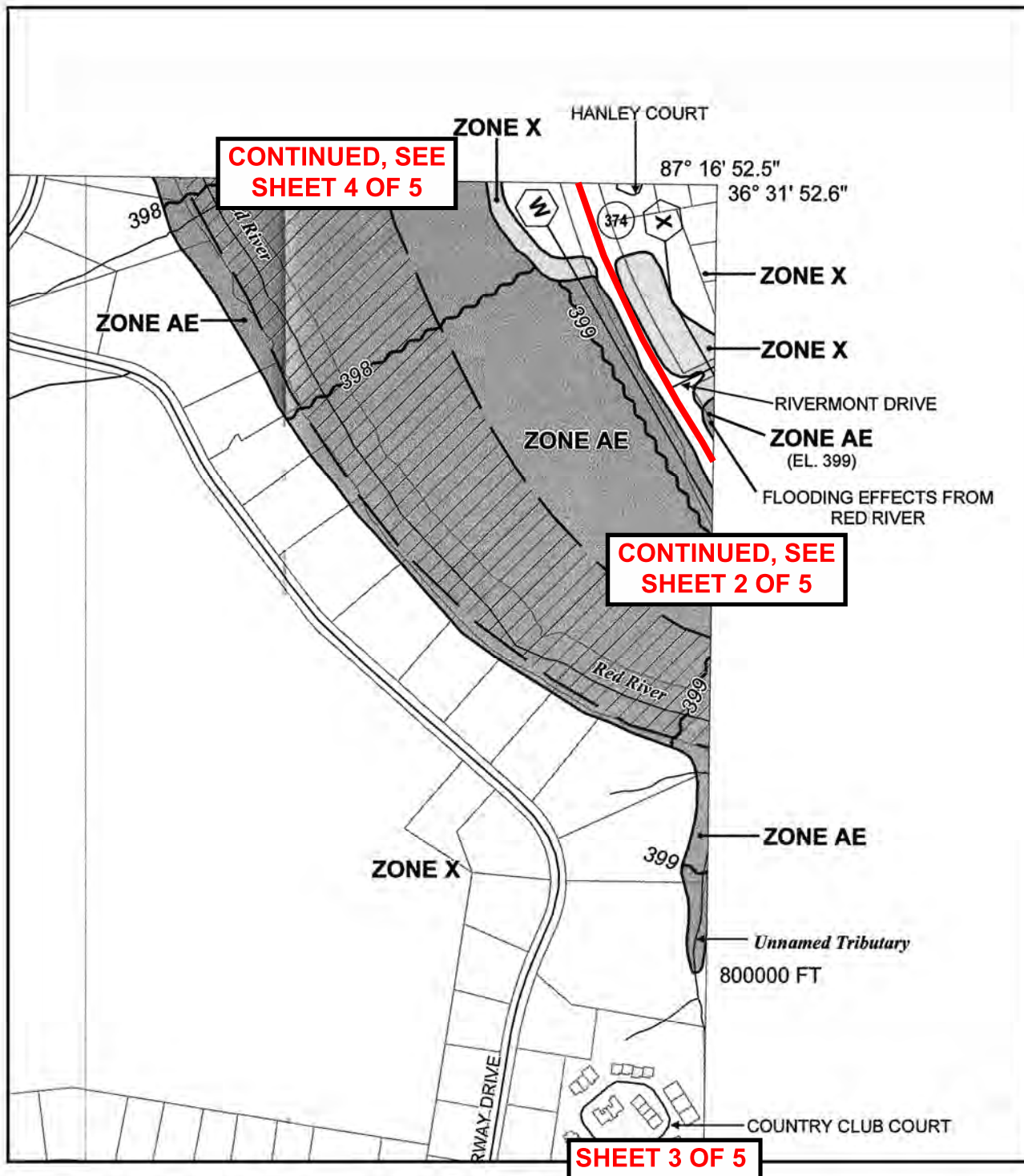
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**Federal Emergency Management Agency**

CONTINUED, SEE  
SHEET 1 OF 5

SHEET 2 OF 5

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MAP SCALE 1" = 500'

PANEL 0243D

**FIRM**

**FLOOD INSURANCE RATE MAP**

**MONTGOMERY COUNTY  
TENNESSEE  
AND INCORPORATED AREAS**

**PANEL 243 OF 491**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLARKSVILLE, CITY OF	470137	0243	D

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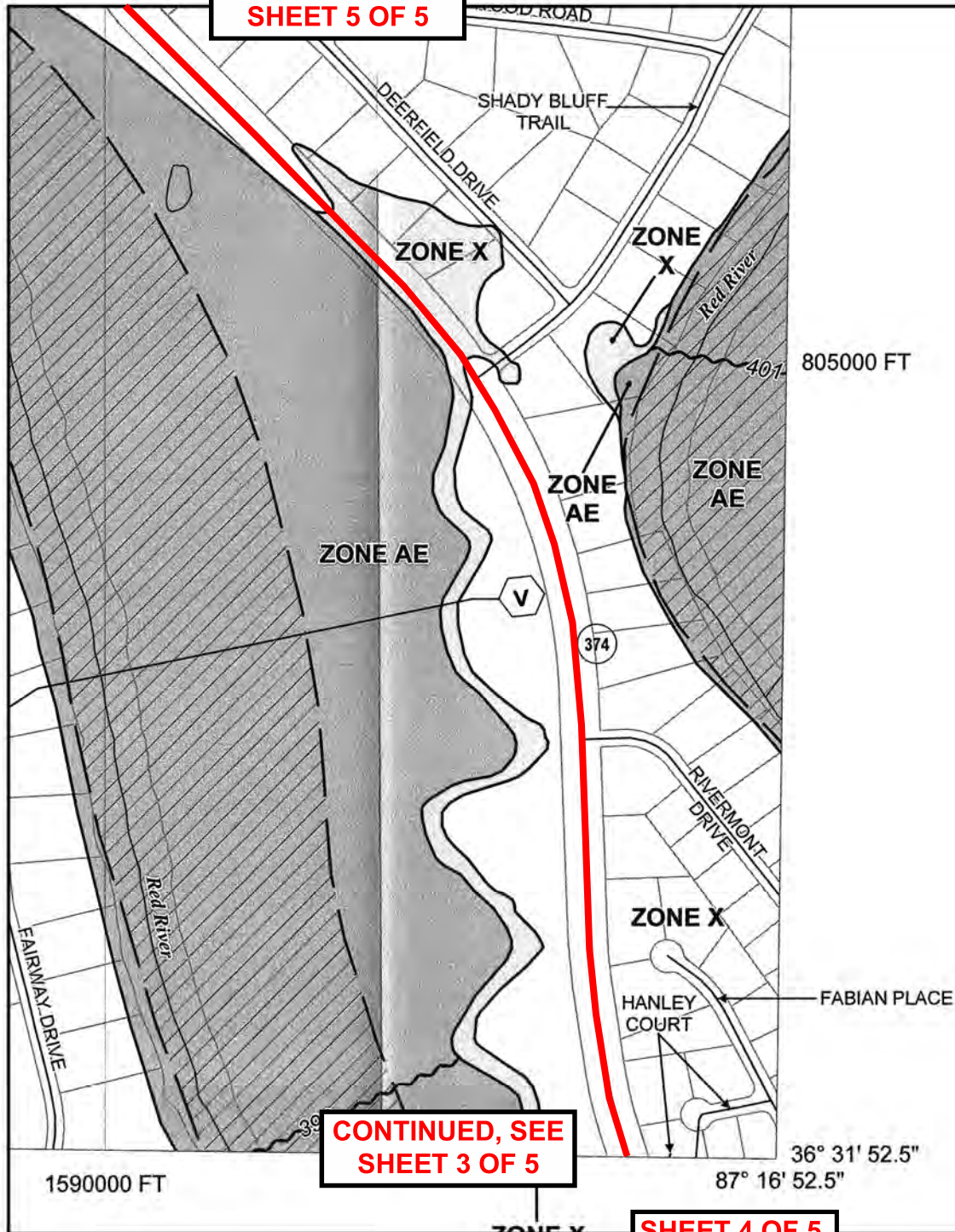
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**SHEET 3 OF 5**

CONTINUED, SEE  
SHEET 5 OF 5



CONTINUED, SEE  
SHEET 3 OF 5

SHEET 4 OF 5



MAP SCALE 1" = 500'

PANEL 0241D

**FIRM**

FLOOD INSURANCE RATE MAP

**MONTGOMERY COUNTY  
TENNESSEE  
AND INCORPORATED AREAS**

**PANEL 241 OF 491**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLARKSVILLE, CITY OF	470137	0241	D

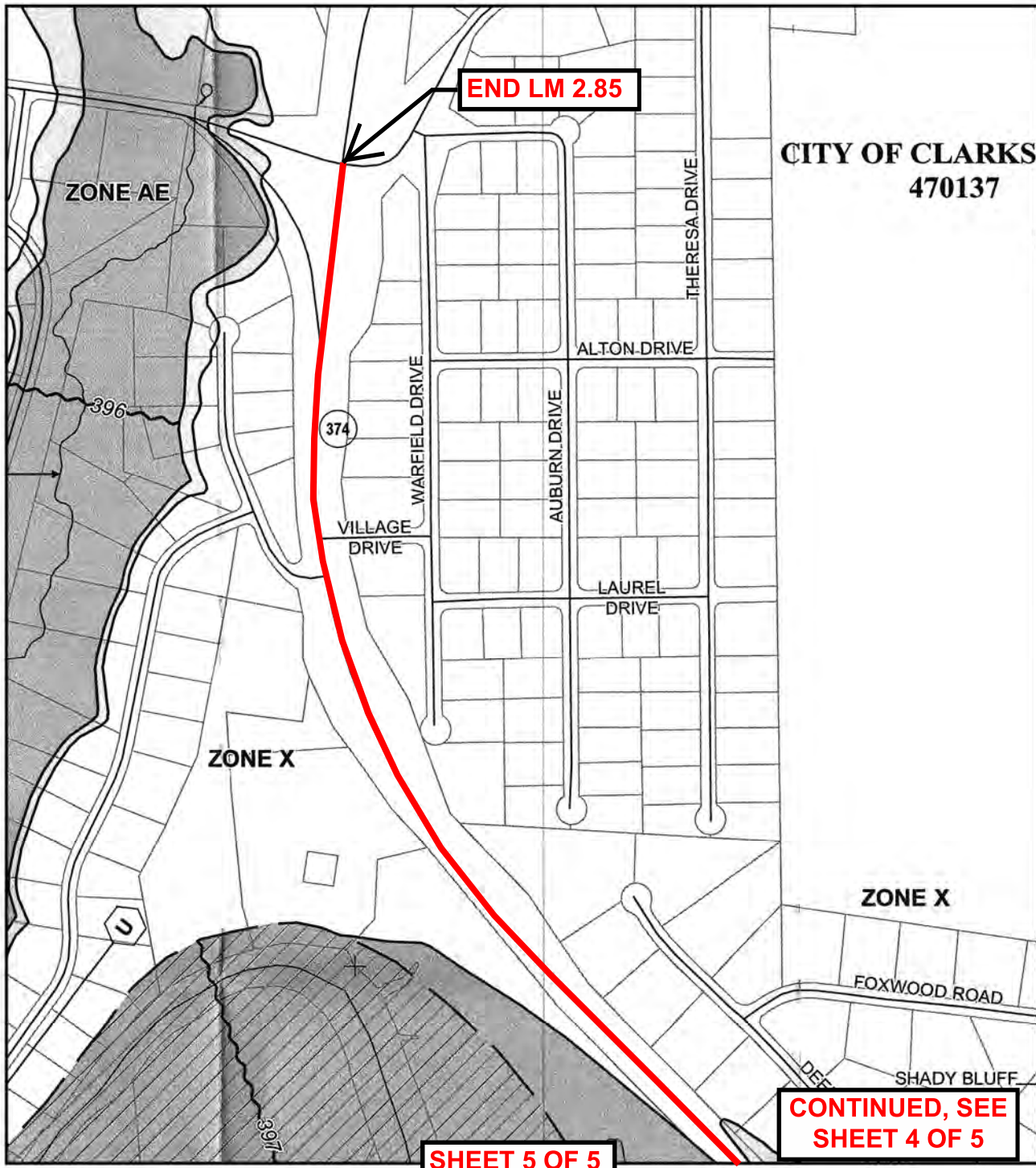
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EFFECTIVE DATE  
MARCH 18, 2008**

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MAP SCALE 1" = 500'

PANEL 0241D

# FIRM

FLOOD INSURANCE RATE MAP

## MONTGOMERY COUNTY TENNESSEE AND INCORPORATED AREAS

PANEL 241 OF 491  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

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CLARKSVILLE, CITY OF	470137	0241	D

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**EFFECTIVE DATE**  
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Federal Emergency Management Agency

**CONTINUED, SEE  
SHEET 4 OF 5**

**SHEET 5 OF 5**

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## 1.2 Demographics

The portion of S.R. 374 under review lies within the City Limits of Clarksville in Montgomery County, Tennessee. The route is located approximately forty-five (45) miles northwest of Nashville, Tennessee. The 2018 population of Montgomery County was estimated by the United States (U.S.) Census Bureau as 205,950. The 2018 population of Clarksville was estimated to be 156,794. Clarksville experienced an 18% growth rate between 2010 and 2018 with a 19.5% countywide growth rate. Select demographics are provided in Table 1, which compares equivalent demographics for Tennessee and the United States.

Comparison of Demographics to TN and US

Characteristic	Clarksville	Montgomery County	Tennessee	United States
Growth Rate (April 1, 2010-July 1, 2018)	18%	19.50%	6.70%	6%
Unemployment (2018)	7.20%	7.10%	5.90%	5.90%
Minority Population (2018)	42.40%	37.20%	26.30%	39.60%
Median Household Income (2014-2018)	\$53,007.00	\$55,972.00	\$50,972.00	\$60,293.00
Persons Below Poverty Level (2014-2018)	14.70%	12.00%	15.30%	11.80%
Median Age (2014-2018)	29.5	30.6	38.7	37.9

Source: U.S. Census Bureau

As shown in the table, Clarksville and Montgomery County experienced much higher than average growth rates between 2010 and 2018. Employment in the Clarksville MPO area has seen dramatic changes over the last several decades relative to the number of jobs and types of jobs that comprise the local economy. Government employment (both civilian and non-civilian) is the largest supplier of jobs within the MPO area. Fort Campbell supports the 3<sup>rd</sup> largest military population in the Army, and the 7<sup>th</sup> largest in the Department of the Army, with nearly 30,000 soldiers and civilians assigned to Fort Campbell.

## 1.3 Existing Land Use and Zoning

Land use is classified as mixed residential commercial from L.M. 0.00 to L.M. 0.23, residential from L.M. 0.23 to L.M. 1.10 and rural from L.M. 1.1 to the end of the study section. It is zoned primarily as residential, with some commercial and industrial zoning near the Madison Street intersection. Clarksville High School and Richview Middle School are located within the study area as well as Family Life Worship Center and Community of Hope Church of the Nazarene. There is an office park located within the study area adjacent to the Memorial Drive intersection. River Club golf course is located within the study area south of Dunbar Cave Road intersection.

## 1.4 Existing Adjacent Projects

Construction was recently completed to widen S.R. 374 from three (3) lanes to five (5) lanes beginning just south of Dunbar Cave Road intersection and extending to Stokes Road. (R-STP-374(10), 63111-3218-14)

## 2.0 Existing Roadway Conditions

This 2.85 mile section has been divided into three (3) segments for analysis.

- Segment one extends from L.M. 0.00 (Madison Street, US-41A S.R. 112) to L.M. 0.78 (Memorial Drive). Section one has a 40 mph speed limit with a 20 mph school zone speed limit. The AADT is 16,015 VPD. Madison Street at the intersection of S.R. 374 is a five (5) lane urban minor arterial with a 45 mph speed limit and AADT of 20,830 VPD. The south approach of the Madison Street intersection is S. Richview Road, a local dead end street serving three businesses and a residential neighborhood. Segment one is a three (3) lane section with two (2) eleven (11) foot travel lanes and an eleven (11) foot continuous left turn lane. Clarksville High School and Richview Middle school are located along this segment. Turning lanes are present at the Madison Street intersection, school entrances, and Memorial Drive intersection.
- Segment two extends from L.M. 0.78 (Memorial Drive) to L.M. 1.32. This is a three (3) lane section (auxiliary truck climbing lane in southbound direction) with twelve (12) foot lane widths from L.M. 0.78 to L.M. 1.1 and transitions to a two (2) lane section before crossing the Red River at L.M. 1.16. The segment transitions to a three lane section with two (2) 12 (twelve) foot travel lanes and a twelve (12) foot continuous left turn lane at L.M. 1.32. The speed limit is 40 mph to L.M. 1.27 then raises to 50 mph.
- Segment three extends from L.M. 1.32 to L.M. 2.85 (Dunbar Cave Road). This is a three (3) lane section with two (2) 12 (twelve) foot travel lanes and a twelve (12) foot continuous left turn lane. Turning lanes are present at the Dunbar Cave Road intersection. The speed limit is 50 mph. The AADT for segments 2 and 3 increase to 27,825 VPD in the 2023 base year.

### 2.1 Existing Structures and Bridges Conditions

There is an existing two (2) lane bridge [63S62701005] that crosses the Red River located at L.M. 1.16 with a 2018 sufficiency rating of 81.3.

According to E-TRIMS, there are eight (8) culverts or pipes less than four (4) feet in diameter along the existing route that will be impacted by this project. Other structures may be present along the project route that are not identified by TRIMS. TDOT Design plans for project 63111-3218-14 indicate that there is an existing 60" corrugated metal pipe located just east of Stonemeadow Drive at approximate log mile (L.M.) 1.07. TRIMS shows a culvert or pipe less than four (4) in diameter at this same location, and it is unclear if this structure was mislabeled in TRIMS, replaced with a larger diameter pipe, or if there are two (2) pipes at this location. The modification of end treatments, extension, or replacement of impacted structures should be included in the eventual scope of the project.

### 2.2 Existing Utility Infrastructure

CDE Lightband and Clarksville Gas and Water provided information regarding their utilities within the project area which can be found in the appendix of this report.

### **2.3 Preliminary Environmental Constraints**

There is an existing 0.84 acre detention pond that will be impacted by construction on the left side of roadway in front of the Family Life Worship Center located north of Sequoia Drive. The pond is classified as a palustrine unconsolidated bottom permanently flooded pond (PUBH). The National Wetlands Inventory Wetlands Mapper shows one (1) crossing within the project limit. S.R. 374 crosses the Red River at L.M. 1.16. This 913.35 acre habitat is classified as riverine lower perennial mud unconsolidated bottom permanently flooded (R2UB3H). Special precaution should be taken to avoid contamination or destruction of environmental features in the project area. Wetland areas exist in the general area but are located several hundred feet away from the existing roadway and are not expected to be impacted by construction. The project will progress in accordance with the National Environmental Policy Act (NEPA) and a detailed Environmental Boundaries Report will be prepared to identify ecological resources within the project area. The report should be used by the designer to minimize the projects impact on the resources.

TDOT Technical Study Staff have identified the following resources within the project limits:

#### **Air and Noise**

This is a Type I noise project, so a detailed noise study will be required. If the NEPA doc is going to be a D-List CE, then Mobile Source Air Toxic Analysis (MSAT) will not be required.

#### **Archaeology**

We studied the existing ROW in the early 2000's and did not identify any archaeological resources at that time. An archaeological survey of all proposed ROW, easements, and undisturbed areas within existing ROW will be required for the subject project. However, due to the geographic context and recent land-use, the probability of identifying archaeological resources that are eligible for the National Register of Historic Places within the area of potential effects is low.

#### **Ecology**

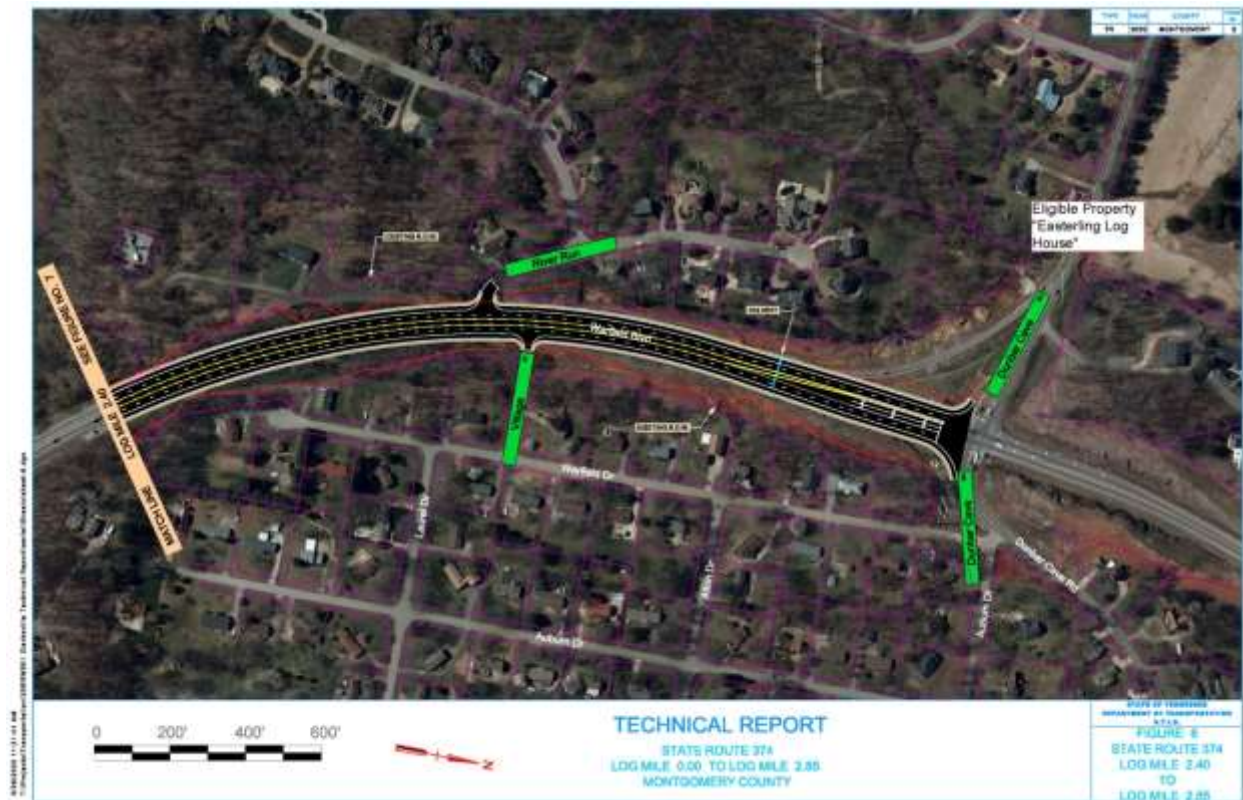
According to the Tennessee Department of Environment and Conservation (TDEC) Natural Heritage Rare Species database, there are two records of rare species within one mile of the proposed project; the state and federally-listed Endangered gray bat, *Myotis grisescens* and state-listed purple milkweed. Within four miles there are several records of rare plants and animals, many of the records are historic. Of the rare species within four miles, only one *Physaria globosa*, Short's bladderpod is federally-listed. All of the others are state-listed. The state -listed species within four miles are: Bewick's wren, hellbender, Northern pine snake, Southern bog lemming, barking tree frog, slenderhead darter, Short's rock cress, pale purple coneflower, sand grape, beak grass, limestone bluestar, and prairie ragwort. There is at least one stream, the Red River within this project area. Since the report states that there are 8 culverts, it is likely that there are smaller streams, ephemeral streams or wet weather conveyances. There may be wetlands in low-lying areas, especially near the river. Tree cutting may affect bats such as Indiana bats and Northern long-eared bats that use trees for summer roosting habitat.

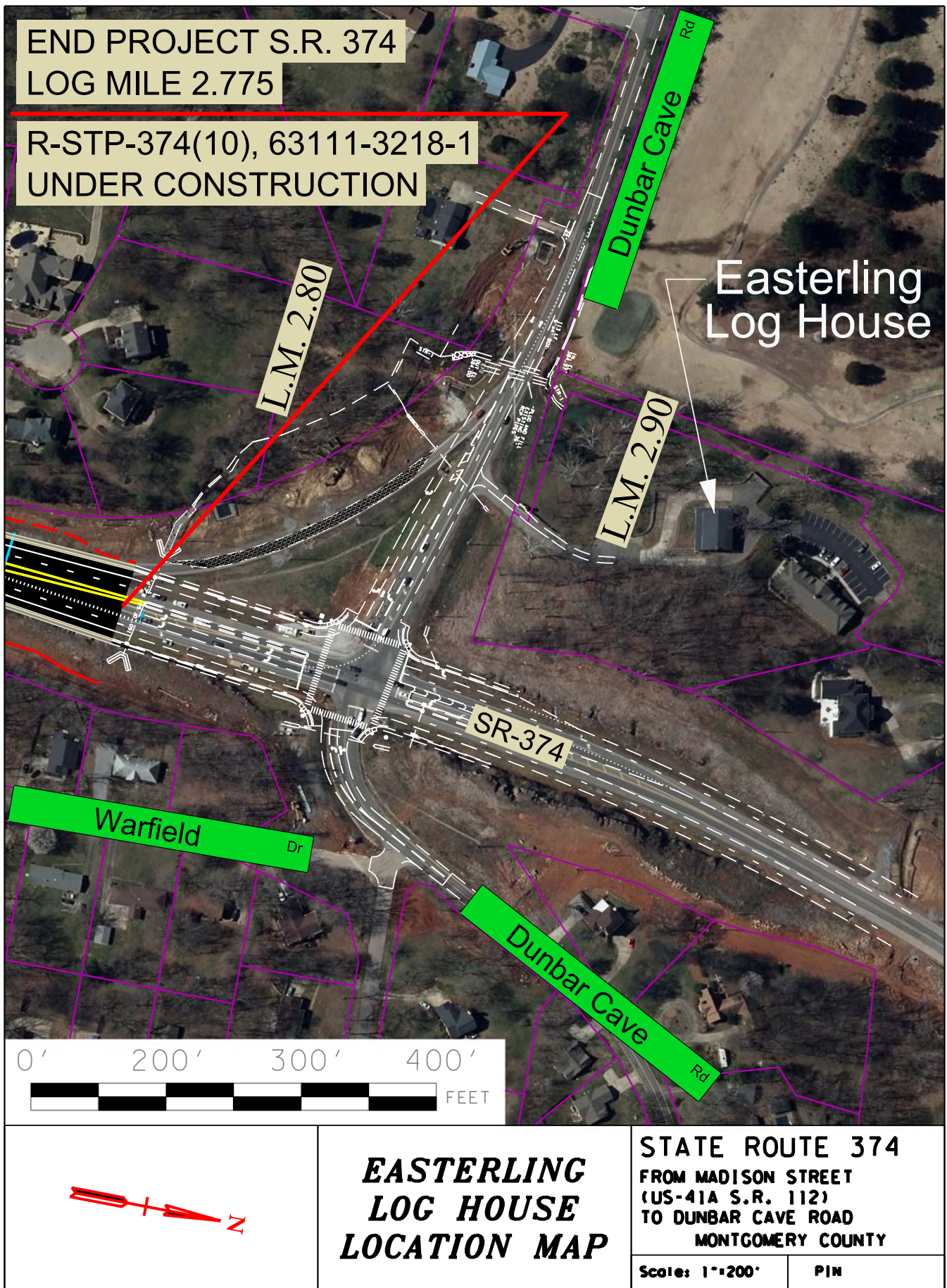
## HazMat

No hazardous materials sites are identified along the corridor other than two current or former UST facilities on the corner of S.R. 374 and Madison St., but no proposed ROW is shown on the figures. The bridge over Red River, and possibly the culverts (anything other than corrugated metal pipe) will require asbestos surveys.

## Historic

There is one structure previously surveyed by TDOT and deemed eligible for listing on the National Register of Historic Places: The Easterling Log Cabin, located at the corner of Dunbar Cave Road and Warfield Blvd. Below is an updated functional map with the location of this property. Further study will be required to assess the project's effect on this property. In addition to the previously surveyed property, there are other properties in the project area that are 50+ years old that may be eligible for listing on the National Register of Historic Places. Further study will be required once we receive our official tech request.





## Multimodal

According to TDOT's Roadway Design Guidelines Chapter 3-Multimodal Design (New Chapter, Revised September 11, 2020), there should be a minimum buffer of three (3) feet between the roadway and a five (5) foot bike lane (Table 3-4 shown below). The Tennessee Department of Transportation Multimodal Transportation Resources Division has recommended a five (5) foot buffer with a five (5) foot bike lane. The following is an excerpt from the Design Guidelines:

### 3-501.04 BUFFERED ON-STREET BICYCLE LANES

Buffered bicycle lanes are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. The buffer space is created with pavement markings. When a buffer is placed between the traveled way and a bicycle lane, it improves safety by separating bicyclists from moving motor vehicles. A buffer can also be placed between on-street parking lanes and bicycle lanes. When that configuration is selected, bicyclists have less risk of being hit by a car door being opened from a parked car. Both locations are acceptable, and the preferred placement of the buffer(s) depends upon local conditions. Buffered bicycle lanes provide the following advantages when compared to conventional bicycle lanes.

- Provide greater distance between bicyclists and motor vehicles
- Provide space for faster moving bicyclists to pass slower moving bicyclists without having to encroach into the motor vehicle travel lane
- Provide a greater space for bicycling without making the bicycle lane appear so wide that it might be mistaken for a travel lane or a parking lane
- Appeal to a wider range of bicyclists and encourages bicycling

Minimum Bicycle Facility Guidance for Urban (Curb and Gutter) Cross Sections				
ADT		< 2,000	2,000 - 10,000	> 10,000
Posted Speed Limit	≤ 35 mph	SL or WOL	BL	BL
	40 - 45 mph	BL (5 ft)	BL (5 ft) or BBL (4 ft ▲)	BL (5 ft) or BBL (4 ft ▲) or SBL (5 ft ▲)
	50 - 55 mph	BBL (4 ft ▲) or SBL (5 ft ▲)	BBL (4 ft ▲) or SBL (5 ft ▲)	BBL (4 ft ▲) or SBL (5 ft ▲)
	> 55 mph	SUP	SUP	SUP
SL = Shared Lane      BBL = Buffered Bike Lane      WOL = Wide Outside Lane SUP = Shared-Use Path      SBL = Separated Bike Lane      (Min. 14 Ft Wide) BL = Conventional Bike Lane				
▲ Add buffer a minimum of 3 feet in width; buffered bike lanes are preferred when on-street parking is present regardless of the speed.				

Table 3-4: Bicycle Facilities on Urban Roadways Design Guidance  
(For Mono Directional Only)

#### **Section 4(f)**

There are two potential Section 4(f) resources along the corridor.

- Clarksville High School Baseball Field along S.R. 374 – Potential Section 4(f) resource – coordination needed with the Official with Jurisdiction (OWJ) is needed to determine. If it is a Section 4(f) resource, any ROW acquisition would cause the need for a de minimis determination. If only temporary easements would be needed, temporary occupancy would be appropriate.
  - If the public-school baseball field serves only school activities and functions and is not open to the public or serve as either organized or substantial walk-on recreational purposes that are determined to be significant, then it is not subject to Section 4(f). The project lead should obtain documentation from the OWJ explaining that the baseball field is only used for school functions and does not have any other local significance for recreational purposes.
- Crow Community Center is located on the same tract as Clarksville High School at 211 Richview Road and is one of three recreation centers managed by the City of Clarksville Park & Recreation. This resource appears to be open to the public but through a daily admission cost or an annual membership. Further coordination with the OWJ and the Federal Highway Administration (FHWA) would be needed to determine if this is a Section 4(f) resource. Neither the center nor its parking appear to be impacted by the proposed project; however, disruption of access during construction could result in a de minimis impact if this Center is determined to be a Section 4(f) resource.
- River Club Golf and Learning Center located at 1150 Warfield Blvd. – Not a Section 4(f) resource. While open to the public, it is privately owned by River Investments GP.
- The Villages at the River Club – Not a Section 4(f) resource. This is a luxury retirement community that does not appear to have ROW or easement impacts.

#### **Section 6(f)**

No resources identified.

#### **ROW**

A Conceptual Stage Relocation Plan (CSRП) will be necessary for any business or residential relocations.

#### **Other Notes**

- This portion of S.R. 374 has signage for Clarksville Transit System (CTS) - Bus Route along the roadway. There is one pedestrian bench located on S.R. 374 near the Clarksville High School driveway across from Sentinel Drive. Appropriate coordination will need to take place.
- Ensure that the project has appropriate transitions of traffic at Madison Street, Dunbar Cave Road, and all other crossing intersections. At Dunbar Cave Road, it appears that two lanes will carry through the intersection, but there is only one existing lane on the other side. Is there another project that will improve that portion of S.R. 374 to match the typical? At Madison Street, turn lanes need to be added on S. Richview Road to show how residential traffic will turn left and right onto Madison Street.

### 3.0 Safety

The calculated crash rate (A) and the severe crash rates for the three segments of the route can be found in the table below. Crash rates were calculated based on TDOT 2018 cycle counts and using crash data from the dates of January 1, 2017 to December 31, 2019.

Crash Rates		
Segment 1: L.M. 0.00-0.78 (A/C ratio 1.81)		
Type	Crash Rate	SW Average
Total	7.66	2.978
Severe (Fatal+Incap)	0.00	0.08
Segment 2: L.M. 0.78-1.32 (A/C ratio 0.82)		
Type	Crash Rate	SW Average
Total	3.023	2.574
Severe (Fatal+Incap)	0.00	0.1
Segment 3: L.M. 1.32-2.85 (A/C ratio 0.82)		
Type	Crash Rate	SW Average
Total	3.028	2.978
Severe (Fatal+Incap)	0.058	0.08
S.R. 112 intersection (A/C ratio 2.86)		
Type	Crash Rate	SW Average
Total	2.995	0.682
Severe (Fatal+Incap)	0.00	0.014
Memorial Drive intersection (A/C ratio 2.46)		
Type	Crash Rate	SW Average
Total	2.589	0.682
Severe (Fatal+Incap)	0.00	0.014
Dunbar Cave Road intersection (A/C ratio 2.41)		
Type	Crash Rate	SW Average
Total	2.549	0.682
Severe (Fatal+Incap)	0.07	0.014

The total crash rate is higher than the statewide average for all three segments and for each of the three analyzed intersections. The severe crash rate is lower than the statewide average for all three segments and for two of the three analyzed intersections. Dunbar Cave Road intersection severe crash rate is higher than the statewide average.

S.R. 374 CRASH STATISTICS		
Condition	1/1/2017-12/31/2019	
	Number of Crashes	Percentage of Total
Lighting Conditions		
Daylight	161	72%
Dark-Not Lighted	37	17%
Dark-Lighted	17	7%
Dusk/ Dawn	9	4%
Crash Severity		
Property Damage	188	84%
Non-incap Injury	34	15%
Incap Injury	2	1%
Fatality	0	0%
Manner of Collision		
Rear-End	132	59%
Angle	41	18%
No Collision w/ Vehicle	36	16%
Head-on	6	3%
Sideswipe, Same Direction	5	2%
Other	3	1%
Sideswipe, Opposite Direction	1	1%
Weather Conditions		
Clear	171	76%
Rain	27	12%
Cloudy	23	10%
Sleet/ Hail	1	0.70%
Fog	1	0.70%
Blowing Sand/Soil/Dirt	1	0.70%

#### 4.0 Existing and Future Traffic Projections

L.M.			2018 Cycle Count AADT	Base Year (2023) AADT	Design Year (2043) AADT
0	to	0.78	12,840	16,015	23,850
0.78	to	2.85	20,700	27,825	48,165
2.85	to	3.75	14,820	-	-

Traffic Projections provided by TDOT Strategic Transportation Investments Division

The base year (2023) AADT for the section of S.R. 374 under study is 21,920 vehicles per day. The design year (2043) AADT is projected to be 36,010 vehicles per day.

#### 5.0 Preliminary Purpose and Need

Existing S.R. 374 is experiencing increased traffic demands as well as increased frequency of rear end and right angle collisions within the project area. The current roadway does not have the capacity to handle the current and projected traffic volumes during peak hours. As the corridor continues to develop, safety and capacity improvements will be needed to provide an adequate and efficient transportation facility.

The needs to be addressed with this project are:

- Providing increased capacity with an additional lane in each direction and continuous left turn lane for current and future traffic demand.
- Intersection upgrades to improve traffic flow.
- Improving safety conditions through reducing conflicts with the addition of right turn lanes at the major intersections.
- Reducing delay and congestion.

By implementing these improvements, S.R. 374 can provide a more efficient, reliable facility. These improvements may also help support existing and future traffic demands.

#### 6.0 Conceptual Project Alternatives

After evaluating the safety, operational, and geometric conditions existing on S.R. 374 within the study limits, two options were considered: The No-Build and the Build Alternative.

##### No-Build Alternative

The no-build alternative maintains the existing roadway network through the design year providing no improvements to capacity or efficiency. Routine maintenance would continue and projects programmed for completion would still occur.

### Build Alternative

S.R. 374 will be widened to become a five (5) lane roadway with ten (10) foot shoulders, curb and gutter, and five (5) foot sidewalks based on TDOT Design Standard Drawing RD11-TS-6B and MM-SW-1 . The thru lanes will be twelve (12) feet and the two-way left turn lane is fourteen (14) feet. As the roadway approaches the major intersections, the cross section is widened to accommodate traffic demands.

The Build alternative's ROW limits and slope lines, as presented on the functional plans, are conceptual in nature and estimated from the Digital Elevation Model (DEM) data provided. The actual ROW needed will be confirmed by future phases of project development. ROW limits shown are to be used to establish the boundaries for additional required environmental technical studies.

### 7.0 Traffic Analysis

The traffic operations analysis for the S.R. 374 widening includes the use of techniques provided in the sixth edition of the Highway Capacity Manual (HCM), published by the Transportation Research Board (TRB) in 2016. Calculations are performed using Highway Capacity Software (HCS), version 7.3.

The HCM prescribes the use of Level of Service (LOS) to characterize operational conditions. LOS is a qualitative measure, defined by the HCM, which describes the operational conditions of a transportation facility in terms of general service measures, such as speed, travel time, freedom to maneuver, interruptions, and user comfort and convenience. Six levels are defined for all transportation facilities with operational analysis methodology in the HCM; the levels are designated using letters from "A" to "F", with "A" representing the best operational conditions and "F" the worst.

#### Level of Service (LOS) Definitions for Vehicular Operations

LOS	Vehicular Operations Definition			
A	Free flow operations. Vehicles are almost completely unimpeded in their ability to maneuver with the traffic stream. The general level of physical and psychological comfort provided to the driver is high.			
B	Reasonable free flow operations. The ability to maneuver within the traffic stream is only slightly restricted. The general level of physical and psychological comfort provided to the driver is still high.			
C	Flow with speeds at or near free flow speeds. Freedom to maneuver within the traffic stream is noticeably restricted and lane changes require more vigilance on the part of the driver. The driver notices an increase in tension.			
D	Speeds decline with increasing traffic. Freedom to maneuver within the traffic stream is more noticeably limited. The driver experiences reduced physical and psychological comfort levels.			
E	At lower boundary; the facility is at capacity. Operations are volatile because there are virtually no gaps in the traffic stream. There is little room to maneuver. The driver experiences poor levels of physical and psychological comfort.			
F	Breakdowns in traffic flow. The number of vehicles entering the highway section exceeds the ability of the highway to accommodate that number of vehicles. There is no room to maneuver. The driver experiences poor levels of physical and psychological comfort.			

Capacity analyses were conducted on the northern section so S.R. 374 between Memorial Drive and Dunbar Cave Road. For the base year 2023 with the no-build scenario, the roadway operates at a LOS E. For both the 2033 and 2043 design years, the roadway will operate at a LOS F. Under the build scenario, the roadway will operate at a LOS C for the 2033 design year and LOS D for the 2043 design year.

Capacity analyses were conducted on the two major intersections; US-41A with S.R. 374 and S.R. 374 with Memorial Drive. Traffic counts were taken to develop Design Hourly Volumes (DHVs) for both intersections. The DHV's were developed for the base year 2023, and future design years 2033 and 2043.

S.R. 374 with US-41A (S.R. 112-Madison St.) L.M. 0.00

This intersection experiences a high southbound to eastbound left turn and a reciprocal westbound to northbound right turn during the morning and afternoon peak. Capacity analysis of the intersection utilizing the existing cross section and base year 2023 traffic data showed the intersection failing with a LOS of F. The southbound left had a peak volume of 807 vehicles. Typically, when traffic volumes reach these levels, additional lanes are needed to reduce the signal green needed time to clear vehicle queues during each traffic signal cycle. The reciprocal right turn has a peak volume of 911 vehicles thus requiring a dedicated right turn lane.

Multiple cross section and intersection phasing scenarios were conducted to provide a solution to provide adequate future capacity at the intersection. With the planned laneage, acceptable levels of service were feasible through the 2043 design year. With the proposed laneage, the intersection will operate at a LOS B for the morning peak and LOS C for the afternoon peak in the baseline 2023 year. For the design year 2033, the intersection will operate at a LOS C for morning peak and LOS D in the afternoon peak. In design year 2043, the intersection will operate at a LOS C for morning peak and LOS E for the afternoon peak.

S.R. 374 with Memorial Drive L.M. 0.780

This intersection experiences a high southbound to westbound right turn and a reciprocating eastbound to northbound left turn volume. The volumes indicate a need for multiple lanes for those movements. Although the intersection currently has left turn lanes and right turn ramps, the intersection operates at a level of service F for the baseline year 2023.

Multiple cross section and intersection phasing scenarios were also conducted to determine which solutions provided adequate future capacity at the intersection. Dual southbound right turn lanes and dual eastbound left turn lanes were incorporated to compensate for the high turning movements on those approaches. In addition, dual westbound left turn lanes were added for lane alignment. With the proposed lane configuration, a capacity analysis for the 2023 base line year was improved to LOS B for both the morning and afternoon peaks. For the design year 2033, the LOS C for both the morning and afternoon peaks. For the design year 2043, the intersection will operate at a LOS E for both the morning and afternoon peak hours.

## **8.0 Horizontal and Vertical Alignment**

The horizontal and vertical alignment of the build alternative follows the horizontal alignment of the existing S.R. 374, with widening from three (3) to five (5) lanes assumed to occur symmetrically throughout the study area. Depending on the specific impacts to and possible acquisitions of properties along the study area, it may be economical to consider widening asymmetrically for certain segments of the build alternative. This determination can be made during the design phase when more extensive survey data is available.

## **8.1 Maintenance of Traffic and Constructability**

Traffic shall be maintained throughout construction. Lane shifts will be used to maintain normal traffic flow in conjunction with the construction. No major constructability issues were identified. Typical construction methods can be used. Efforts will be made to minimize cost and environmental impacts.

## **8.2 Design Exceptions, Retaining Walls, and Slope Adjustments**

No design exceptions are needed for this project. Preliminary retaining wall locations have been identified on the functionals. Retaining walls and adjustments to ditch slopes could be considered as the project moves to the next stage of design if ROW acquisition is a concern.

## 9.0 Benefits: Traffic Analysis

Traffic analyses of the existing roadway indicated that Levels of Service for the facility was poor. The improvements recommended provide for an acceptable Level of Service until the design year 2043. The table below provides Level of Service differences between the No-Build and the Build Alternative.

LEVEL OF SERVICE COMPARISON TABLE												
Description	No Build Alternative						Build Alternative					
	2023		2033		2043		2023		2033		2043	
Memorial Drive to Dunbar Cave Road	E		F		F		A-B		B-C		C-D	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
S.R. 374/US-41A Intersection	F	F	F	F	F	F	B	C	C	D	C	E
S.R. 374/Memorial Dr. Intersection	F	F	F	F	F	F	B	B	C	C	E	E

## 9.1 Benefits: Safety

### Crash Modification Factors for Proposed Alternatives

Crash modification factors (CMFs) are an index of how much crash experience is expected to change following a modification in design or traffic control. A CMF is defined as the ratio between the number of crashes per unit of time expected after a modification or measure is implemented and the number of crashes per unit of time expected if the change does not take place:

$$\text{CMF} = \frac{\text{Expected Average Crash Frequency with Modification Measure}}{\text{Expected Average Crash Frequency with No Change}}$$

Where the implementation of a modification in design or traffic control may be expected to result in a reduction in crashes (i.e., where the CMF is less than 1), the change can be expressed as a crash reduction factor (CRF), which is the percentage crash reduction that might be expected after implementing a certain modification in design or traffic control. A CRF is calculated as follows:

$$\text{CRF} = 1 - \text{CMF}$$

The CMF Clearinghouse (<http://www.cmfclearinghouse.org>), a website funded by the US Department of Transportation (USDOT) Federal Highway Administration (FHWA) and maintained by the University of North Carolina Highway Safety Research Center, is a comprehensive and searchable database of published CMFs. The CMF Clearinghouse provides information on all available CMFs, including the CMF value and all published details about the CMF, citations and related information about the study that produced each CMF, and a star rating that provides an indication of the quality of each CMF.

The star ratings provided in the CMF Clearinghouse are based on a 1-to-5 scale, where five stars indicates the highest or most-reliable rating. The review process to determine the star rating judges the accuracy

and precision as well as the general applicability of the study results. Reviewers considered five categories for each study—study design, sample size, standard error, potential bias, and data source—and judged each CMF according to its performance in each category.

#### CMF Clearinghouse Relative Ratings and Performance Categories

Relative Rating	Excellent	Fair	Poor
Study Design	Statistically rigorous study design with reference group or randomized experiment and control	Cross sectional study or other coefficient based analysis	Simple before/ after study
Sample Size	Large sample, multiple years, diversity of sites	Moderate sample size, limited years, and limited diversity of sites	Limited homogenous sample
Standard Error (SE)	Small compared to CRF	Relatively large SE, but confidence interval does not include zero	Large SE and confidence interval includes zero
Potential Bias	Controls for all sources of know potential bias	Controls for some sources of potential bias	No consideration of potential bias
Data Source	Diversity in States representing different geographies	Limited to one State, but diversity in geography within State	Limited to one jurisdiction in one State

To provide a more quantitative translation from these categories to the star rating, a point-based system was developed. Points are assigned to each CMF characteristic based on the level of rigor (excellent = 2 points, fair = 1 point, or poor = 0 points). While the points decrease from excellent to poor, not all characteristics receive equal weight. Study design and sample size categories receive twice the weight of the other characteristics:

$$\text{Score} = (2 \times \text{Study Design}) + (2 \times \text{Sample Size}) + \text{Standard Error} + \text{Potential Bias} + \text{Data Source}$$

#### Scores and Corresponding Star Ratings

Score	Star Rating
14 (maximum possible)	5 Stars
11-13	4 Stars
7-10	3 Stars
3-6	2 Stars
1-2	1 Star
0	0 Stars

While the primary improvement featured in the Build Alternative is widening the existing S.R. 374 from three (3) to five (5) lanes, the CMF Clearinghouse does not feature a category of CMFs for that improvement. The CMF Category for “Convert 2 lane roadway to 4 lane divided roadway” is similar to the widening proposed for the Build Alternative but may present higher crash reduction values due to the divided roadway compared to Two-Way Left Turn Lane (TWLTL). A number of minor improvements featured in the Build Alternative have corresponding categories. The below table lists the CMFs with identifying information.

#### Crash Modification Factors (CMF) Applying to Conceptual Alternatives

CMF ID	Countermeasure Description	CMF	CRF	Adj. SE	Quality	Crash Type	Crash Severity	Area Type
7574	Convert 2 lane roadway to 4 lane divided roadway to 4	0.714	29%	0.11	★★★	All	All	All
289	Provide a right-turn lane on both major-road approaches	0.92	26%	0.08	★★★★★	All	All	All
4649	Provide a right-turn lane on both major-road approaches	0.59	41%	N/A	Cannot Be Rated (HSM)	All	Fatal, Injury	All

#### 10.0 Recommended Improvements

The recommended cross section for S.R. 374 is a five (5) lane roadway with ten (10) foot shoulders, curb and gutter, and sidewalks. The thru lanes are twelve (12) feet and the two-way left turn lane is fourteen (14) feet. As the roadway approaches the major intersections, the cross section is widened to accommodate traffic demands.

#### 11.0 Cost

The total estimated cost of preliminary engineering, ROW and utilities, and construction for the Build Alternative is approximately \$51,000,000. The cost estimate was completed using the Estimating Tool provided by TDOT. Actual property values should be confirmed at the next phase of project. The inflated costs for 5 and 10 years out is shown in the table below:

COST ESTIMATE SUMMARY (2020)						
PIN	Project Type of Work	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Project Cost (2020):
0.00	Widen	\$ 2,470,000	\$ 4,840,000	\$ 6,190,000	\$ 40,800,000	\$ 50,900,000

INFLATED COST ESTIMATE SUMMARY						Report Type: Technical Report
No. of Years	Year	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Inflated Project Cost
5	2025	\$ 3,150,000	\$ 6,180,000	\$ 7,900,000	\$ 52,100,000	\$ 65,000,000
10	2030	\$ 4,020,000	\$ 7,880,000	\$ 10,100,000	\$ 66,500,000	\$ 82,900,000

Inflated values were based on a five percent (5%) inflation rate.

## **12.0 Conclusions**

After analysis, the Build scenario is recommended for the study limits of S.R. 374. The Build scenario consists of five (5) lane roadway with ten (10) foot shoulders, curb and gutter, and five (5) foot sidewalks. The thru lanes are twelve (12) feet and the two-way left turn lane is fourteen (14) feet. The shoulder will be striped with a five (5) foot bicycle lane and a five (5) foot buffer. The sidewalk will be expanded to six (6) foot within the school zone area. In addition, right turn lanes will be added at both the high school and the middle school entrances. Additional study may be required to determine the optimal school entrance configurations. The major intersections will include right and left turn lanes with ten (10) foot shoulders, curb and gutter, and five (5) foot sidewalks. At the intersection of S.R. 374 with U.S. 41-A, S.R. 374 will have a raised median for positive access control near the intersection. Signal control at the major intersections will be upgraded to accommodate the new cross-section and traffic demands. The roadway and signals should provide acceptable levels of service up to the 2043 design year.

## **13.0 Functionals**

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TITLE SHEET.....	1
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PROPOSED LAYOUTS.....	3-8

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF ENGINEERING

MONTGOMERY COUNTY

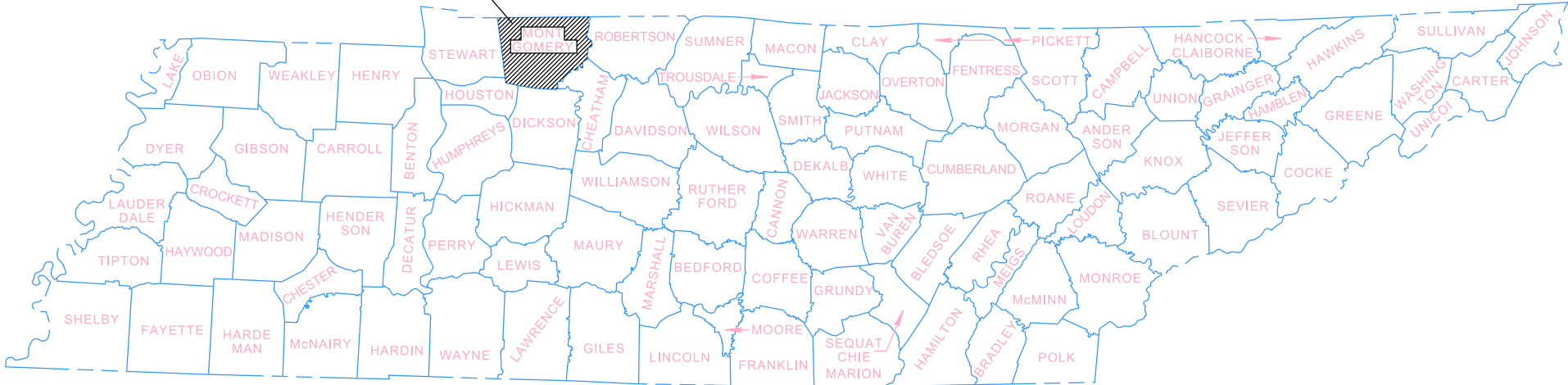
STATE ROUTE 374  
FROM MADISON ST. (US-41A, STATE ROUTE 112 L.M. 0.00)  
TO DUNBAR CAVE RD. (L.M. 2.85)

FUNCTIONAL PLANS  
WIDENING

STATE HIGHWAY NO. 374 F.A.H.S. NO.

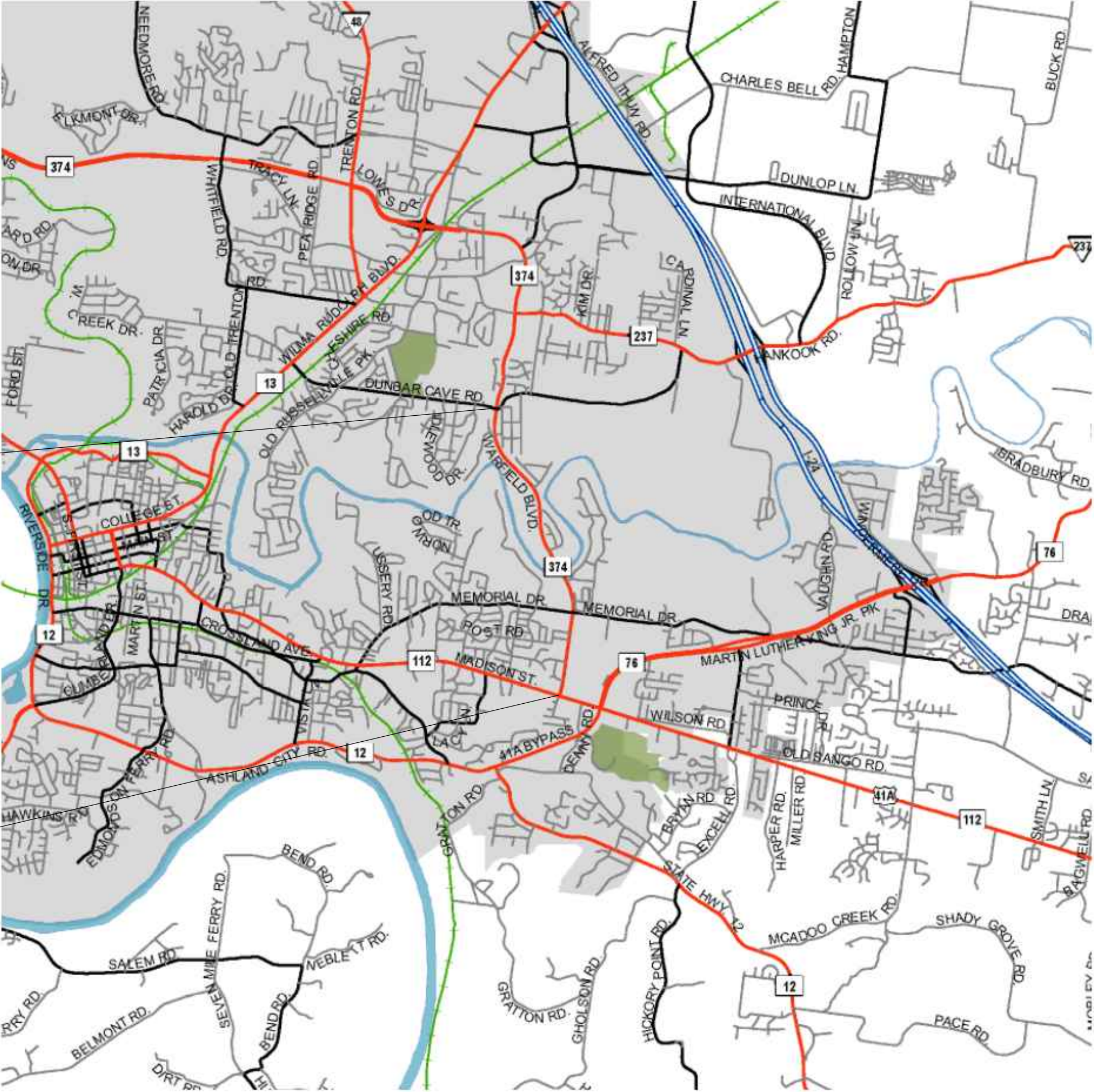
PROJECT LOCATION

BRIDGE ID. # 63S62701005

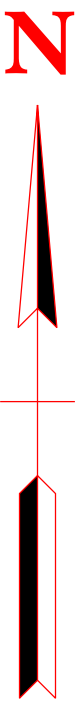


END PROJECT FUNCTIONAL  
LOG MILE 2.85

BEGIN PROJECT FUNCTIONAL  
LOG MILE 0.00



SCALE: 1"= 1 MILE

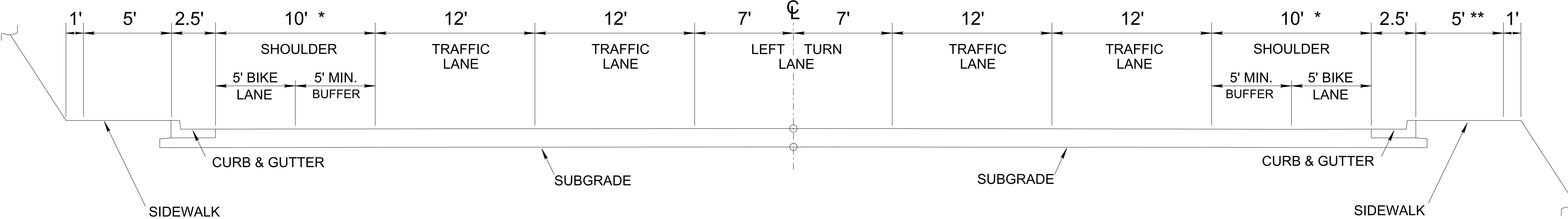


TRAFFIC DATA

ADT (2023)	21,920
ADT (2043)	36,010
DHV (2043)	3,752
D	55 - 45
T (ADT)	3 %
T (DHV)	2 %
V	50 MPH

ROADWAY LENGTH 2.85 MILES

TYPICAL SECTION



BASED ON TDOT DESIGN STANDARD DRAWING RD11-TS-6B

- \* SHOULDERS ARE REDUCED TO 8' FROM:  
L.M. 0.015 LT TO L.M. 0.062 LT AND L.M. 0.017 RT TO L.M. 0.096 RT
- SHOULDERS ARE TRANSITIONING FROM 8' TO 10' FROM:  
L.M. 0.062 LT TO L.M. 0.114 LT AND L.M. 0.096 RT TO L.M. 0.138 RT
- \*\* SIDEWALK WILL BE WIDENED TO 6' WITHIN SCHOOL LIMITS BEGINNING AT  
L.M. 0.161 RT TO LIMITS OF CONSTRUCTION ON EAST MEMORIAL DRIVE ON RT

TECHNICAL REPORT

STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

FIGURE 2  
TYPICAL  
SECTION

TYPE	YEAR	COUNTY	FIGURE NO.
TR	2020	MONTGOMERY	3

BEGIN PROJECT S.R. 374

LOG MILE 0+00

L.M. 0.10

L.M. 0.20

L.M. 0.30

SEE FIGURE NO. 4  
LOG MILE 0.40  
MATCH LINE

Beachavan  
Auto Sales

Shipley  
Do-Nuts

Kneading  
Massege

Chickasaw  
Dr

Sequoia  
Dr

BEGIN RETAINING WALL

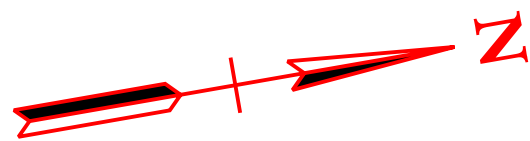
American  
Car Wash

Clarksville Gas  
& Water

Clarksville High School

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0 200' 400' 600'



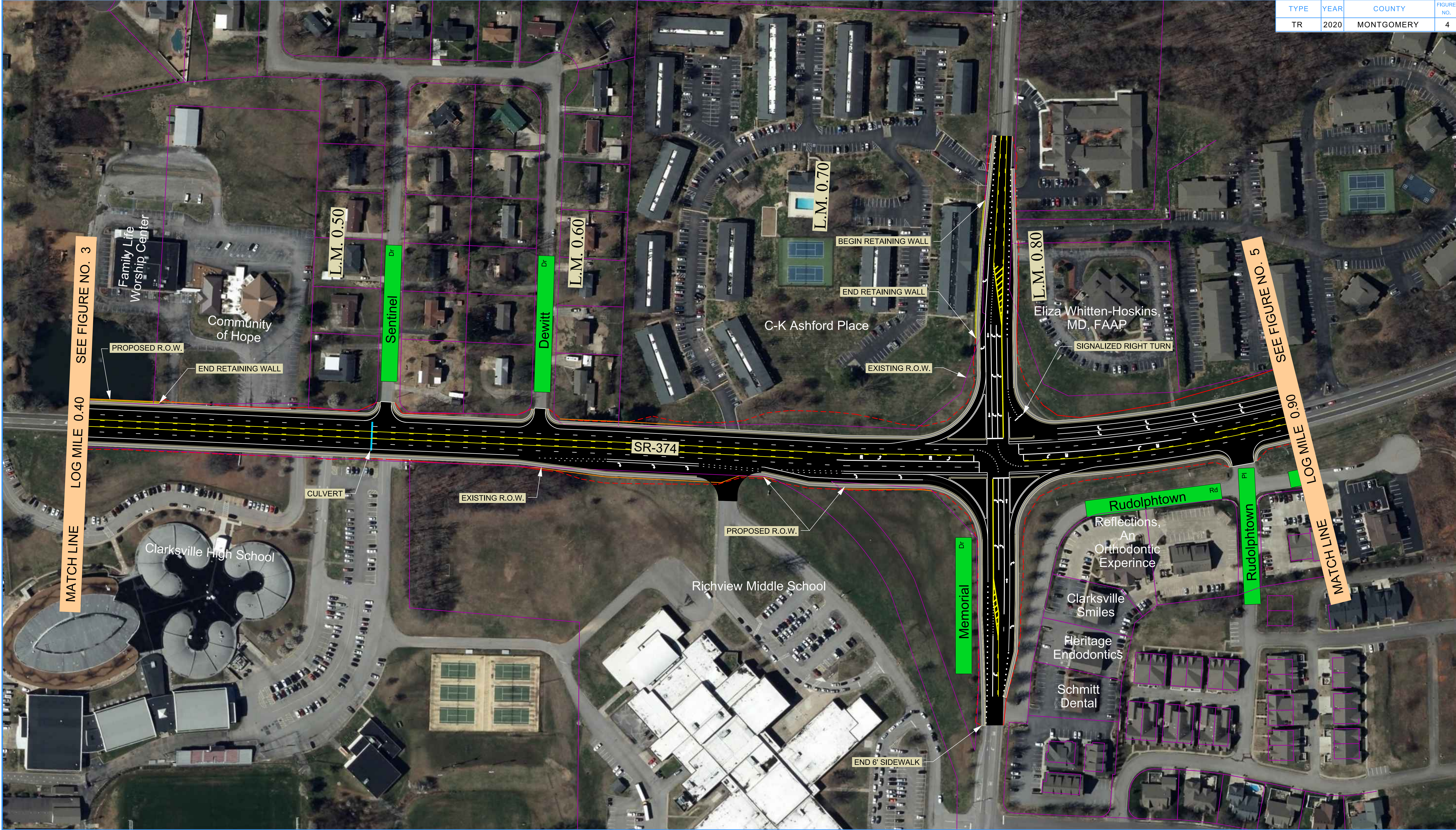
# TECHNICAL REPORT

STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

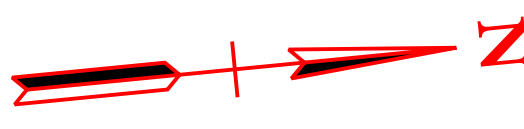
FIGURE 3  
STATE ROUTE 374  
LOG MILE 0.00  
TO  
LOG MILE 0.40

TYPE	YEAR	COUNTY	FIGURE NO.
TR	2020	MONTGOMERY	4



MATCH LINE LOG MILE 0.40 SEE FIGURE NO. 3

SEE FIGURE NO. 5 LOG MILE 0.90 MATCH LINE



# TECHNICAL REPORT

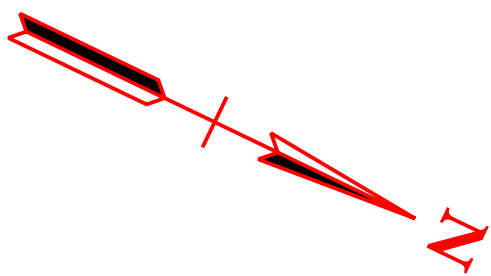
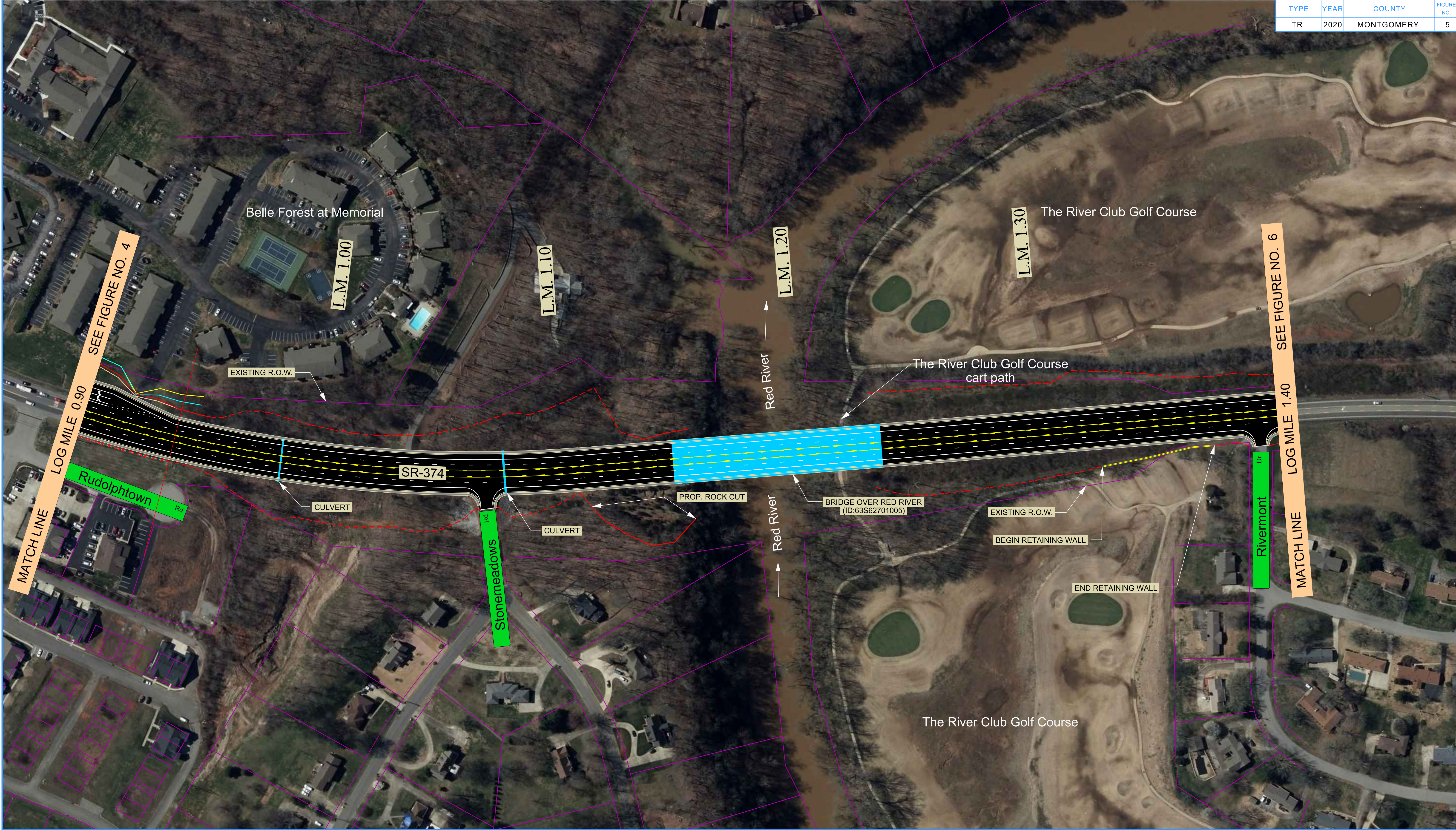
STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

FIGURE 4  
STATE ROUTE 374  
LOG MILE 0.40  
TO  
LOG MILE 0.90

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TYPE	YEAR	COUNTY	FIGURE NO.
TR	2020	MONTGOMERY	5



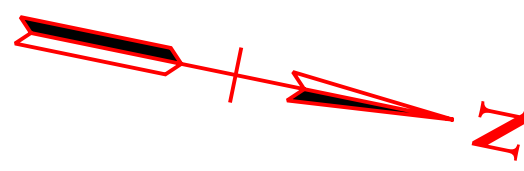
# TECHNICAL REPORT

STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

FIGURE 5  
STATE ROUTE 374  
LOG MILE 0.90  
TO  
LOG MILE 1.40

TYPE	YEAR	COUNTY	FIGURE NO.
TR	2020	MONTGOMERY	6



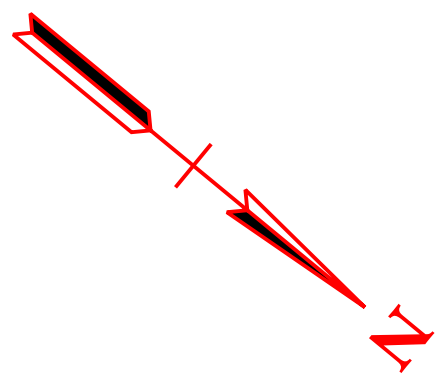
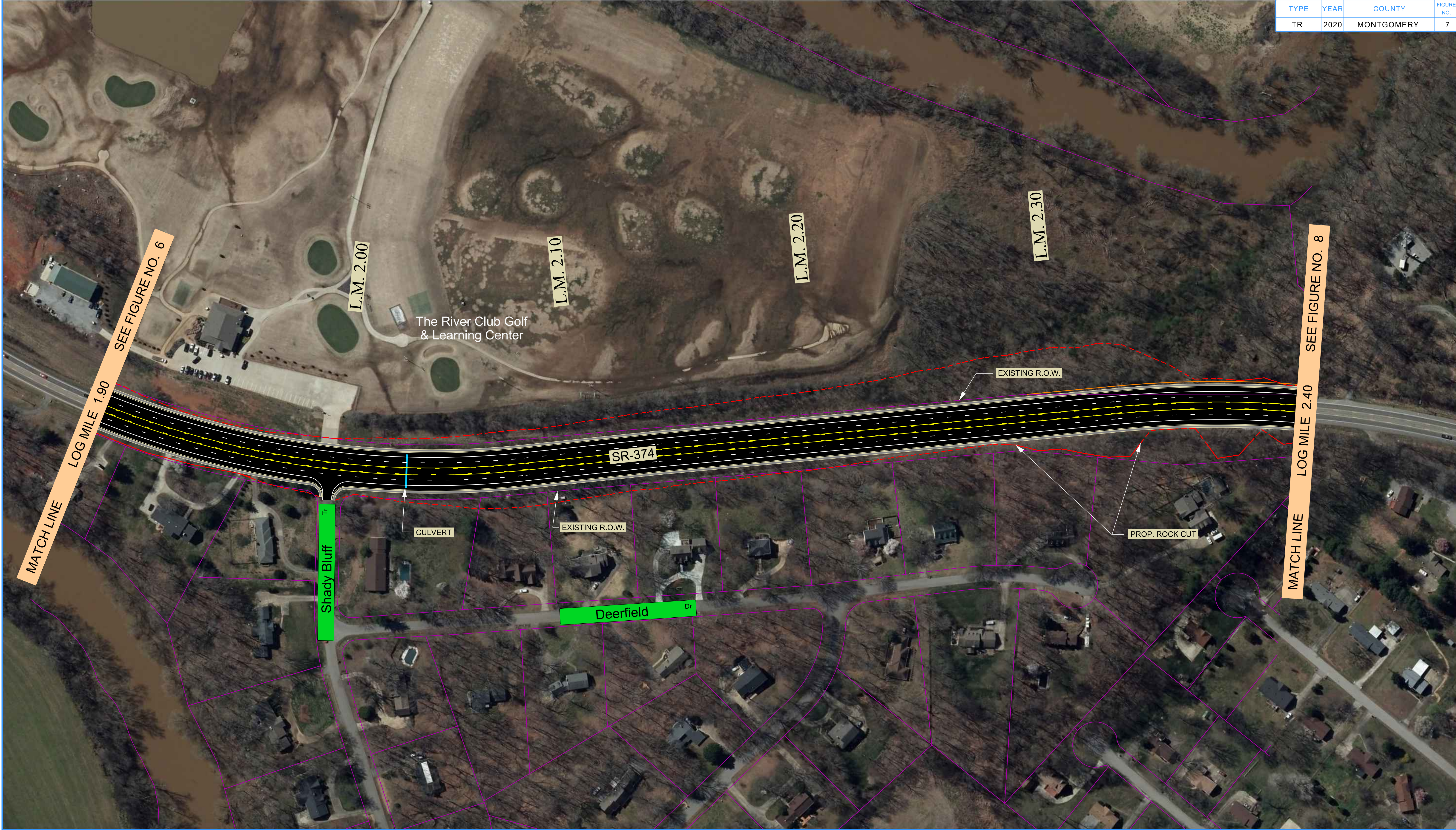
# TECHNICAL REPORT

STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

FIGURE 6  
STATE ROUTE 374  
LOG MILE 1.40  
TO  
LOG MILE 1.90

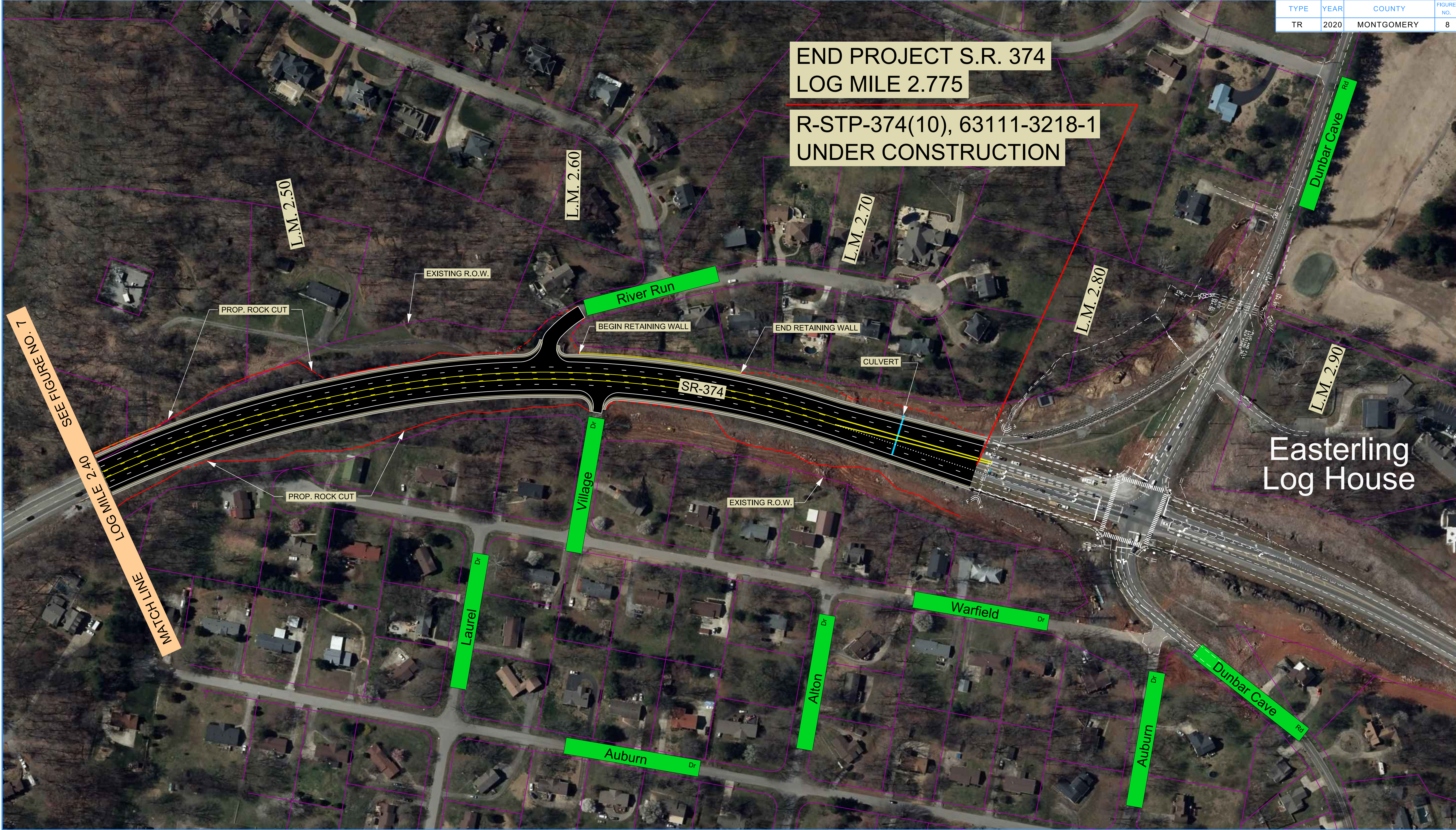
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# TECHNICAL REPORT

STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

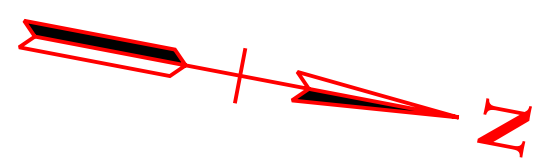
TYPE	YEAR	COUNTY	FIGURE NO.
TR	2020	MONTGOMERY	8



END PROJECT S.R. 374  
LOG MILE 2.775

R-STP-374(10), 63111-3218-1  
UNDER CONSTRUCTION

Easterling  
Log House



# TECHNICAL REPORT

STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

FIGURE 8  
STATE ROUTE 374  
LOG MILE 2.40  
TO  
LOG MILE 2.85

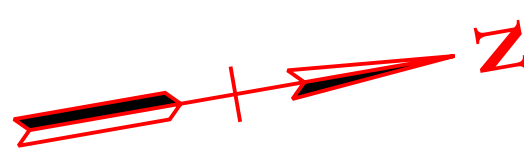
## **14.0 Appendix**

## **14.1 Clarksville Gas and Water Utility Information**

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TYPE	YEAR	COUNTY	FIGURE NO.
TR	2020	MONTGOMERY	3

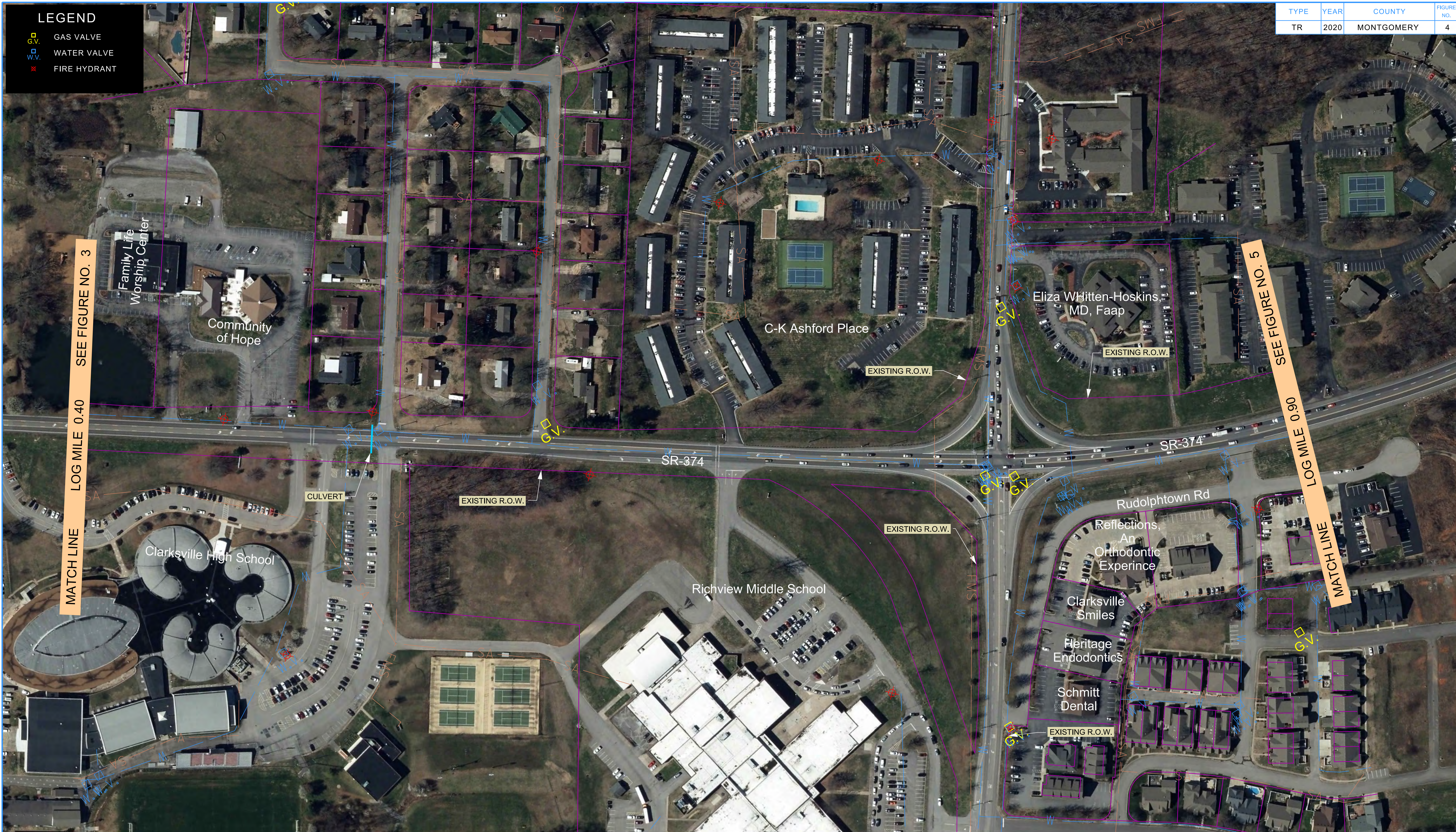


**TECHNICAL REPORT**  
STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

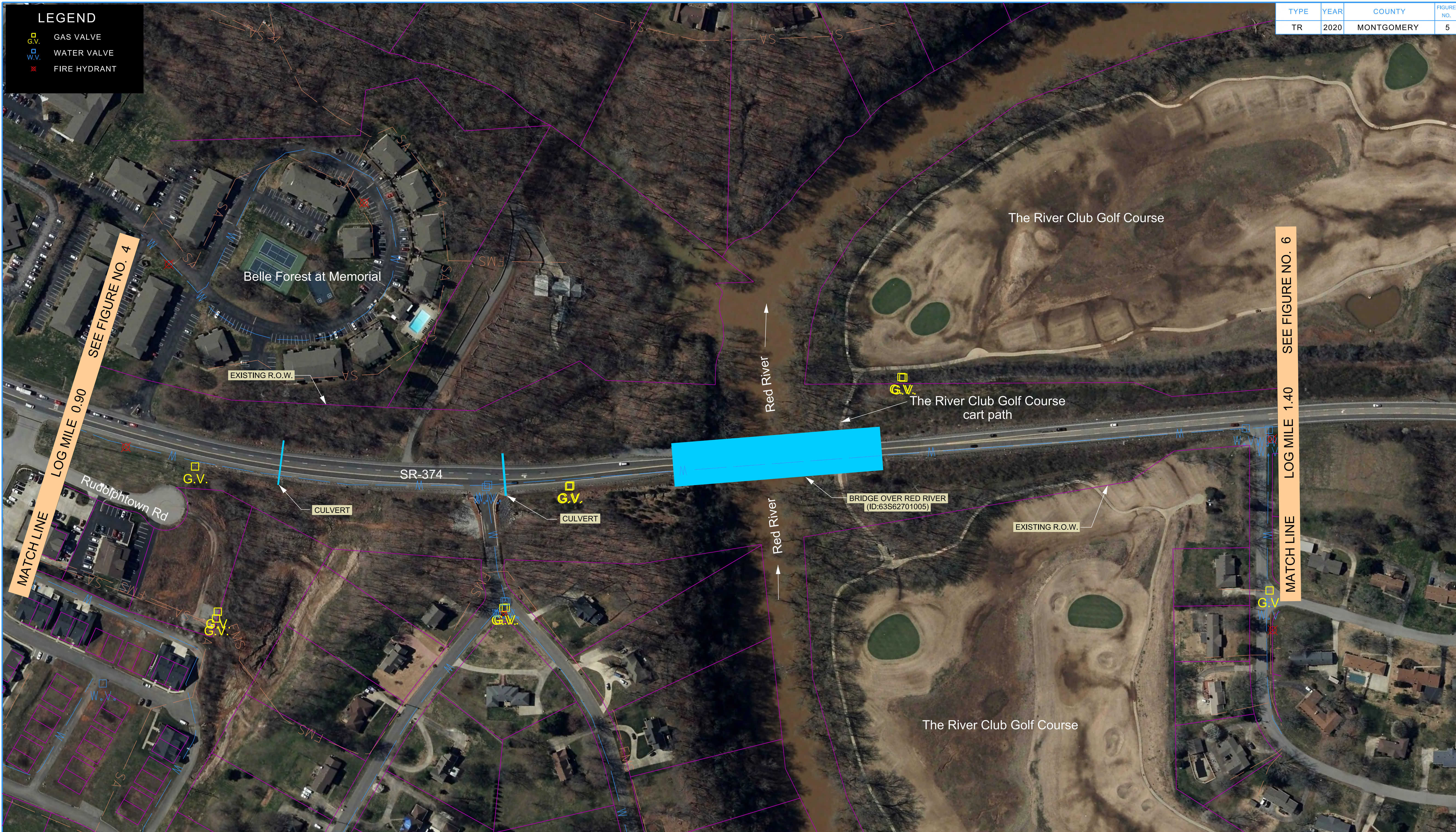
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

**FIGURE 3**  
STATE ROUTE 374  
LOG MILE 0.00  
TO  
LOG MILE 0.40

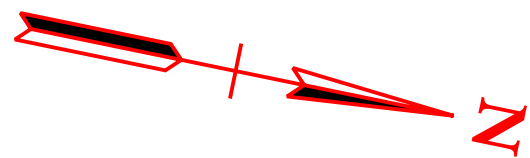
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6/18/2020 8:26:25 AM  
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6/18/2020 8:26:48 AM  
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# TECHNICAL REPORT

STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

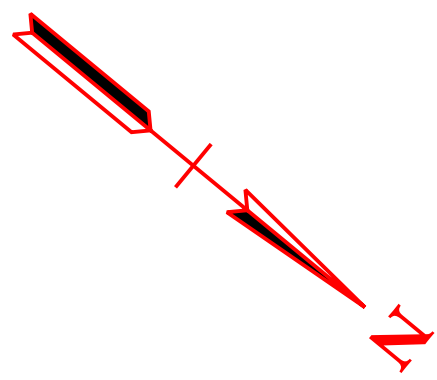
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TYPE	YEAR	COUNTY	FIGURE NO.
TR	2020	MONTGOMERY	7

LEGEND

- G.V. GAS VALVE
- W.V. WATER VALVE
- F.H. FIRE HYDRANT



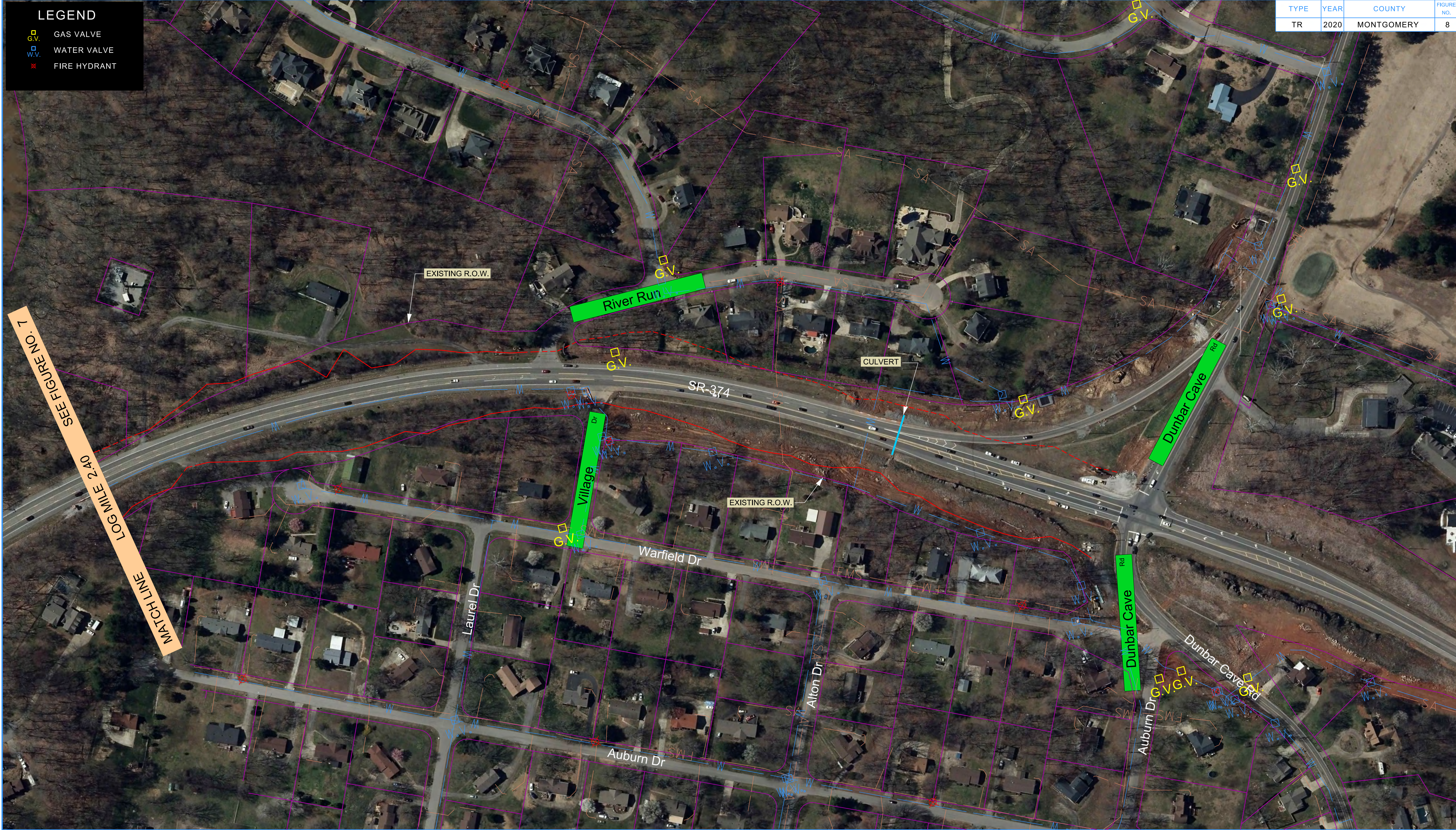
TECHNICAL REPORT

STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

FIGURE 7  
STATE ROUTE 374  
LOG MILE 1.90  
TO  
LOG MILE 2.40

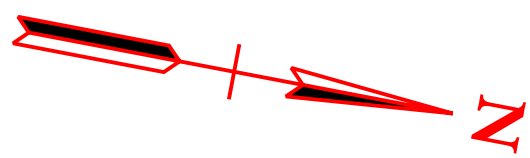
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LEGEND

- G.V. GAS VALVE
- W.V. WATER VALVE
- FIRE HYDRANT

TYPE	YEAR	COUNTY	FIGURE NO.
TR	2020	MONTGOMERY	8



TECHNICAL REPORT

STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

FIGURE 8  
STATE ROUTE 374  
LOG MILE 2.40  
TO  
LOG MILE 2.85

## **14.2 CDE LIGHTBAND UTILITY INFORMATION**

## Warfield Blvd Symbology

### Primary Overhead Conductor

 DC534

 E954

 E964

 RP724

### Primary Underground Conductor

 DC534

 E954

 E964

### Secondary Overhead

 Overhead Secondary

 Overhead Service

### Secondary Underground

 Underground Secondary

 Underground Service

## Support Structure

- Distribution Pole
- ✖ Transmission Pole

## Lightning Arrestor

- ||| Lightning Arrestor

## Fuse Bank

- ⊗ Fuse Bank

## Light

- ☀ Flood Light
- ☀ Security Light
- ☀ Street Light

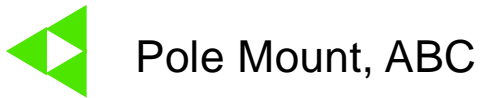
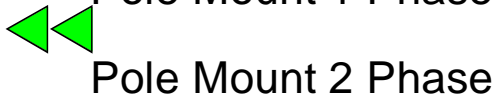
## Protective Device

- ⬡ R Recloser
- ⊙ Sectionalizer

## ServiceLocation



## Transformer Bank



## Surface Structure

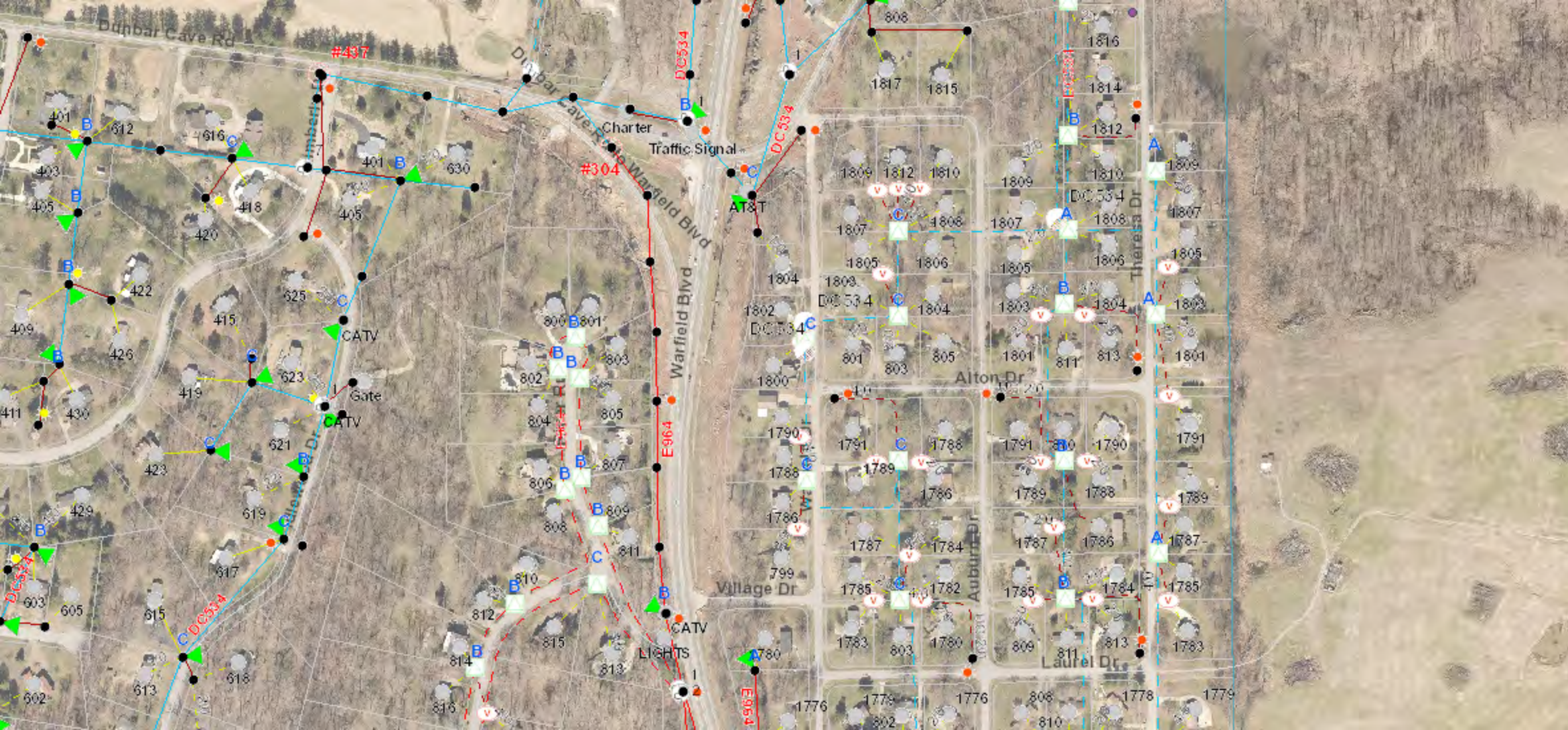


## Underground Structure



## Switch Bank



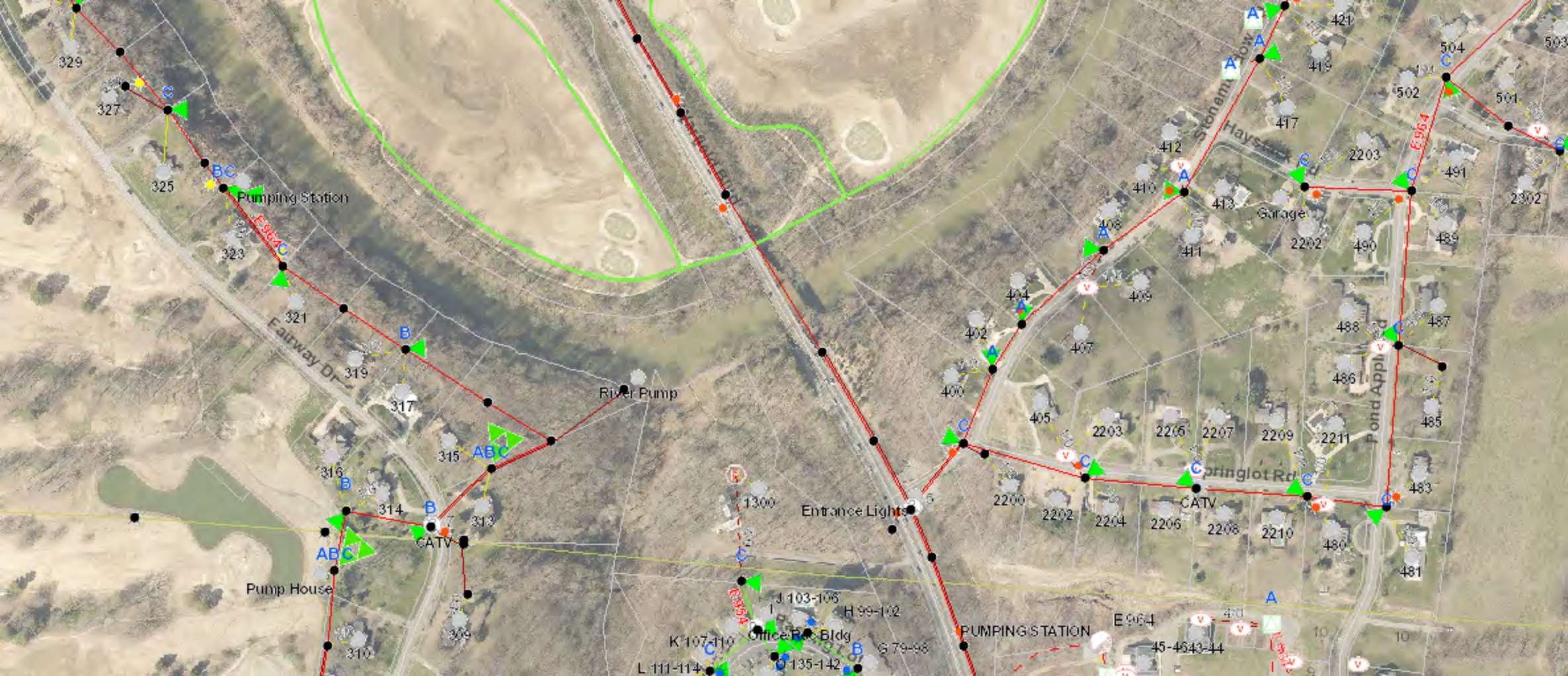


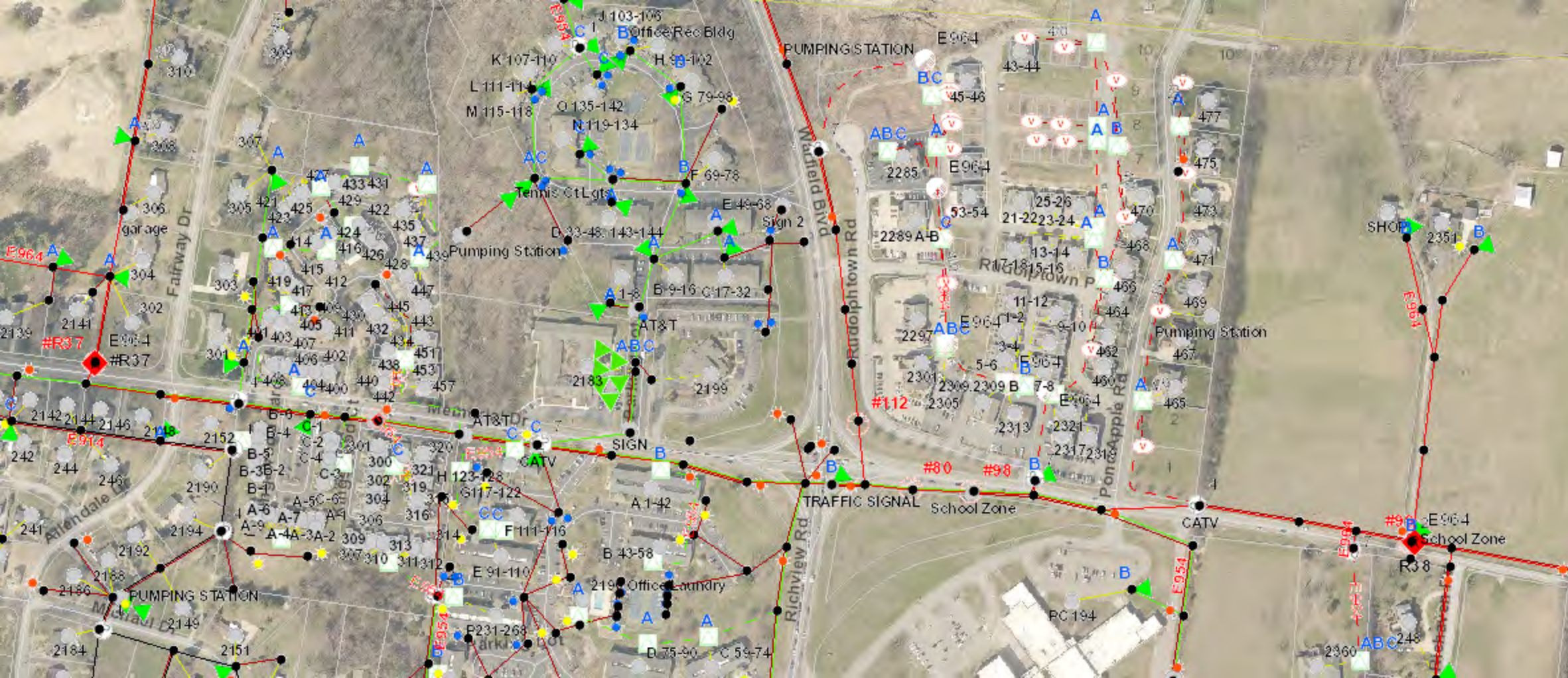




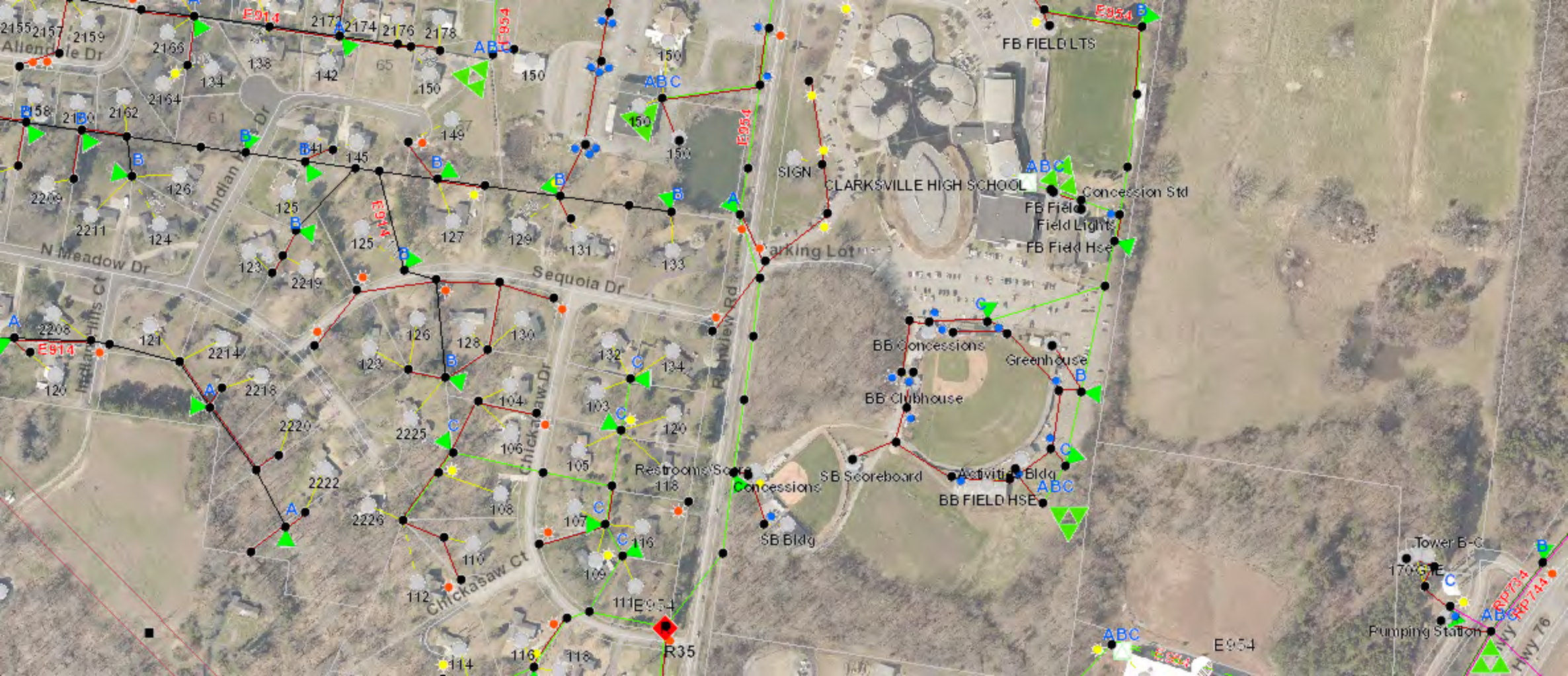














### **14.3 FIELD REVIEW PACKAGE AND CRASH FUNCTIONALS**

# **Technical Report**

## **Field Review Packet**

### **Montgomery County S.R. 374**

From Madison Street (US-41A, State Route 112 L.M. 0.00) to Dunbar Cave Road (L.M. 2.85)

#### **Existing Conditions:**

- Classification
  - Urban Minor Arterial
  - Bicycle Route (according to ETRIMS)
- Typical Section
  - Three lane (two travel lanes and continuous left turn lane) L.M. 0.00-0.78
  - Three lane (two southbound lanes and one northbound lane) L.M. 0.78-1.10
  - Two lane L.M. 1.10-1.32
  - Three lane (two travel lanes and continuous left turn lane) L.M. 1.32-2.85
- Located within Clarksville City Limits
- Lane Widths =11-12 ft
- Shoulder Widths (outside) = variable 2 to 8 ft
- Speed Limit =
  - 40 mph (LM 0.00 to LM 1.27)
  - 50 mph (LM 1.27 to LM 2.85)
  - 20 mph school speed limit (LM 0.23-0.90)
- Traffic AADT (2018):
  - 12,840 (LM 0.00-0.78)
  - 20,700 (LM 0.78-2.85)
  - 14,820 (LM 2.85-3.75)
- Existing ROW = variable

#### **Proposed improvements:**

- Widen roadway to 5x12' lanes, 12' shoulders (bike lane), curb and gutter, sidewalk

#### **Structures:**

- Bridge [63S62701005]: Red River log mile 1.16  
There is an existing two-lane bridge [63S62701005] that crosses the Red River located at log mile 1.16 with a 2018 sufficiency rating of 81.3.
- There are eight (8) culverts or pipes less than four (4) feet in diameter along the existing route that will be impacted by this project.

**Notes for field review discussion:**

- Design Speed and Posted speed limit for curb and gutter sections
- Proposed lane shift at bridge
- Typical section width at bridge and in areas with tight right of way
- Continuous left turn lane throughout
- School entrances and parking

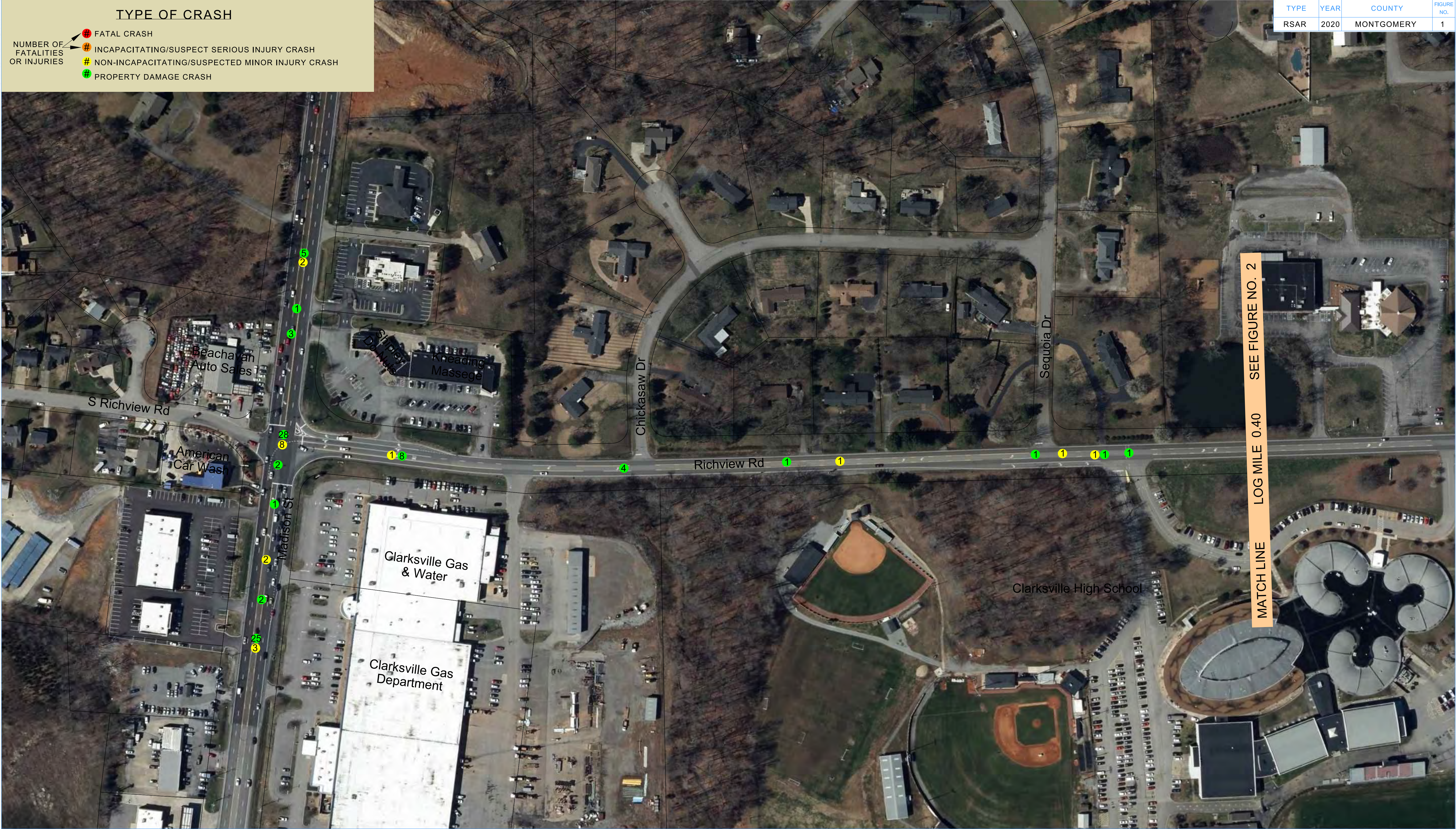
STATE ROUTE 374 CRASH STATISTICS		
Condition	1/1/2017-12/31/2019	
	Number of Crashes	Percentage of Total
Lighting Conditions		
Daylight	161	72%
Dark-Not Lighted	37	17%
Dark-Lighted	17	7%
Dusk/ Dawn	9	4%
Crash Severity		
Property Damage	188	84%
Non-incap Injury	34	15%
Incap Injury	2	1%
Fatality	0	0%
Manner of Collision		
Rear-End	132	59%
Angle	41	18%
No Collision w/ Vehicle	36	16%
Head-on	6	3%
Sideswipe, Same Direction	5	2%
Other	3	1%
Sideswipe, Opposite Direction	1	1%
Weather Conditions		
Clear	171	76%
Rain	27	12%
Cloudy	23	10%
Sleet/ Hail	1	0.70%
Fog	1	0.70%
Blowing Sand/Soil/Dirt	1	0.70%

Crash Rates		
Segment 1: LM 0.00-0.78 (A/C ratio 1.81)		
Type	Crash Rate	SW Average
Total	7.66	2.978
Severe (Fatal+Incap)	0.00	0.08
Segment 2: LM 0.78-1.32 (A/C ratio 0.82)		
Type	Crash Rate	SW Average
Total	3.023	2.574
Severe (Fatal+Incap)	0.00	0.01
Segment 3: LM 1.32-2.85 (A/C ratio 0.82)		
Type	Crash Rate	SW Average
Total	3.028	2.978
Severe (Fatal+Incap)	0.058	0.08
SR 112 intersection (A/C ratio 2.86)		
Type	Crash Rate	SW Average
Total	2.995	0.682
Severe (Fatal+Incap)	0.00	0.014
Memorial Drive intersection (A/C ratio 2.46)		
Type	Crash Rate	SW Average
Total	2.589	0.682
Severe (Fatal+Incap)	0.00	0.014
Dunbar Cave Road intersection (A/C ratio 2.41)		
Type	Crash Rate	SW Average
Total	2.549	0.682
Severe (Fatal+Incap)	0.07	0.014

TYPE OF CRASH

- FATAL CRASH
- INCAPACITATING/SUSPECT SERIOUS INJURY CRASH
- NON-INCAPACITATING/SUSPECTED MINOR INJURY CRASH
- PROPERTY DAMAGE CRASH

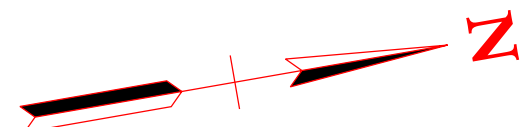
TYPE	YEAR	COUNTY	FIGURE NO.
RSAR	2020	MONTGOMERY	1



SEE FIGURE NO. 2

LOG MILE 0.40

MATCH LINE



TECHNICAL REPORT

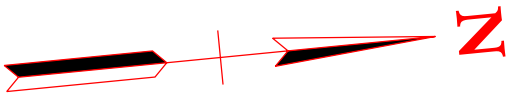
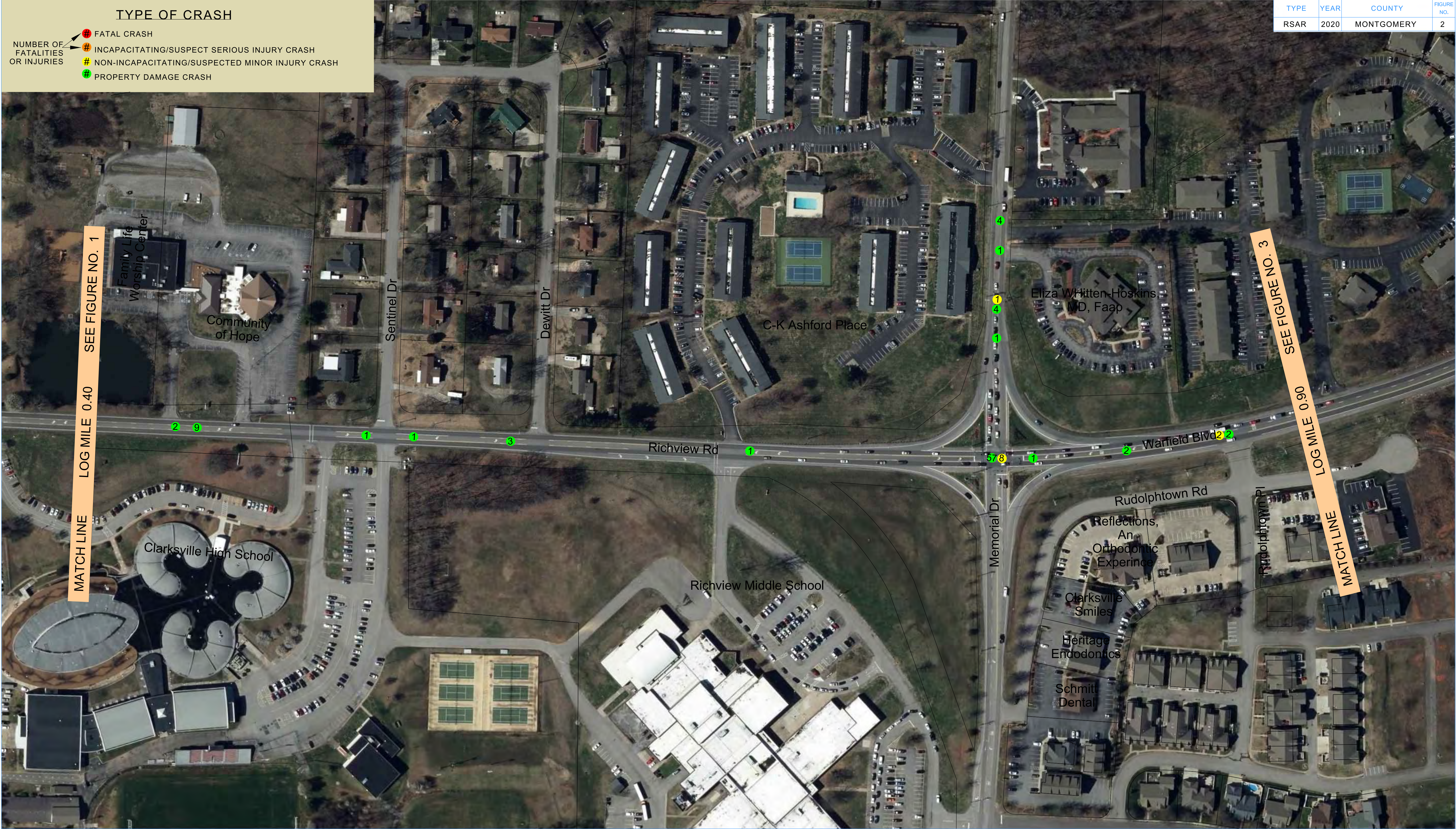
STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.  
FIGURE 1  
STATE ROUTE 374  
LOG MILE 0.00  
TO  
LOG MILE 0.40

TYPE OF CRASH

- FATAL CRASH
- INCAPACITATING/SUSPECT SERIOUS INJURY CRASH
- NON-INCAPACITATING/SUSPECTED MINOR INJURY CRASH
- PROPERTY DAMAGE CRASH

TYPE	YEAR	COUNTY	FIGURE NO.
RSAR	2020	MONTGOMERY	2



TECHNICAL REPORT

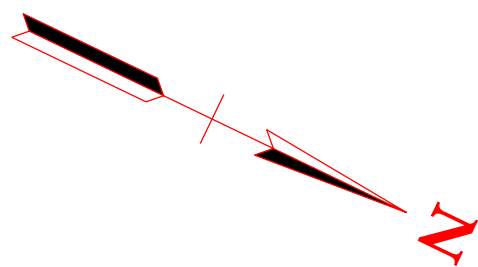
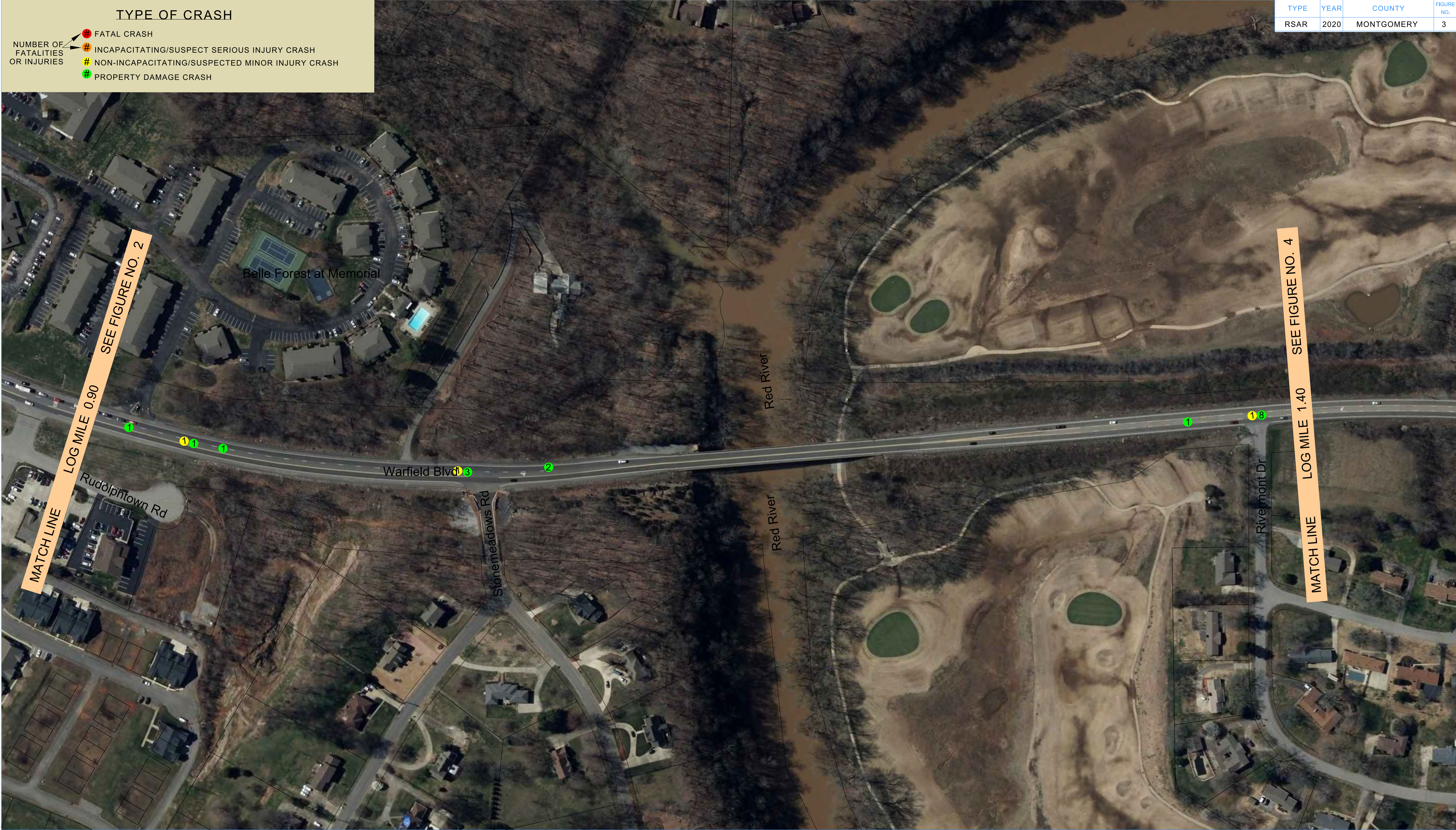
STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.  
FIGURE 2  
STATE ROUTE 374  
LOG MILE 0.40  
TO  
LOG MILE 0.90

TYPE OF CRASH

- FATAL CRASH
- INCAPACITATING/SUSPECT SERIOUS INJURY CRASH
- NON-INCAPACITATING/SUSPECTED MINOR INJURY CRASH
- PROPERTY DAMAGE CRASH

TYPE	YEAR	COUNTY	FIGURE NO.
RSAR	2020	MONTGOMERY	3



TECHNICAL REPORT

STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

TYPE OF CRASH

- FATAL CRASH
- INCAPACITATING/SUSPECT SERIOUS INJURY CRASH
- NON-INCAPACITATING/SUSPECTED MINOR INJURY CRASH
- PROPERTY DAMAGE CRASH

TYPE	YEAR	COUNTY	FIGURE NO.
RSAR	2020	MONTGOMERY	4



TECHNICAL REPORT

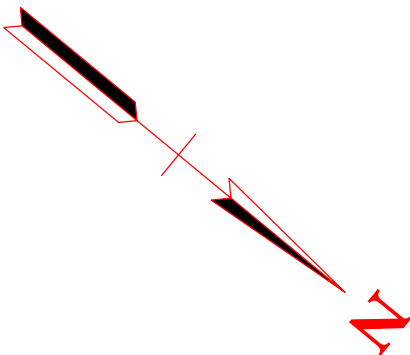
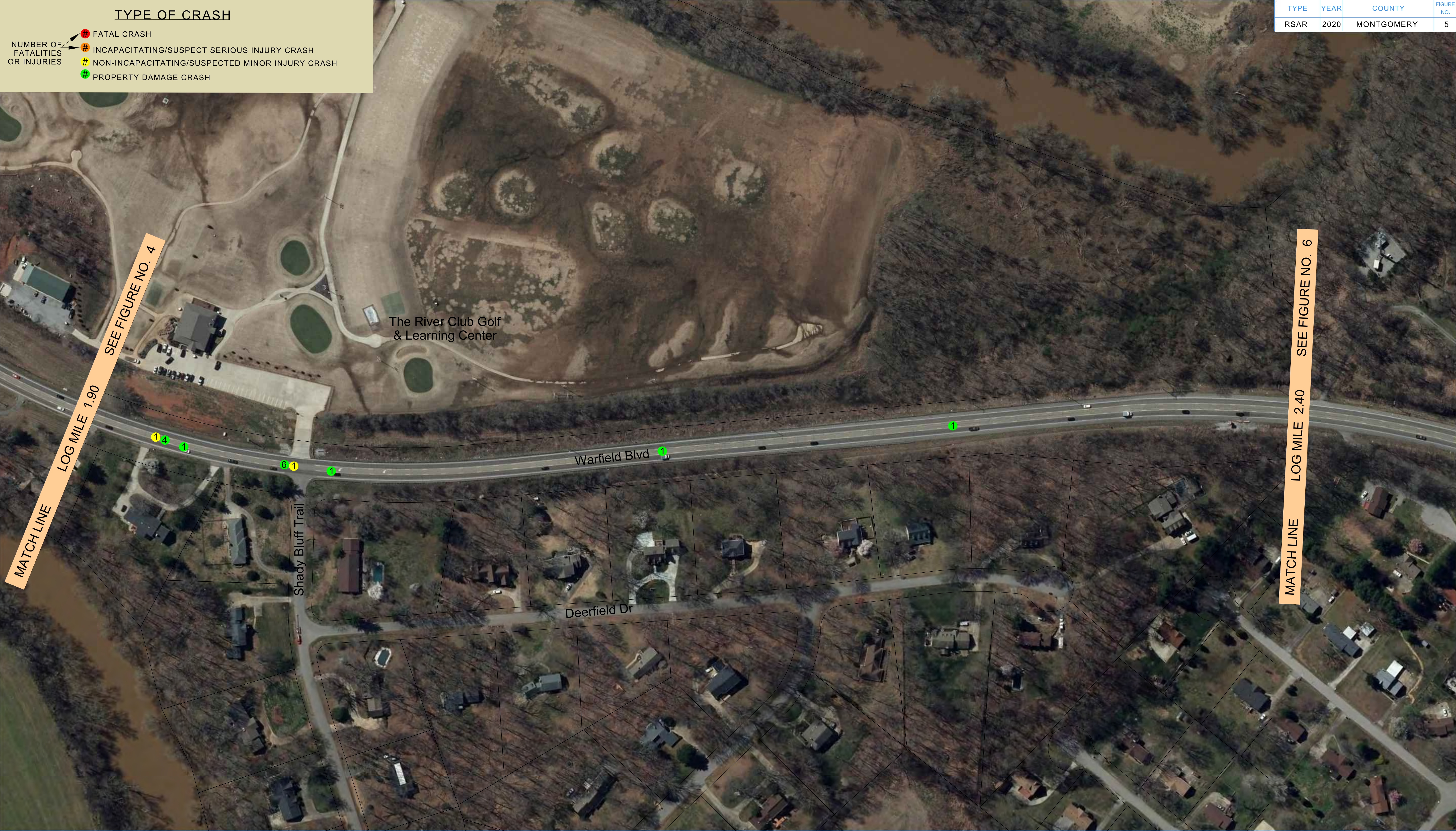
STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION S.T.I.D.
FIGURE 4 STATE ROUTE 374 LOG MILE 1.40 TO LOG MILE 1.90

TYPE OF CRASH

- FATAL CRASH
- INCAPACITATING/SUSPECT SERIOUS INJURY CRASH
- NON-INCAPACITATING/SUSPECTED MINOR INJURY CRASH
- PROPERTY DAMAGE CRASH

TYPE	YEAR	COUNTY	FIGURE NO.
RSAR	2020	MONTGOMERY	5



TECHNICAL REPORT

STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

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TWO (2) INCAPACITATING INJURY CRASHES AT DUNBAR CAVE ROAD INTERSECTION

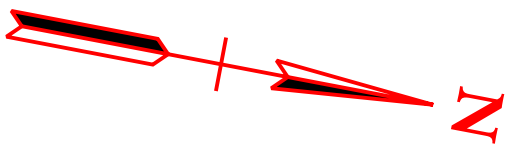
	CRASH 1	CRASH 2
TIME OF CRASH	1.23.17 1:47 PM	6.12.17 1:30 PM
TOTAL VEHICLES	2	3
TOTAL OCCUPANTS	2	5
TOTAL INJURED	2	3
WORK ZONE	NO	NO
FIRST HARMFUL EVENT	OVERTURN/ ROLL OVER	HEAD ON COLLISION
DUI	NO	NO
WEATHER	CLEAR	CLEAR
NOTE	BRAKE FAILURE; THREE AXLE VEHICLE	VEHICLE RAN RED LIGHT

TYPE	YEAR	COUNTY	FIGURE NO.
RSAR	2020	MONTGOMERY	6



STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
S.T.I.D.

FIGURE 6  
STATE ROUTE 374  
LOG MILE 2.40  
TO  
LOG MILE 2.85



TECHNICAL REPORT  
STATE ROUTE 374  
LOG MILE 0.00 TO LOG MILE 2.85  
MONTGOMERY COUNTY

#### **14.4 CRASH RATE SHEETS**

**TENNESSEE DEPARTMENT OF TRANSPORTATION**

COUNTY	=	Montgomery	Date:	6/23/2020
Route	=	State Route 374		
Location	=	SR-112 US 41A intersection		
Highway Type	=	urban multi-lane with turn lane		
FUNCTIONAL CLASS	=	Urban Minor Arterial		
DATA YEARS	=	2017-2019		
ADT YEARS USED	=	TRIMS 2018		
COMMENTS	=			
ANALYZED BY	=	BG		
SECTION = MORE THAN 0.10 MILE / SPOT= LESS THAN OR EQUAL TO 0.10 MILE				
BLM	ELM	Length	Average AADT	VMT
		0.000		0
0.000		0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
		0.000	0	0
INTERSECTION		Leg	Traffic AADT	
Log Mile	=	0	North	= 12,840
			East	= 20,830
			South	= 1,000
			West	= 20,830
PRODUCED PURSUANT TO PUBLIC RECORDS REQUEST		Entering AADT = 27,750		
This document is covered by 23 USC §409 and its production pursuant to a public document records request does not waive the provisions of §409		Trims 2018		
		Urban Minor Arterial 2017-2019		
		Total	Fatal	Incap. Injury
No. of Crashes	=	91	0	0
No. of Years	=	3		
SW avg. rate	=	0.682	0.001	0.013
14-16 S/W Rates				
Exposure (E)	=	30.3863		
Crash Rate (A)	=	2.995	0.000	0.000
Critical Rate (C)	=	1.047		
Severity Index (SI)	=	0.1758		
Actual Rate/SW Average	=	4.39	0.00	0.00
Ratio of A/C	=	2.86		
* Severe Crashes are the sum of fatal and incapacitating injury crashes				
Revised 11/3/2009				
T.D.O.T. STRTAEGIC TRANSPORTATION INVESTMENTS DIVISION ( SAFETY DATA SECTION )				

**TENNESSEE DEPARTMENT OF TRANSPORTATION**

COUNTY	=	Montgomery	Date:	6/23/2020
Route	=	State Route 374		
Location	=	Memorial Drive		
Highway Type	=	urban multi-lane with turn lane		
FUNCTIONAL CLASS	=	Urban Minor Arterial		
DATA YEARS	=	2017-2019		
ADT YEARS USED	=	TRIMS 2018		
COMMENTS	=			
ANALYZED BY	=	BG		
SECTION = MORE THAN 0.10 MILE / SPOT= LESS THAN OR EQUAL TO 0.10 MILE				
BLM	ELM	Length	Average AADT	VMT
		0.000		0
0.000		0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
		0.000	0	0
INTERSECTION		Leg	Traffic AADT	
Log Mile	=	0.78	North	= 20,700
			East	= 6,850
			South	= 12,840
			West	= 13,930
PRODUCED PURSUANT TO PUBLIC RECORDS REQUEST		Entering AADT = 27,160		
This document is covered by 23 USC §409 and its production pursuant to a public document records request does not waive the provisions of §409		Trims 2018		
		Urban Minor Arterial 2017-2019		
		Total	Fatal	Incap. Injury
No. of Crashes	=	77	0	0
No. of Years	=	3		
SW avg. rate	=	0.682	0.001	0.013
14-16 S/W Rates				
Exposure (E)	=	29.7402		
Crash Rate (A)	=	2.589	0.000	0.000
Critical Rate (C)	=	1.051		
Severity Index (SI)	=	0.1169		
Actual Rate/SW Average	=	3.80	0.00	0.00
Ratio of A/C	=	2.46		
* Severe Crashes are the sum of fatal and incapacitating injury crashes				
Revised 11/3/2009				
T.D.O.T. STRTAEGIC TRANSPORTATION INVESTMENTS DIVISION ( SAFETY DATA SECTION )				

# TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	= <b>Montgomery</b>	Date:	6/23/2020
Route	= <b>State Route 374</b>		
Location	= <b>Dunbar Cave Road</b>		
Highway Type	= urban multi-lane with turn lane		
FUNCTIONAL CLASS	= <b>Urban Minor Arterial</b>		
DATA YEARS	= <b>2017-2019</b>		
ADT YEARS USED	= <b>TRIMS 2018</b>		
COMMENTS	=		
ANALYZED BY	= <b>BG</b>		

<b>SECTION = MORE THAN 0.10 MILE / SPOT= LESS THAN OR EQUAL TO 0.10 MILE</b>				
BLM	ELM	Length	Average AADT	VMT
		0.000		0
0.000		0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
0.000	0.000	0.000		0
		0.000	0	0

**INTERSECTION**

Log Mile = **2.85**

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Leg	Traffic AADT
North	= <b>14,820</b>
East	= <b>5,100</b>
South	= <b>20,700</b>
West	= <b>11,690</b>
<hr/>	
Entering AADT	= <b>26,155</b>
Trims 2018	

**Urban Minor Arterial  
2017-2019**

	Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	= <b>73</b>	<b>0</b>	<b>2</b>	2	<b>13</b>
No. of Years	= <b>3</b>				
SW avg. rate	= <b>0.682</b>	<b>0.001</b>	<b>0.013</b>	0.014	<b>0.160</b>

**14-16 S/W Rates**

Exposure (E)	=	28.6397			
Crash Rate (A)	=	2.549	0.000	0.070	0.070
Critical Rate (C)	=	1.059			
Severity Index (SI)	=	0.2329			
Actual Rate/SW Average	=	3.74	0.00	5.37	4.99
Ratio of A/C	=	2.41			

\* Severe Crashes are the sum of fatal and incapacitating injury crashes

Revised 11/3/2009

# TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	= <b>Montgomery</b>	Date:	6/23/2020
Route	= <b>State Route 374</b>		
Location	= <b>log mile 0.00-0.78</b>		
Highway Type	= <b>two lane with turn</b>		
FUNCTIONAL CLASS	= <b>Urban Minor Arterial</b>		
DATA YEARS	= <b>2017-2019</b>		
ADT YEARS USED	= <b>TRIMS 2018</b>		
COMMENTS	=		
ANALYZED BY	= <b>BG</b>		

<b>SECTION = MORE THAN 0.10 MILE / SPOT= LESS THAN OR EQUAL TO 0.10 MILE</b>				
BLM	ELM	Length	Average AADT	VMT
<b>0.000</b>	<b>0.780</b>	<b>0.780</b>	<b>12,840</b>	<b>10,015</b>
<b>0.000</b>		<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
		<b>0.780</b>	<b>12,840</b>	<b>10,015</b>

**INTERSECTION**

Log Mile =

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Leg	Traffic AADT
North	= <span style="border: 1px solid black; display: inline-block; width: 100px; height: 20px;"></span>
East	= <span style="border: 1px solid black; display: inline-block; width: 100px; height: 20px;"></span>
South	= <span style="border: 1px solid black; display: inline-block; width: 100px; height: 20px;"></span>
West	= <span style="border: 1px solid black; display: inline-block; width: 100px; height: 20px;"></span>
Entering AADT =	<b>0</b>

Trims 2018

**Urban Minor Arterial  
2017-2019**

	Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	<b>84</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>10</b>
No. of Years	<b>3</b>				
SW avg. rate	<b>2.978</b>	<b>0.009</b>	<b>0.071</b>	<b>0.080</b>	<b>0.583</b>

Exposure (E)	=	<b>10.9666</b>			
Crash Rate (A)	=	<b>7.660</b>	<b>0.000</b>	<b>0.000</b>	<b>0.912</b>
Critical Rate (C)	=	<b>4.236</b>			
Severity Index (SI)	=	<b>0.1190</b>			
Actual Rate/SW Average	=	<b>2.57</b>	<b>0.00</b>	<b>0.00</b>	<b>1.56</b>
Ratio of A/C	=	<b>1.81</b>			

\* Severe Crashes are the sum of fatal and incapacitating injury crashes

T.D.O.T. STRTAEIC TRANSPORTATION INVESTMENTS DIVISION ( SAFETY DATA SECTION )

Revised 11/3/2009

Bg

# TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	= <b>Montgomery</b>	Date:	6/23/2020
Route	= <b>State Route 374</b>		
Location	= <b>log mile 0.78-1.32</b>		
Highway Type	= <b>two or three lane</b>		
FUNCTIONAL CLASS	= <b>Urban Minor Arterial</b>		
DATA YEARS	= <b>2017-2019</b>		
ADT YEARS USED	= <b>TRIMS 2018</b>		
COMMENTS	=		
ANALYZED BY	= <b>BG</b>		

<b>SECTION = MORE THAN 0.10 MILE / SPOT= LESS THAN OR EQUAL TO 0.10 MILE</b>				
BLM	ELM	Length	Average AADT	VMT
<b>0.780</b>	<b>1.320</b>	<b>0.540</b>	<b>20,700</b>	<b>11,178</b>
<b>0.000</b>		<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0</b>
		<b>0.540</b>	<b>20,700</b>	<b>11,178</b>

**INTERSECTION**

Log Mile =

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Leg	Traffic AADT
North	= <span style="border: 1px solid black; display: inline-block; width: 100px; height: 20px;"></span>
East	= <span style="border: 1px solid black; display: inline-block; width: 100px; height: 20px;"></span>
South	= <span style="border: 1px solid black; display: inline-block; width: 100px; height: 20px;"></span>
West	= <span style="border: 1px solid black; display: inline-block; width: 100px; height: 20px;"></span>
Entering AADT =	<b>0</b>

Trims 2018

**Urban Minor Arterial  
2017-2019**

		Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	=	<b>37</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7</b>
No. of Years	=	<b>3</b>				
SW avg. rate	=	<b>2.574</b>	<b>0.015</b>	<b>0.085</b>	<b>0.100</b>	<b>0.559</b>

**14-16 S/W Rates**

Exposure (E)	=	12.2399				
Crash Rate (A)	=	3.023	0.000	0.000	0.000	0.572
Critical Rate (C)	=	3.682				
Severity Index (SI)	=	0.1892				
Actual Rate/SW Average	=	1.17	0.00	0.00	0.00	1.02
Ratio of A/C	=	0.82				

\* Severe Crashes are the sum of fatal and incapacitating injury crashes

T.D.O.T. STRTAEIC TRANSPORTATION INVESTMENTS DIVISION ( SAFETY DATA SECTION )

Bg

Revised 11/3/2009

# TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	= <b>Montgomery</b>	Date:	6/23/2020
Route	= <b>State Route 374</b>		
Location	= <b>log mile 1.32-2.85</b>		
Highway Type	= <b>two lane with turn</b>		
FUNCTIONAL CLASS	= <b>Urban Minor Arterial</b>		
DATA YEARS	= <b>2017-2019</b>		
ADT YEARS USED	= <b>TRIMS 2018</b>		
COMMENTS	=		
ANALYZED BY	= <b>BG</b>		

<b>SECTION = MORE THAN 0.10 MILE / SPOT= LESS THAN OR EQUAL TO 0.10 MILE</b>				
BLM	ELM	Length	Average AADT	VMT
<b>1.320</b>	<b>2.850</b>	1.530	<b>20,700</b>	31,671
0.000		0.000		0
0.000	<b>0.000</b>	0.000		0
0.000	<b>0.000</b>	0.000		0
0.000	<b>0.000</b>	0.000		0
0.000	<b>0.000</b>	0.000		0
0.000	<b>0.000</b>	0.000		0
0.000	<b>0.000</b>	0.000		0
		1.530	20,700	31,671

**INTERSECTION**

Log Mile =

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document records request does not  
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Leg		Traffic AADT	
North	=		
East	=		
South	=		
West	=		
Entering AADT =			<b>0</b>
Trims 2018			

**Urban Minor Arterial  
2017-2019**

	Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	= <b>105</b>	<b>0</b>	<b>2</b>	<b>2</b>	<b>17</b>
No. of Years	= <b>3</b>				
SW avg. rate	= <b>2.978</b>	<b>0.009</b>	<b>0.071</b>	<b>0.080</b>	<b>0.583</b>

**14-16 S/W Rates**

Exposure (E)	=	34.6797			
Crash Rate (A)	=	3.028	0.000	0.058	0.490
Critical Rate (C)	=	3.674			
Severity Index (SI)	=	0.2000			
Actual Rate/SW Average	=	1.02	0.00	0.81	0.84
Ratio of A/C	=	0.82			

**\* Severe Crashes are the sum of fatal and incapacitating injury crashes**

Revised 11/3/2009

T.D.O.T. STRTAEIC TRANSPORTATION INVESTMENTS DIVISION ( SAFETY DATA SECTION )
Bg

## 14.5 TRAFFIC DATA

**TENNESSEE DEPARTMENT OF TRANSPORTATION  
STRATEGIC TRANSPORTATION INVESTMENTS DIVISION**

PROJECT NO.: \_\_\_\_\_ ROUTE: S.R. 374  
COUNTY: MONTGOMERY CITY: CLARKSVILLE  
PROJECT PIN NUMBER: \_\_\_\_\_  
PROJECT DESCRIPTION: FROM S.R. 112 TO DUNBAR CAVE ROAD.

[1] S.R. 374 AVERAGE TRAFFIC DATA.

**DIVISION REQUESTING:**

MAINTENANCE	<input type="checkbox"/>	PAVEMENT DESIGN	<input type="checkbox"/>
S.T.I.D.	<input checked="" type="checkbox"/>	STRUCTURES	<input type="checkbox"/>
PROG. DEVELOPMENT & ADM.	<input type="checkbox"/>	SURVEY & ROADWAY DESIGN	<input type="checkbox"/>
PUBLIC TRANS. & AERO.	<input type="checkbox"/>	TRAFFIC SIGNAL DESIGN	<input type="checkbox"/>
YEAR PROJECT PROGRAMMED FOR CONSTRUCTION: _____		OTHER TRCWW	<input checked="" type="checkbox"/>
PROJECTED LETTING DATE: _____			

**TRAFFIC ASSIGNMENT:**

[1]

BASE YEAR		DESIGN YEAR					DESIGN ROADWAY % TRUCKS		DESIGN AVERAGE DAILY LOADS	
AADT	YEAR	AADT	DHV	%	YEAR	DIR.DIST.	DHV	AADT	FLEX	RIGID
21,920	2023	36,010	3,752	10	2043	55-45	2	3		

REQUESTED BY: NAME MIKE TUGWELL DATE 2/10/20  
DIVISION TRC WORLDWIDE ENGINEERING  
ADDRESS 202 EAST 7<sup>th</sup> AVENUE  
TAMPA, FL 33602

REVIEWED BY: DEBBI HOWARD *Debbi Howard* DATE 2/12/2020  
TRANSPORTATION MANAGER 1  
SUITE 1000, JAMES K. POLK BUILDING

APPROVED BY: TONY ARMSTRONG *Tony Armstrong* DATE 2.12.20  
TRANSPORTATION MANAGER 2  
SUITE 1000, JAMES K. POLK BUILDING

**COMMENTS:**

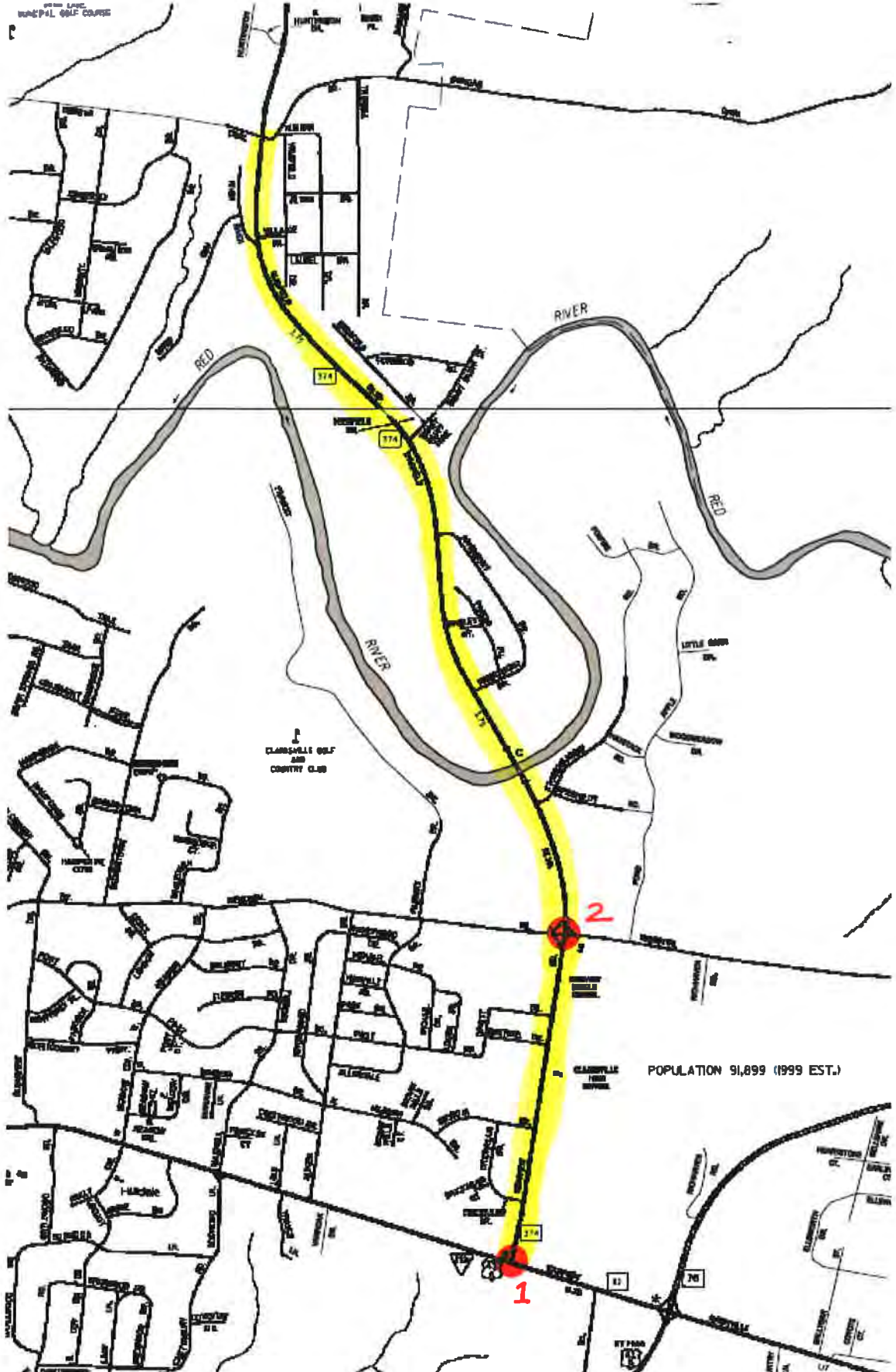
THIS TRAFFIC IS BASED ON 2019 CYCLE COUNTS AND TWO 8-HOUR TURNING MOVEMENT COUNTS [JAN. 2020] FURNISHED WITH THIS REQUEST. THE DESIGN YEAR TRAFFIC IS BASED ON THE AVERAGE OF GROWTH RATES FROM THE CLARKSVILLE MPO COMPUTER ASSIGNMENT MODEL. AADT's AND BOTH YEAR DHV's ARE INCLUDED.

**DHV'S ARE NOT REQUIRED FOR SIDE ROADS LESS THAN 1000 AADT.**

**NOTE:** FOR BRIDGE REPLACEMENT PROJECTS, ADLs ARE NOT REQUIRED FOR ADT's OF 1000 OR LESS AND PERCENTAGE OF TRUCKS OF 7% OR LESS.

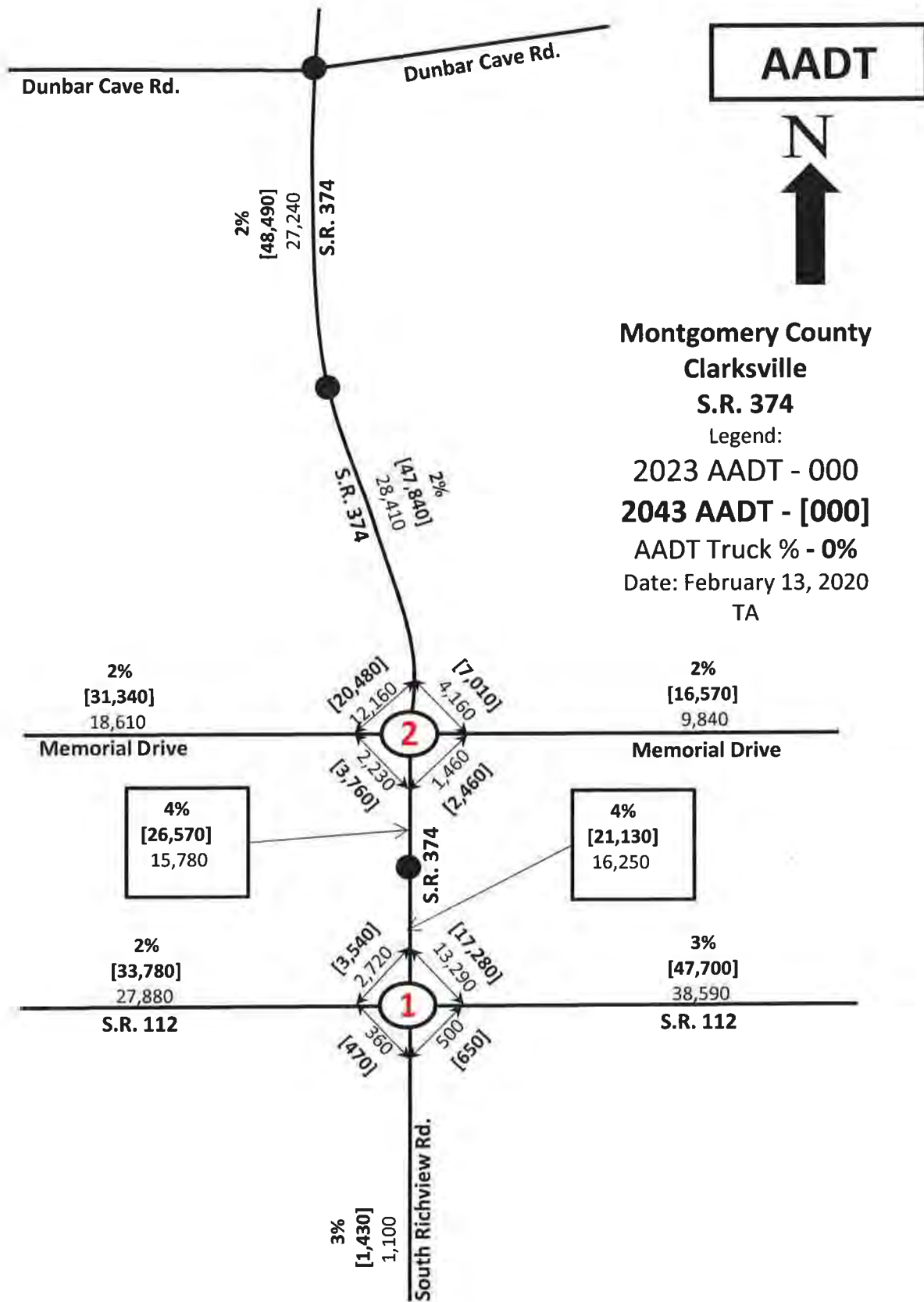
SEE ATTACHMENTS FOR TURNING MOVEMENTS AND/OR OTHER DETAILS.

(REV. 4/1/18)

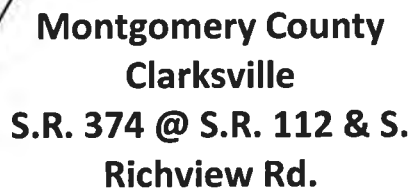


POPULATION 91,899 (1999 EST.)

MONTGOMERY COUNTY  
CLARKSVILLE  
S.R. 374



1



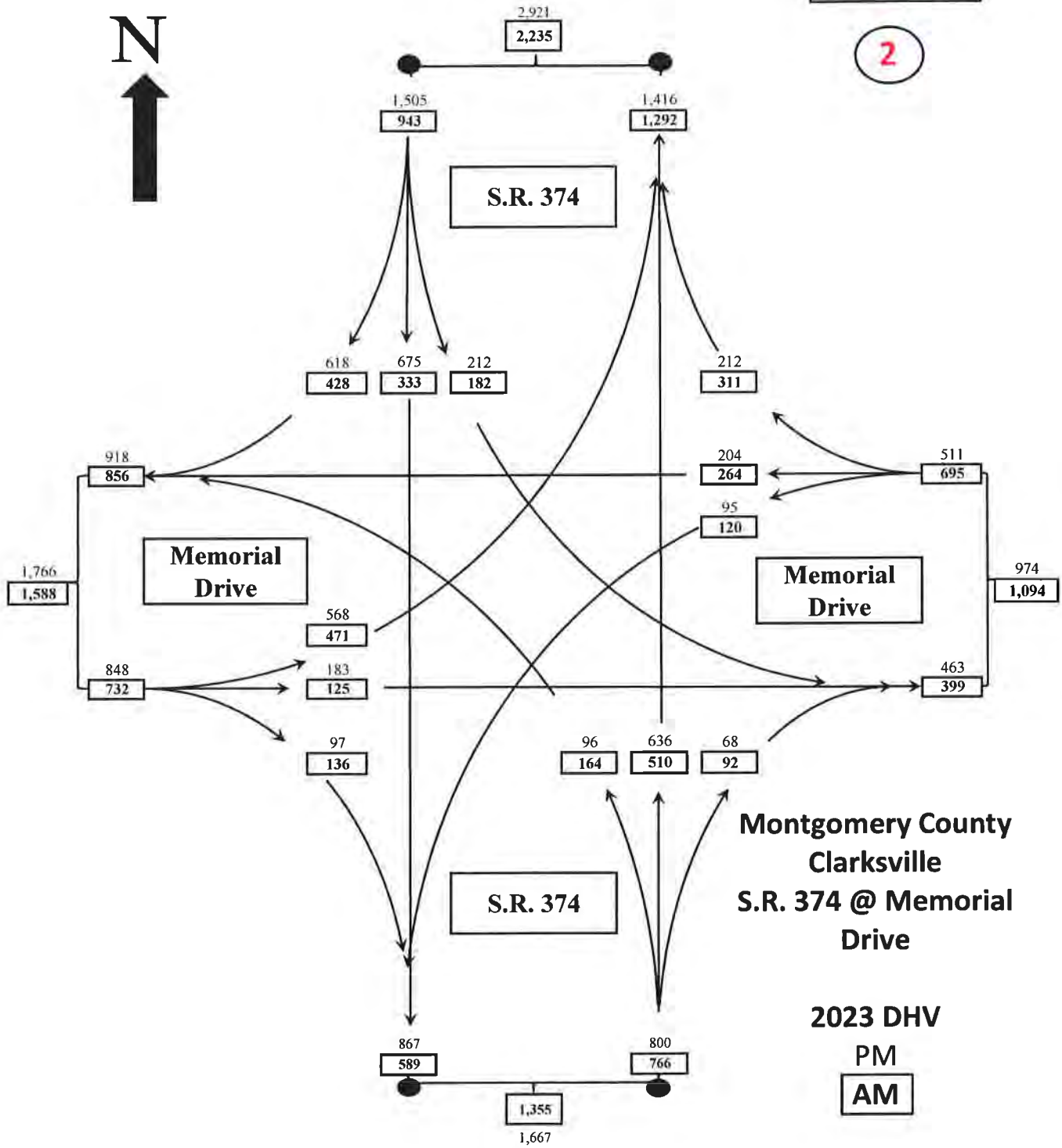
PM

**AM**

Date: February 13, 2020  
TA

2023 DHV

2



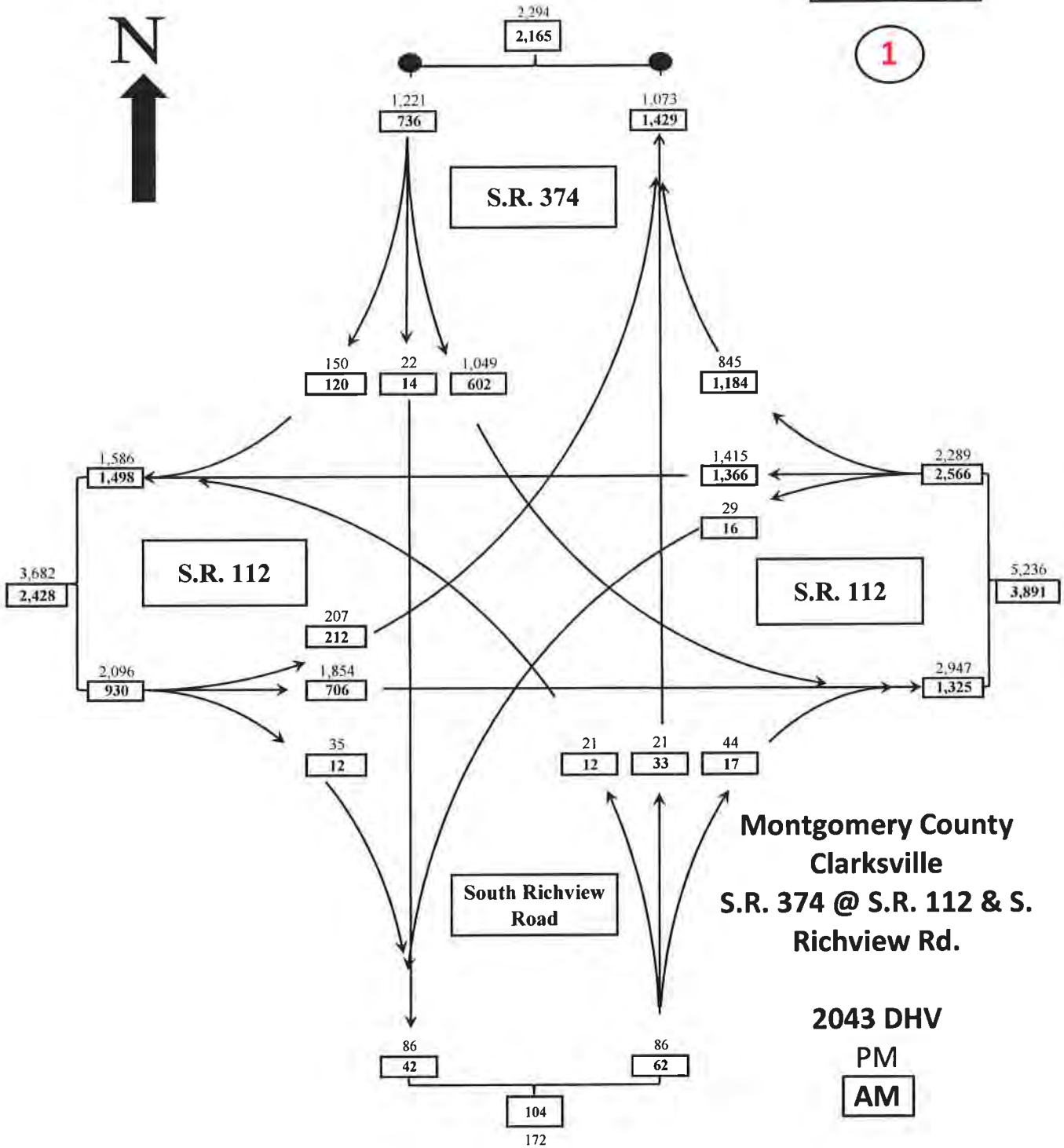
Montgomery County  
Clarksville  
S.R. 374 @ Memorial  
Drive

2023 DHV  
PM  
AM

Date: February 13, 2020  
TA

2043 DHV

1



Montgomery County  
Clarksville  
S.R. 374 @ S.R. 112 & S.  
Richview Rd.

2043 DHV

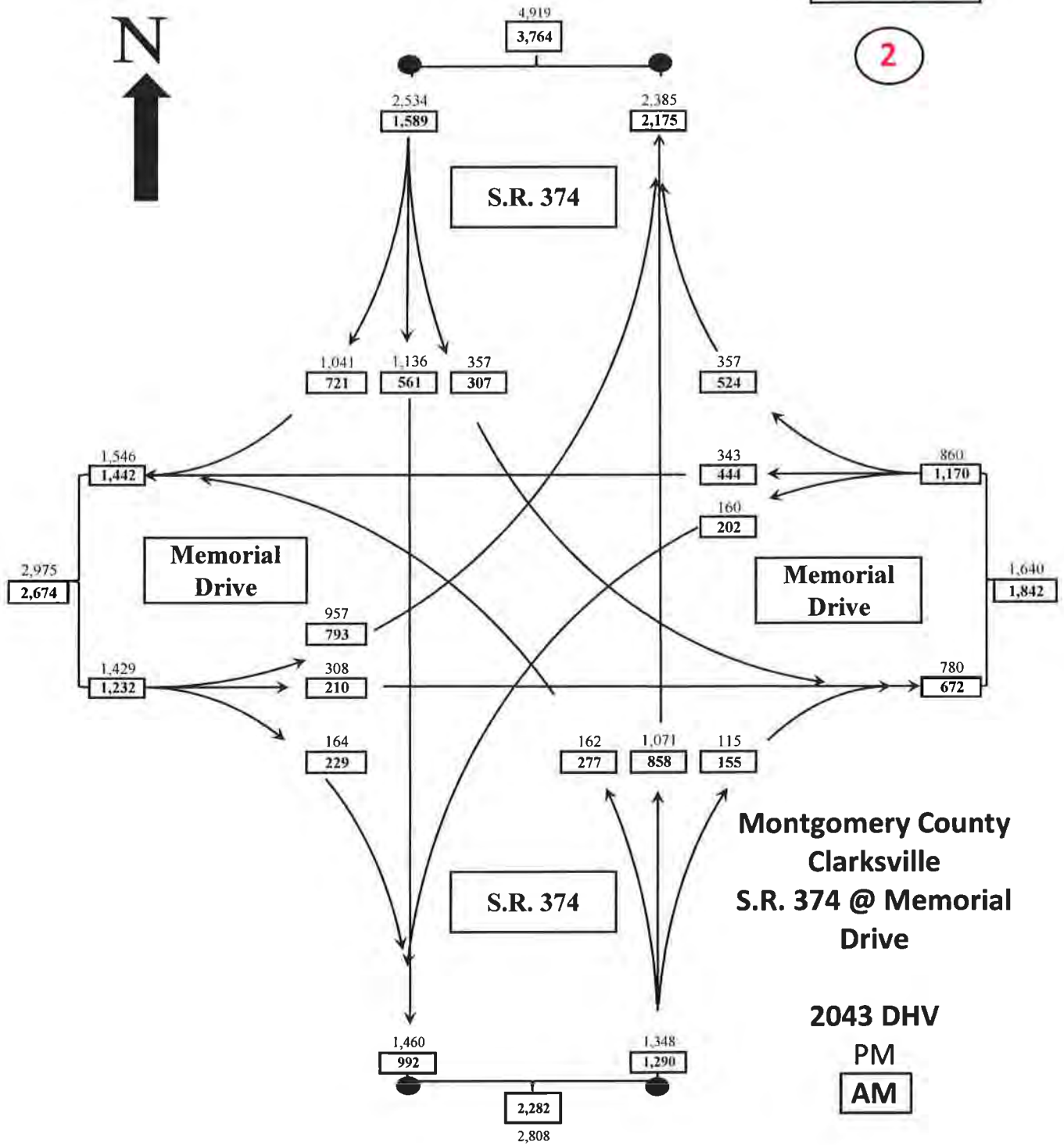
PM

AM

Date: February 13, 2020  
TA

2043 DHV

2



Date: February 13, 2020  
TA

# Turning Movement Count Sheet

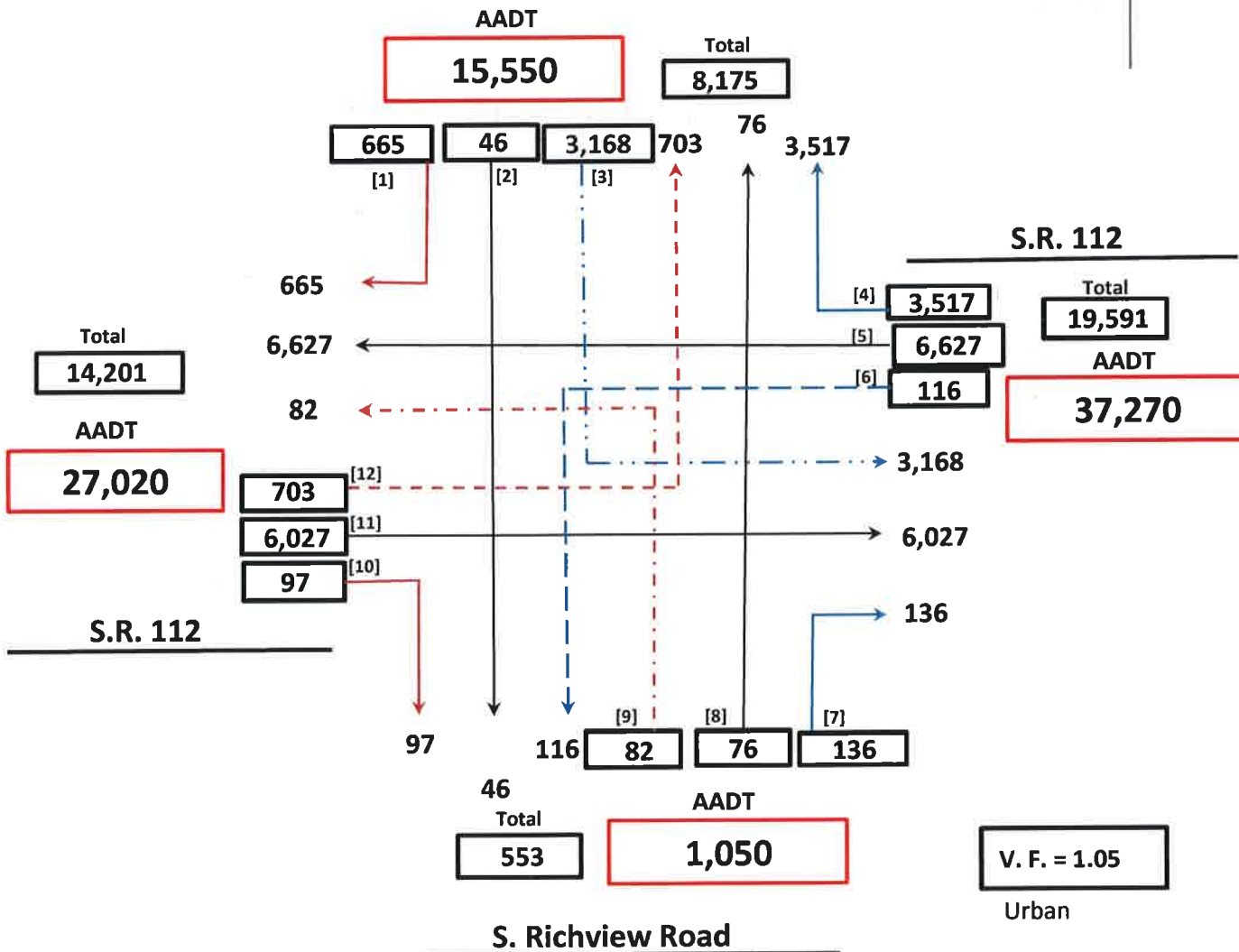
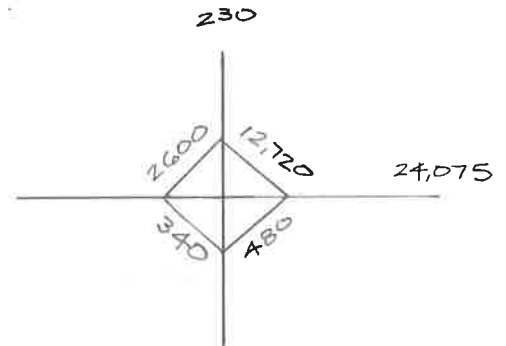
Station No.: 1  
 Location: S.R. 112 @ S.R. 374  
 Count Date: January 28, 2020  
 Recorder: Marr Traffic  
 County: Montgomery  
 City: Clarksville



**8-HR. TMC**      2020      **AADT**

**1.812**      24-Hour Exp. Fac.

**Sta. 80 [2019] 1.812**      S.R. 374



# Turning Movement Count Sheet

Station No.: 2  
 Location: S.R. 374 @ Memorial Drive  
 Count Date: January 28, 2020  
 Recorder: Marr Traffic  
 County: Montgomery  
 City: Clarksville

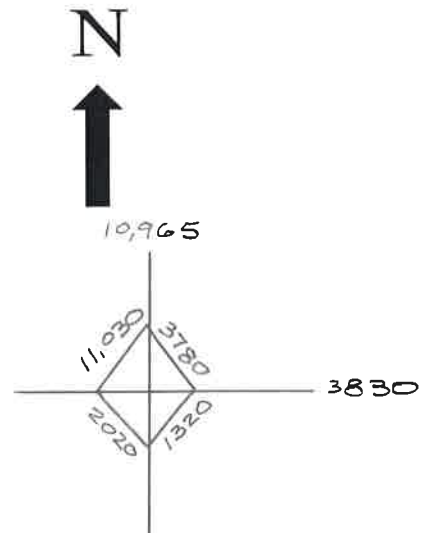
8-HR.  
TMC

2020

AADT

1.852

24-Hour Exp. Fac.



S.R. 374

AADT

25,770

Total

13,254

Sta. 192  
[2019]  
1.852

Memorial Drive

Total

4,591

AADT

8,930

Total

8,682

AADT

16,880

Memorial Drive

2,734

Total

7,359

AADT

14,310


V. F. = 1.05

Urban

S.R. 374

## **14.6 COST ESTIMATE**

# COST ESTIMATE SUMMARY

<b>Route:</b>	SR 374			
<b>Description:</b>	From Madison Street (US-41A, SR 112 LM 0.00)			
	To Dunbar Cave Road (LM 2.85)			
<b>Project Type of Work:</b>	Widen			
<b>County:</b>	Montgomery			
<b>Length:</b>	2.85 Miles			
<b>Date:</b>	September 22, 2020			
<b>Estimate Type:</b>	Concept			

DESCRIPTION	LOCAL	STATE	FEDERAL	TOTAL
	0%	0%	0%	
<b>Construction Items</b>				
Removal Items	\$0	\$0	\$0	\$268,000
Asphalt Paving	\$0	\$0	\$0	\$7,520,000
Concrete Pavement	\$0	\$0	\$0	\$181,000
Drainage	\$0	\$0	\$0	\$2,330,000
Appurtenances	\$0	\$0	\$0	\$2,320,000
Structures	\$0	\$0	\$0	\$5,700,000
Fencing	\$0	\$0	\$0	\$0
Signalization & Lighting	\$0	\$0	\$0	\$750,000
Railroad Crossing	\$0	\$0	\$0	\$0
Earthwork	\$0	\$0	\$0	\$4,010,000
Clearing and Grubbing	\$0	\$0	\$0	\$61,000
Seeding & Sodding	\$0	\$0	\$0	\$32,400
Rip-Rap or Slope Protection	\$0	\$0	\$0	\$31,900
Guardrail	\$0	\$0	\$0	\$210,000
Signing	\$0	\$0	\$0	\$23,400
Pavement Markings	\$0	\$0	\$0	\$93,900
Maintenance of Traffic	\$0	\$0	\$0	\$266,000
Mobilization 5%	\$0	\$0	\$0	\$1,190,000
Other Items 10%	\$0	\$0	\$0	\$2,500,000
Const. Contingency 30%	\$0	\$0	\$0	\$6,540,000
Const. Eng. & Inspec. 10%	\$0	\$0	\$0	\$3,400,000
<b>Construction Estimate</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$37,400,000</b>
<b>Interchanges &amp; Unique Intersections</b>				
Roundabouts	\$0	\$0	\$0	\$0
Interchanges	\$0	\$0	\$0	\$0
<b>Right-of-Way &amp; Utilities</b>	<b>LOCAL</b>	<b>STATE</b>	<b>FEDERAL</b>	<b>TOTAL</b>
	0%	0%	0%	
Right-of-Way	\$0	\$0	\$0	\$4,840,000
Utilities	\$0	\$0	\$0	\$6,190,000
<b>Preliminary &amp; Construction Engineering and Inspection</b>				
Prelim. Eng. 7%	\$0	\$0	\$0	\$2,470,000
<b>Total Project Cost (2020)</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$ 50,900,000</b>

COST ESTIMATE SUMMARY (2020)						
PIN	Project Type of Work	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Project Cost (2020):
0.00	Widen	\$ 2,470,000	\$ 4,840,000	\$ 6,190,000	\$ 40,800,000	\$ 50,900,000

INFLATED COST ESTIMATE SUMMARY					Report Type:	Technical Report
No. of Years	Year	Preliminary Engineering:	Right-of-Way:	Utilities:	Construction:	Total Inflated Project Cost
5	2025	\$ 3,150,000	\$ 6,180,000	\$ 7,900,000	\$ 52,100,000	\$ 65,000,000
10	2030	\$ 4,020,000	\$ 7,880,000	\$ 10,100,000	\$ 66,500,000	\$ 82,900,000

INFLATION INPUTS	
Inflation Rate:	5.00%

# PAY ITEM SUMMARY

TDOT PAY ITEM	TDOT DESCRIPTION	UNIT	TOOL QUANTITIES	ADDITIONAL QUANTITIES	TOOL QUANTITIES + ADDITIONAL QUANTITIES	Statewide UNIT COST	TOTAL COST	
								<-- Unit Cost Trends with Quantities
<b>Pavment Removal</b>								
202-03.01	REMOVAL OF ASPHALT PAVEMENT	SY	3889		3889	\$ 33.89	\$ 131,794.44	
202-03.02	REMOVAL OF RIGID PAVEMENT	CY	154		154	\$ 14.81	\$ 2,285.49	
415-01.02	COLD PLANING BITUMINOUS PAVEMENT	SY	55176		55176	\$ 2.42	\$ 133,525.92	
								PAVEMENT REMOVAL TOTAL (ROUNDED) \$ 267,700
<b>Asphalt Roads</b>								
303-01	MINERAL AGGREGATE, TYPE A BASE, GRADING D	TON	89718	4800	94518	\$ 21.20	\$ 2,003,777.82	
307-02.01	ASPHALT CONCRETE MIX (PG70-22) (BPMB-HM) GRADING A	TON	17834	930	18764	\$ 99.41	\$ 1,865,326.26	
307-01.21	AGGREGATE (BPMB-HM) GRADING A-S MIX	TON	11963	660	12623	\$ 97.57	\$ 1,231,641.72	
307-02.08	ASPHALT CONCRETE MIX (PG70-22) (BPMB-HM) GRADING B-M2	TON	10014	770	10784	\$ 99.60	\$ 1,074,047.36	
402-01	BITUMINOUS MATERIAL FOR PRIME COAT (PC)	TON	123	11	134	\$ 570.81	\$ 76,351.03	
402-02	AGGREGATE FOR COVER MATERIAL (PC)	TON	443	44	487	\$ 40.02	\$ 19,492.94	
403-01	BITUMINOUS MATERIAL FOR TACK COAT (TC)	TON	97	10	107	\$ 657.80	\$ 70,568.72	
411-02.10	ACS MIX(PG70-22) GRADING D	TON	10335	1400	11735	\$ 100.50	\$ 1,179,372.53	
								PAVING TOTAL (ROUNDED) \$ 7,520,600
<b>Concrete Roads</b>								
604-01.01	CLASS A CONCRETE (ROADWAY)	CY	56	250	306	\$ 591.74	\$ 180,809.44	
								CONCRETE RAMPS AND ROADWAYS TOTAL (ROUNDED) \$ 180,900
<b>Drainage</b>								
607-05.02	24" CONCRETE PIPE CULVERT (CLASS III)	LF	22647		22647	\$ 75.01	\$ 1,698,769.47	
607-09.02	48" CONCRETE PIPE CULVERT (CLASS III)	LF		40	40	\$ 143.27	\$ 5,730.80	
607-11.03	60" CONCRETE PIPE CULVERT (CLASS III)	LF		40	40	\$ 214.60	\$ 8,584.00	
611-12.02	CATCH BASINS, TYPE 12, > 4' - 8' DEPTH	EA	50		50	\$ 4,082.39	\$ 204,772.83	
611-14.02	CATCH BASINS, TYPE 14, > 4' - 8' DEPTH	EA	25		25	\$ 6,847.88	\$ 171,744.78	
611-42.02	CATCH BASINS, TYPE 42, > 4' - 8' DEPTH	EA	11		11	\$ 5,435.85	\$ 61,968.69	
710-02	Aggregate Underdrains (with pipe)	LF	30096		30096	\$ 6.07	\$ 182,682.72	
								DRAINAGE TOTAL (ROUNDED) \$ 2,334,300
<b>Appurtenances</b>								
701-01.01	CONCRETE SIDEWALK (4")	SF	150480	9300	159780	\$ 7.97	\$ 1,273,446.60	
702-03	CONCRETE COMBINED CURB & GUTTER	CY	2161	250	2411	\$ 432.38	\$ 1,042,551.96	
								ROADWAY AND PAVEMENT APPURTENANCES TOTAL (ROUNDED) \$ 2,316,000
<b>Earthwork &amp; Mineral</b>								
105-01	CONSTRUCTION STAKES, LINES AND GRADES	LS	1		1	\$ 282,491.98	\$ 282,491.98	
203-01	ROAD & DRAINAGE EXCAVATION (UNCLASSIFIED)	CY	303698		303698	\$ 7.40	\$ 2,247,365.82	
203-02.01	BORROW EXCAVATION (GRADED SOLID ROCK)	TON	25271		25271	\$ 32.33	\$ 817,011.10	
203-03	BORROW EXCAVATION (UNCLASSIFIED)	CY	68209		68209	\$ 9.71	\$ 662,194.31	
								EARTHWORK & MINERAL TOTAL (ROUNDED) \$ 4,009,100
<b>Structures</b>								
N/A	Widen Existing Bridge (Concrete Girder)	SF	17860		17860	\$ 48.00	\$ 857,280.00	
N/A	New Bridge (Concrete Girder)	SF	29140		29140	\$ 150.00	\$ 4,371,000.00	
604-07.01	RETAINING WALL	SF	6250		6250	\$ 75.00	\$ 468,750.00	
								STRUCTURES TOTAL (ROUNDED) \$ 5,697,100
<b>Lighting &amp; Signalization</b>								
N/A	Traffic Signal	EA	2	1	3	\$ 250,000.00	\$ 750,000.00	
								LIGHTING & SIGNALIZATION TOTAL (ROUNDED) \$ 750,000
<b>Guardrail</b>								
705-01.01	GUARDRAIL AT BRIDGE ENDS	LF	100		100	\$ 66.52	\$ 6,651.84	
705-06.01	W Beam GR (Type 2) Mash TL3	LF	8276		8276.4	\$ 20.07	\$ 166,107.35	
705-06.20	Tangent Energy Absorbing Term Mash TL-3	EA	10		10	\$ 2,626.00	\$ 26,260.00	
705-04.09	EARTH PAD FOR TYPE 38 GR END TREATMENT	EA	10		10	\$ 1,122.29	\$ 11,222.90	
								GUARDRAIL TOTAL (ROUNDED) \$ 210,300
<b>Seeding and Sodding</b>								
801-01	SEEDING (WITH MULCH)	UNIT	564		564	\$ 27.26	\$ 15,382.82	
801-01.07	TEMPORARY SEEDING (WITH MULCH)	UNIT	423		423	\$ 22.31	\$ 9,442.15	
801-02	SEEDING (WITHOUT MULCH)	UNIT	423		423	\$ 17.70	\$ 7,491.08	
								SODDING TOTAL (ROUNDED) \$ 32,400
<b>Maintenance of Traffic</b>								
N/A	Traffic Control	LS	1		1		\$ 243,546.48	
712-02.02	INTERCONNECTED PORTABLE BARRIER RAIL	LF	752		752	\$ 30.18	\$ 22,707.43	
								MAINTENANCE OF TRAFFIC TOTAL (ROUNDED) \$ 266,300
<b>Signs</b>								
Not Listed	Signs (Construction)	LS	1		1	\$ -	\$ 23,400	
								SIGNING TOTAL (ROUNDED) \$ 23,400
<b>Pavement Markings</b>								
716-13.06	Spray Thermo P.M. (40 mil 4")	LM	54.7	2	56.7	\$ 1,654.23	\$ 93,827.78	
								PAVEMENT MARKINGS TOTAL (ROUNDED) \$ 93,900
<b>Rip-Rap</b>								
709-05.05	Machined Rip-Rap (Class A-3)	TON	800		800	\$ 39.85	\$ 31,880.00	
								RIP-RAP & SLOPE PROTECTION TOTAL (ROUNDED) \$ 31,900.00
<b>Clearing and Grubbing</b>								
201-01	Clearing and Grubbing	LS		1	1	\$ 60,931.51	\$ 60,931.51	
								CLEAR AND GRUBBING TOTAL (ROUNDED) \$ 61,000.00
<b>Utilities</b>								
N/A	Overhead Distribution	LM	2.85		2.85	\$ 375,000	\$ 1,068,750	
N/A	Underground Power	LM	2.85		2.85	\$ 500,000	\$ 1,425,000	
N/A	Underground Communication	LM	2.85		2.85	\$ 500,000	\$ 1,425,000	
N/A	Underground Gas	LM	2.85		2.85	\$ 250,000	\$ 712,500	
N/A	Underground Water	LM	2.85		2.85	\$ 237,600	\$ 677,160	
N/A	Underground Sewer	LM	2.85		2.85	\$ 310,200	\$ 884,070	
								UTILITIES TOTAL (ROUNDED) \$ 6,192,500.00
<b>Right-of-Way</b>								
N/A	Right-of-Way	LS	1		1	\$ 4,838,831.17	\$ 4,838,831.17	
								RIGHT-OF-WAY TOTAL (ROUNDED) \$ 4,838,900.00

## **14.7 FIELD REVIEW MEETING NOTES**

**State Route 374 from Madison Street (US-41A, State Route 112 to Dunbar Cave Road**  
**Technical Report WebEx Conference**

A WebEx conference was held at 10:00 AM CST Thursday May 28, 2020 to discuss the preliminary conceptual plans for the widening of State Route 374 in Clarksville, TN from Madison Street to Dunbar Cave Road. Those who attended the meeting were as follows.

- Steve Allen, Strategic Transportation Investments Division
- Jim Waters, Strategic Transportation Investments Division
- Shaun Armstrong, Strategic Transportation Investments Division
- Emily Burgess, Strategic Transportation Investments Division
- Chris Cowan, City of Clarksville
- Stan Williams, City of Clarksville
- Sharon Schutz, TDOT Region 3 Project Development
- Jon Zirkle, TDOT Region 3 Project Development
- Melissa Portell, TDOT Region 3 Survey
- Amy Hume, TDOT Environmental
- Sharon Sanders, TDOT Environmental
- Ted Kniazewycz, TDOT Structures
- George Hardy, TDOT Region 3 Traffic
- Mike Tugwell, TRC Worldwide Engineering, Inc.
- Jon Meadows, TRC Worldwide Engineering, Inc.
- Anthony Smith, TRC Worldwide Engineering, Inc.
- Brady Griggs, TRC Worldwide Engineering, Inc.

TRC has prepared the following bullet points regarding the discussion of this meeting:

- The preliminary functionals prepared by TRC Worldwide Engineering showed twelve (12) foot shoulders for the typical section to maintain continuity with the adjacent project to the north. Based upon the discussion at this meeting it was determined to reduce the shoulder widths to ten (10) feet, which is the current standard for RD11-TS-6B and provides sufficient width for the proposed bicycle lanes.
- The preliminary functionals currently include a raised curb island at the Madison Street intersection that will prevent left turn movements onto State Route 374 from the shopping center located on the northwest corner. This was discussed at the meeting but no definitive determination was made if this should instead be changed to pavement marking to allow left turn movements.

- Sidewalks may have to be widened adjacent to the high school and middle school to accommodate the 'Safe Route to Schools' requirements. Current sidewalk width is five (5) feet. TRC will update functionals as required if guidance is provided regarding required changes.
- Any proposed shoulder reductions to reduce right of way near the beginning of the project should be sketched out and provided to Shaun Armstrong for approval.
- A retaining wall should be used at the pond across from the High School to reduce impacts.
- Other potential retaining wall locations should be shown on the functionals if adjacent property is adversely affected.
- Future study may be required to determine optimum layout for school entrances. Crossing guards are present during school hours at three (3) locations in the school zone.
- The southbound to westbound right turn lanes at the Memorial Drive intersection should be reviewed to determine optimal configuration.
- Signalized Intersections should be illuminated.
- TDOT Structures has determined that the existing bridge should be widened to accommodate the new typical section. Symmetrical widening of the bridge is preferred. Bridge should use the full typical section width.
- River Run intersection tie-in will be reviewed to determine if it needs to be extended.
- Shaun Armstrong has provided TRC with Microstation files for the north project to be incorporated into the functionals. Project should end at tie in to the north project south of Dunbar Cave Road.

Additional comments were received from TDOT Strategic Transportation Investments Division after the meeting. These comments are summarized as follows:

- Estimated proposed ROW should be added to functional sheets.
- If functionals include locations where the plan is to hold one side of the existing Edge of Pavement, provide notes throughout describing the concept plan.
- Tie slope lines into side roads.
- Label any areas of major rock cuts
- Shade proposed median at Madison Street intersection.
- Bike lane should include three (3) to four (4) foot buffer area.
- Label design speed, or list segments where different design speed is used.
- Review if a double left turn lane is warranted for the eastbound to northbound movement at the Madison Street Intersection. There are two (2) receiving lanes currently proposed.
- Will Clarksville Gas and Water be receptive to moving the back entrance to State Route 374 further north if feasible?
- Change all roadway name labels on the main route to State Route 374.

- Does existing right turn lane at the Clarksville High School and Richview Middle School need to be replaced? The functionals currently do not include right turn lanes into school entrances.
- Change line-style to solid white for left turn lane.
- The apartment on the southwest side of the Memorial Drive intersection will have right of way issues. Review to determine if typical section can be modified to reduce impact.
- Review if traffic warrants a double left turn lane for the northbound to westbound movement at the Memorial Drive intersection.
- Square up the limit of construction on Memorial Drive east approach.
- Label golf course locations on aerial.
- Show flow arrows of Red River.
- Label access path under bridge over Red River.
- Show adjacent project linework (under construction)

Comments have also been received from TDOT Technical study staff regarding known resources within the project limits. These comments were as follows:

#### **Air and Noise**

This is a Type I noise project, so a detailed noise study will be required. If the NEPA doc is going to be a D-List CE, then MSATs will not be required.

#### **Archaeology**

We studied the existing ROW in the early 2000s and did not identify any archaeological resources at that time. An archaeological survey of all proposed ROW, easements, and undisturbed areas within existing ROW will be required for the subject project. However, due to the geographic context and recent land-use, the probability of identifying archaeological resources that are eligible for the National Register of Historic Places within the area of potential effects is low.

## **Ecology**

According to the TDEC Natural Heritage Rare Species database, there are two records of rare species within one mile of the proposed project; the state and federally-listed Endangered gray bat, *Myotis grisescens* and state-listed purple milkweed. Within four miles there are several records of rare plants and animals, many of the records are historic. Of the rare species within four miles, only one *Physaria globosa*, Short's bladderpod is federally-listed. All of the others are state-listed. The state -listed species within four miles are: Bewick's wren, hellbender, Northern pine snake, Southern bog lemming, barking tree frog, slenderhead darter, Short's rock cress, pale purple coneflower, sand grape, beak grass, limestone bluestar, and prairie ragwort. There is at least one stream, the Red River within this project area. Since the report states that there are 8 culverts, it is likely that there are smaller streams, ephemeral streams or wet weather conveyances. There may be wetlands in low-lying areas, especially near the river. Tree cutting may affect bats such as Indiana bats and Northern long-eared bats that use trees for summer roosting habitat.

## **HazMat**

No hazardous materials sites are identified along the corridor other than two current or former UST facilities on the corner of SR-374 and Madison St, but no proposed ROW is shown on the figures. The bridge over Red River, and possibly the culverts (anything other than corrugated metal pipe) will require asbestos surveys.

## **Historic**

There is one structure previously surveyed by TDOT and deemed eligible for listing on the National Register of Historic Places: The Easterling Log Cabin, located at the corner of Dunbar Cave Road and Warfield Blvd. I have attached an updated functional map with the location of this property. Further study will be required to assess the project's effect on this property. In addition to the previously surveyed property, there are other properties in the project area that are 50+ years old that may be eligible for listing on the National Register of Historic Places. Further study will be required once we receive our official tech request.

## **Multimodal**

There should be a buffer of 3-4 feet between the roadway and a 5' bike lane. Please see pages 43-44 of TDOT's Multimodal Roadway Design Guidelines with the following:

### **9-501.04 BUFFERED ON-STREET BICYCLE LANES**

Buffered bicycle lanes are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. The buffer space is created with pavement markings. When a buffer is placed between the traveled way and a bicycle

lane, it improves safety by separating bicyclists from moving motor vehicles. A buffer can also be placed between on-street parking lanes and bicycle lanes. When that configuration is selected, bicyclists have less risk of being hit by a car door being opened from a parked car. Both locations are acceptable, and the preferred placement of the buffer(s) depends upon local conditions. Buffered bicycle lanes provide the following advantages when compared to conventional bicycle lanes.

- Provide greater distance between bicyclists and motor vehicles
- Provide space for faster moving bicyclists to pass slower moving bicyclists without having to encroach into the motor vehicle travel lane
- Provide a greater space for bicycling without making the bicycle lane appear so wide that it might be mistaken for a travel lane or a parking lane
- Appeal to a wider range of bicyclists and encourages bicycling

Page 45 of the Multimodal Design Guidelines also has the table with the minimum buffer and bike lane width guidelines.

#### **Section 4(f)**

There are two potential Section 4(f) resources along the corridor.

- Clarksville High School Baseball Field along SR-374 – Potential Section 4(f) resource – coordination needed with the Official with Jurisdiction (OWJ) is needed to determine. If it is a Section 4(f) resource, any ROW acquisition would cause the need for a de minimis determination. If only temporary easements would be needed, temporary occupancy would be appropriate.
  - If the public-school baseball field serves only school activities and functions and is not open to the public or serve as either organized or substantial walk-on recreational purposes that are determined to be significant, then it is not subject to Section 4(f). The project lead should obtain documentation from the OWJ explaining that the baseball field is only used for school functions and does not have any other local significance for recreational purposes.
- Crow Community Center is located on the same tract as Clarksville High School at 211 Richview Road and is one of three recreation centers managed by the City of Clarksville Park & Recreation. This resource appears to be open to the public but through a daily admission cost or an annual membership. Further coordination with the OWJ and FHWA would be needed to determine if this is a Section 4(f) resource. Neither the center nor its parking appear to be impacted by the proposed project; however, disruption of access during construction could result in a de minimis impact if this Center is determined to be a Section 4(f) resource.
- River Club Golf and Learning Center located at 1150 Warfield Blvd. – Not a Section 4(f) resource. While open to the public, it is privately owned by River Investments GP.
- The Villages at the River Club – Not a Section 4(f) resource. This is a luxury retirement community that does not appear to have ROW or easement impacts.

## **Section 6(f)**

No resources identified.

## **ROW**

A Conceptual Stage Relocation Plan (CSRP) will be necessary for any business or residential relocations.

## **Other Notes**

- This portion of SR-374 has signage for Clarksville Transit System (CTS) - Bus Route along the roadway. There is one pedestrian bench located on SR-374 near the Clarksville High School driveway across from Sentinel Drive. Appropriate coordination will need to take place.
- Ensure that the project has appropriate transitions of traffic at Madison Street, Dunbar Cave Road, and all other crossing intersections. At Dunbar Cave Road, it appears that two lanes will carry through the intersection, but there is only one existing lane on the other side. Is there another project that will improve that portion of SR-374 to match the typical? At Madison Street, turn lanes need to be added on S. Richview Road to show how residential traffic will turn left and right onto Madison Street.

## **14.8 CAPACITY ANALYSIS**

# HCS7 Two-Lane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineering, Inc.	Analysis Year	2023
Jurisdiction	Clarksville MPO	Time Period Analyzed	AM Peak
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Segment 1

## Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	5280
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	50	Access Point Density, pts/mi	5.0

## Demand and Capacity

Directional Demand Flow Rate, veh/h	1292	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	2.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.76

## Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	53.6
Speed Slope Coefficient	3.46439	Speed Power Coefficient	0.41674
PF Slope Coefficient	-1.34598	PF Power Coefficient	0.74335
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	20.8
%Improved % Followers	0.0	% Improved Avg Speed	0.0

## Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	5280	-	-	49.9

## Vehicle Results

Average Speed, mi/h	49.9	Percent Followers, %	80.4
Segment Travel Time, minutes	1.20	Followers Density, followers/mi/ln	20.8
Vehicle LOS	E		

## Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	3
Flow Rate Outside Lane, veh/h	1292	Bicycle Effective Width, ft	15
Bicycle LOS Score	5.40	Bicycle Effective Speed Factor	4.62
Bicycle LOS	E		

# HCS7 Two-Lane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineering, Inc.	Analysis Year	2023
Jurisdiction	Clarksville MPO	Time Period Analyzed	PM Peak
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Segment 1

## Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	5280
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	50	Access Point Density, pts/mi	5.0

## Demand and Capacity

Directional Demand Flow Rate, veh/h	1505	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	2.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.89

## Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	53.6
Speed Slope Coefficient	3.46439	Speed Power Coefficient	0.41674
PF Slope Coefficient	-1.34598	PF Power Coefficient	0.74335
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	25.5
%Improved % Followers	0.0	% Improved Avg Speed	0.0

## Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	5280	-	-	49.6

## Vehicle Results

Average Speed, mi/h	49.6	Percent Followers, %	83.9
Segment Travel Time, minutes	1.21	Followers Density, followers/mi/ln	25.5
Vehicle LOS	E		

## Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	3
Flow Rate Outside Lane, veh/h	1505	Bicycle Effective Width, ft	15
Bicycle LOS Score	5.48	Bicycle Effective Speed Factor	4.62
Bicycle LOS	E		

# HCS7 Two-Lane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineering, Inc.	Analysis Year	2033
Jurisdiction	Clarksville MPO	Time Period Analyzed	AM Peak
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Segment 1

## Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	5280
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	50	Access Point Density, pts/mi	5.0

## Demand and Capacity

Directional Demand Flow Rate, veh/h	1733	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	2.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.02

## Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	75.0
Speed Slope Coefficient	0.00000	Speed Power Coefficient	0.00000
PF Slope Coefficient	0.00000	PF Power Coefficient	0.00000
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	0.0
%Improved % Followers	0.0	% Improved Avg Speed	0.0

## Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	5280	-	-	75.0

## Vehicle Results

Average Speed, mi/h	75.0	Percent Followers, %	0.0
Segment Travel Time, minutes	0.00	Followers Density, followers/mi/ln	0.0
Vehicle LOS	F		

## Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	3
Flow Rate Outside Lane, veh/h	1733	Bicycle Effective Width, ft	15
Bicycle LOS Score	5.55	Bicycle Effective Speed Factor	4.62
Bicycle LOS	F		

# HCS7 Two-Lane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineering, Inc.	Analysis Year	2033
Jurisdiction	Clarksville MPO	Time Period Analyzed	PM Peak
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Segment 1

## Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	5280
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	50	Access Point Density, pts/mi	5.0

## Demand and Capacity

Directional Demand Flow Rate, veh/h	2019	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	2.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.19

## Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	75.0
Speed Slope Coefficient	0.00000	Speed Power Coefficient	0.00000
PF Slope Coefficient	0.00000	PF Power Coefficient	0.00000
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	0.0
%Improved % Followers	0.0	% Improved Avg Speed	0.0

## Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	5280	-	-	75.0

## Vehicle Results

Average Speed, mi/h	75.0	Percent Followers, %	0.0
Segment Travel Time, minutes	0.00	Followers Density, followers/mi/ln	0.0
Vehicle LOS	F		

## Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	3
Flow Rate Outside Lane, veh/h	2019	Bicycle Effective Width, ft	15
Bicycle LOS Score	5.63	Bicycle Effective Speed Factor	4.62
Bicycle LOS	F		

# HCS7 Two-Lane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineering, Inc.	Analysis Year	2043
Jurisdiction	Clarksville MPO	Time Period Analyzed	AM Peak
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Segment 1

## Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	5280
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	50	Access Point Density, pts/mi	5.0

## Demand and Capacity

Directional Demand Flow Rate, veh/h	2175	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	2.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.28

## Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	75.0
Speed Slope Coefficient	0.00000	Speed Power Coefficient	0.00000
PF Slope Coefficient	0.00000	PF Power Coefficient	0.00000
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	0.0
%Improved % Followers	0.0	% Improved Avg Speed	0.0

## Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	5280	-	-	75.0

## Vehicle Results

Average Speed, mi/h	75.0	Percent Followers, %	0.0
Segment Travel Time, minutes	0.00	Followers Density, followers/mi/ln	0.0
Vehicle LOS	F		

## Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	3
Flow Rate Outside Lane, veh/h	2175	Bicycle Effective Width, ft	15
Bicycle LOS Score	5.66	Bicycle Effective Speed Factor	4.62
Bicycle LOS	F		

# HCS7 Two-Lane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineering, Inc.	Analysis Year	2043
Jurisdiction	Clarksville MPO	Time Period Analyzed	PM Peak
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Segment 1

## Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	5280
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	50	Access Point Density, pts/mi	5.0

## Demand and Capacity

Directional Demand Flow Rate, veh/h	2534	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	2.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.49

## Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	75.0
Speed Slope Coefficient	0.00000	Speed Power Coefficient	0.00000
PF Slope Coefficient	0.00000	PF Power Coefficient	0.00000
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	0.0
%Improved % Followers	0.0	% Improved Avg Speed	0.0

## Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	5280	-	-	75.0

## Vehicle Results

Average Speed, mi/h	75.0	Percent Followers, %	0.0
Segment Travel Time, minutes	0.00	Followers Density, followers/mi/ln	0.0
Vehicle LOS	F		

## Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	3
Flow Rate Outside Lane, veh/h	2534	Bicycle Effective Width, ft	15
Bicycle LOS Score	5.74	Bicycle Effective Speed Factor	4.62
Bicycle LOS	F		

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2023
Jurisdiction	Clarksville MPO	Time Period Analyzed	AM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 1 Geometric Data

Direction 1	Northbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 1 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 1 Demand and Capacity

Volume(V) veh/h	1099	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	584
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.31

## Direction 1 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	13.3
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	B
Access Point Density Adjustment (fA)	1.3		

## Direction 1 Bicycle LOS

Flow Rate in Outside Lane (VOL),veh/h	585	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	2.28
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	B

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2023
Jurisdiction	Clarksville MPO	Time Period Analyzed	AM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 2 Geometric Data

Direction 2	Southbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 2 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 2 Demand and Capacity

Volume(V) veh/h	566	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	301
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.16

## Direction 2 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	6.9
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (fA)	1.3		

## Direction 2 Bicycle LOS

Flow Rate in Outside Lane (vOL),veh/h	301	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	1.94
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	B

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2023
Jurisdiction	Clarksville MPO	Time Period Analyzed	PM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 1 Geometric Data

Direction 1	Northbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 1 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 1 Demand and Capacity

Volume(V) veh/h	825	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	439
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.23

## Direction 1 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	10.0
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (fA)	1.3		

## Direction 1 Bicycle LOS

Flow Rate in Outside Lane (vOL),veh/h	439	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	2.13
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	B

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2023
Jurisdiction	Clarksville MPO	Time Period Analyzed	PM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 2 Geometric Data

Direction 2	Southbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 2 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 2 Demand and Capacity

Volume(V) veh/h	939	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	500
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.26

## Direction 2 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	11.4
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	B
Access Point Density Adjustment (fA)	1.3		

## Direction 2 Bicycle LOS

Flow Rate in Outside Lane (vOL),veh/h	499	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	2.20
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	B

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2033
Jurisdiction	Clarksville MPO	Time Period Analyzed	AM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 1 Geometric Data

Direction 1	Northbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLT	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 1 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 1 Demand and Capacity

Volume(V) veh/h	1733	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	922
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.49

## Direction 1 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	21.1
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (fA)	1.3		

## Direction 1 Bicycle LOS

Flow Rate in Outside Lane (VOL),veh/h	922	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	2.51
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	C

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2033
Jurisdiction	Clarksville MPO	Time Period Analyzed	AM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 2 Geometric Data

Direction 2	Southbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLT	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 2 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 2 Demand and Capacity

Volume(V) veh/h	1265	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	673
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.35

## Direction 2 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	15.4
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	B
Access Point Density Adjustment (fA)	1.3		

## Direction 2 Bicycle LOS

Flow Rate in Outside Lane (VOL),veh/h	673	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	2.35
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	B

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2033
Jurisdiction	Clarksville MPO	Time Period Analyzed	PM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 1 Geometric Data

Direction 1	Northbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLT	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 1 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 1 Demand and Capacity

Volume(V) veh/h	1899	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1010
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.53

## Direction 1 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	23.1
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (fA)	1.3		

## Direction 1 Bicycle LOS

Flow Rate in Outside Lane (VOL),veh/h	1010	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	2.56
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	C

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2033
Jurisdiction	Clarksville MPO	Time Period Analyzed	PM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 2 Geometric Data

Direction 2	Southbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 2 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 2 Demand and Capacity

Volume(V) veh/h	2019	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1074
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.57

## Direction 2 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	24.5
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (fA)	1.3		

## Direction 2 Bicycle LOS

Flow Rate in Outside Lane (vOL),veh/h	1074	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	2.59
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	C

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2043
Jurisdiction	Clarksville MPO	Time Period Analyzed	AM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 1 Geometric Data

Direction 1	Northbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 1 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 1 Demand and Capacity

Volume(V) veh/h	2175	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1157
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.61

## Direction 1 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	26.4
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	D
Access Point Density Adjustment (fA)	1.3		

## Direction 1 Bicycle LOS

Flow Rate in Outside Lane (vOL),veh/h	1157	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	2.63
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	C

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2043
Jurisdiction	Clarksville MPO	Time Period Analyzed	AM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 2 Geometric Data

Direction 2	Southbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLT	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 2 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 2 Demand and Capacity

Volume(V) veh/h	1589	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	845
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.44

## Direction 2 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	19.3
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (fA)	1.3		

## Direction 2 Bicycle LOS

Flow Rate in Outside Lane (VOL),veh/h	845	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	2.47
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	B

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2043
Jurisdiction	Clarksville MPO	Time Period Analyzed	PM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 1 Geometric Data

Direction 1	Northbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLT	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 1 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 1 Demand and Capacity

Volume(V) veh/h	2385	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1268
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.67

## Direction 1 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	28.9
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	D
Access Point Density Adjustment (fA)	1.3		

## Direction 1 Bicycle LOS

Flow Rate in Outside Lane (VOL),veh/h	1269	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	2.67
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	C

# HCS7 Multilane Highway Report

## Project Information

Analyst	MLT	Date	7/8/2020
Agency	TRC Worldwide Engineers, Inc.	Analysis Year	2043
Jurisdiction	Clarksville MPO	Time Period Analyzed	PM PEAK
Project Description	SR 374 between Memorial Drive and Dunbar Cave Road	Unit	United States Customary

## Direction 2 Geometric Data

Direction 2	Southbound		
Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LCR), ft	6
Median Type	TWLT	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	43.8		

## Direction 2 Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Driver Population SAF	1.000	Final Capacity Adjustment Factor (CAF)	1.000
Driver Population CAF	1.000		

## Direction 2 Demand and Capacity

Volume(V) veh/h	2534	Heavy Vehicle Adjustment Factor (fHV)	1.000
Peak Hour Factor	0.94	Flow Rate (Vp), pc/h/ln	1348
Total Trucks, %	0.02	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (cadj), pc/h/ln	1900
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.71

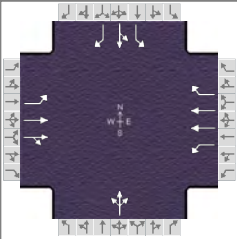
## Direction 2 Speed and Density

Lane Width Adjustment (fLW)	0.0	Average Speed (S), mi/h	43.8
Total Lateral Clearance Adj. (fLLC)	0.0	Density (D ), pc/mi/ln	30.8
Median Type Adjustment (fM)	0.0	Level of Service (LOS)	D
Access Point Density Adjustment (fA)	1.3		

## Direction 2 Bicycle LOS

Flow Rate in Outside Lane (VOL),veh/h	1348	Effective Speed Factor (St)	4.42
Effective Width of Volume (Wv), ft	18	Bicycle LOS Score (BLOS)	2.70
Average Effective Width (We), ft	24	Bicycle Level of Service (LOS)	C

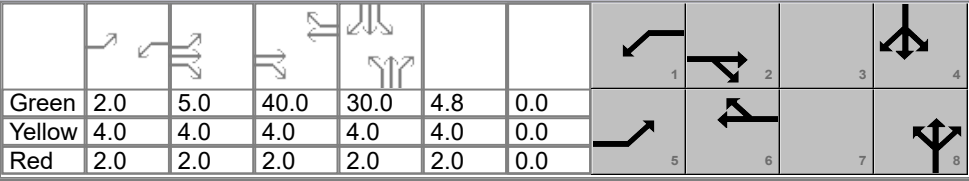
# HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering				Duration, h	0.250						
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other					
Jurisdiction	Clarksville MPO		Time Period	DHV Morning Peak		PHF	0.92					
Urban Street	SR 374 (Richview Drive)		Analysis Year	2023		Analysis Period	1 > 7:00					
Intersection	US 41A (SR 112-Madiso...		File Name	SR 374 w US 41A AM DHV Yr 2023 Existing.xus								
Project Description	Existing Conditions											

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	163	588	9	12	1138	911	9	25	13	463	11	92

Signal Information																	
Cycle, s	111.8	Reference Phase	2	Green	2.0	5.0	40.0	30.0	4.8	0.0	Yellow	4.0	4.0	4.0	4.0	4.0	0.0
Offset, s	0	Reference Point	End	Red	2.0	2.0	2.0	2.0	2.0	2.0	0.0	Uncoordinated	Yes	Simult. Gap E/W	On	Force Mode	Fixed
				Simult. Gap N/S	On												

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	163	588	9	12	1138	911	9	25	13	463	11	92
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %	2	2		0	2	2		0		2	0	2
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0	12.0		12.0		12.0	12.0	12.0
Turn Bay Length, ft	280	1000		200	1000	210		200		1000	275	275
Grade (Pg), %		0			0			0			0	
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40


Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	20.0	40.0	20.0	40.0		30.0		30.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R <sub>c</sub> ), s	2.0	2.0	2.0	2.0		2.0		2.0
Minimum Green ( G <sub>min</sub> ), s	6	6	6	6		6		6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0	2.0	2.0		2.0		2.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

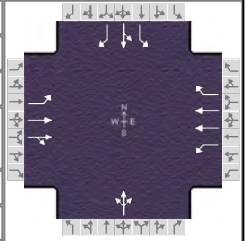
  

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary
















General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2023 Existing.xus		
Project Description	Existing Condtions				

A diagram of a four-way intersection. It shows a central square with four arrows pointing outwards towards the corners, indicating traffic flow. The diagram is surrounded by a grid of small squares, likely representing a street grid or zoning map.



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	163	588	9	12	1138	911	9	25	13	463	11	92

Signal Information												
Cycle, s	111.8	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	2.0	5.0	40.0	30.0	4.8	0.0		
				Yellow	4.0	4.0	4.0	4.0	4.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0		

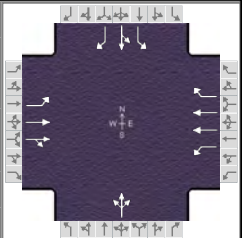
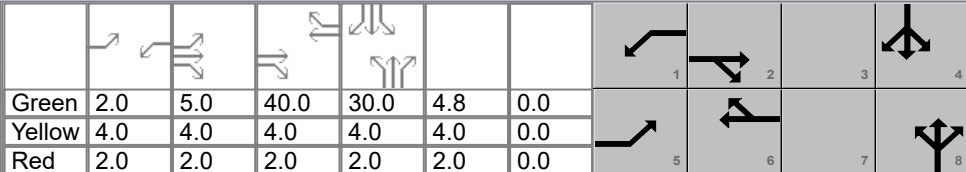
														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	3.0		12.0		9.0
Phase Duration, s	19.0	57.0	8.0	46.0		10.8		36.0
Change Period, ( $Y+R_c$ ), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway ( $MAH$ ), s	3.1	3.1	3.1	3.1		3.1		3.1
Queue Clearance Time ( $g_s$ ), s	12.9	14.8	2.8	42.0		5.1		32.0
Green Extension Time ( $g_e$ ), s	0.2	9.6	0.0	0.0		0.1		0.0
Phase Call Probability	1.00	1.00	0.33	1.00		0.80		1.00
Max Out Probability	0.01	0.24	0.00	1.00		0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	177	325	324	13	1237	990		51		503	12	100
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1781	1870	1860	1810	1781	1585		1794		1781	1900	1585
Queue Service Time ( $g_s$ ), s	10.9	12.8	12.8	0.8	38.2	40.0		3.1		30.0	0.5	5.5
Cycle Queue Clearance Time ( $g_c$ ), s	10.9	12.8	12.8	0.8	38.2	40.0		3.1		30.0	0.5	5.5
Green Ratio ( $g/C$ )	0.12	0.46	0.46	0.02	0.36	0.36		0.04		0.27	0.27	0.27
Capacity ( $c$ ), veh/h	208	854	849	32	1274	567		77		478	510	425
Volume-to-Capacity Ratio ( $X$ )	0.854	0.381	0.381	0.403	0.971	1.746		0.667		1.053	0.023	0.235
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	132.5	136	133.2	9.6	482.8	1745		36.7		509.5	5.9	52.9
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	5.2	5.4	5.3	0.4	19.0	68.7		1.5		20.1	0.2	2.1
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.47	0.14	0.14	0.05	0.48	8.31		0.18		0.51	0.02	0.19
Uniform Delay ( $d_1$ ), s/veh	48.5	20.0	20.0	54.3	35.3	35.9		52.7		40.9	30.1	31.9
Incremental Delay ( $d_2$ ), s/veh	8.2	0.1	0.1	3.0	18.5	343.0		3.7		55.8	0.0	0.1
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	56.7	20.1	20.1	57.3	53.8	378.9		56.4		96.7	30.1	32.0
Level of Service (LOS)	E	C	C	E	D	F		E		F	C	C
Approach Delay, s/veh / LOS	28.0		C	197.5		F	56.4		E	84.9		F
Intersection Delay, s/veh / LOS	139.5						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.68	B	2.11	B	2.48	B	2.32	B
Bicycle LOS Score / LOS	1.17	A	2.34	B	0.57	A	1.50	B

# HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information									
Agency	TRC Worldwide Engineering					Duration, h	0.250								
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other								
Jurisdiction	Clarksville MPO		Time Period	DHV Morning Peak		PHF	0.92								
Urban Street	SR 374 (Richview Drive)		Analysis Year	2023		Analysis Period	1> 7:00								
Intersection	US 41A (SR 112-Madiso...		File Name	SR 374 w US 41A AM DHV Yr 2023 Existing.xus											
Project Description	Existing Condtions														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				163	588	9	12	1138	911	9	25	13	463	11	92
Signal Information															
Cycle, s	111.8	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	2.0	5.0	40.0	30.0	4.8	0.0					
				Yellow	4.0	4.0	4.0	4.0	4.0	0.0					
				Red	2.0	2.0	2.0	2.0	2.0	0.0					
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor (f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor (f <sub>HVg</sub> )				0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984
Parking Activity Adjustment Factor (f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor (f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor (f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor (f <sub>LU</sub> )				1.000	1.000	1.000	1.000	0.952	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Left-Turn Adjustment Factor (f <sub>LT</sub> )				0.952	0.000		0.952	0.000		0.944	0.944		0.952	0.000	
Right-Turn Adjustment Factor (f <sub>RT</sub> )					0.995	0.995		0.000	0.847		0.000	0.000		0.000	0.847
Left-Turn Pedestrian Adjustment Factor (f <sub>LPb</sub> )				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor (f <sub>RPb</sub> )						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor (f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor (f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h				1781	3674	56	1810	3561	1585	343	954	496	1781	1900	1585
Proportion of Vehicles Arriving on Green (P)				0.12	0.46	0.46	0.02	0.36	0.36	0.04	0.04	0.04	0.27	0.27	0.27
Incremental Delay Factor (k)				0.09	0.04	0.04	0.04	0.47	0.50		0.04		0.50	0.04	0.04
Signal Timing / Movement Groups				EBL	EBT/R		WBL	WBT/R		NBL	NBT/R		SBL	SBT/R	
Lost Time (t <sub>L</sub> )				6.0	6.0		6.0	6.0			6.0			4.0	
Green Ratio (g/C)				0.12	0.46		0.02	0.36			0.04			0.27	
Permitted Saturation Flow Rate (s <sub>p</sub> ), veh/h/ln				0	0		0	0			0			1781	
Shared Saturation Flow Rate (s <sub>sh</sub> ), veh/h/ln															
Permitted Effective Green Time (g <sub>p</sub> ), s				0.0	0.0		0.0	0.0			0.0			0.0	
Permitted Service Time (g <sub>u</sub> ), s				0.0	0.0		0.0	0.0			0.0			0.0	
Permitted Queue Service Time (g <sub>ps</sub> ), s															
Time to First Blockage (g <sub>t</sub> ), s				0.0	0.0		0.0	0.0			0.0			0.0	
Queue Service Time Before Blockage (g <sub>ts</sub> ), s															
Protected Right Saturation Flow (s <sub>R</sub> ), veh/h/ln								0						0	
Protected Right Effective Green Time (g <sub>R</sub> ), s								0.0						0.0	
Multimodal				EB			WB			NB			SB		
Pedestrian F <sub>w</sub> / F <sub>v</sub>				0.972	0.000		1.389	0.000		1.710	0.000		1.557	0.000	
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.112		0.000	0.126		0.000	0.166		0.000	0.158	
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>															
Bicycle c <sub>b</sub> / d <sub>b</sub>				912.80	16.52		715.59	23.05			63.12		85.39	51.23	
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	0.68		-3.64	1.85		-3.64	0.08		-3.64	1.02	

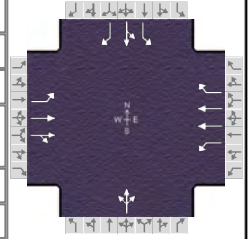
# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering		
Analyst	MLT	Analysis Date	2/17/2020
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak
Urban Street	SR 374 (Richview Drive)	Analysis Year	2023
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2023 Existing.xus
Project Description	Existing Condtns		

## Intersection Information

































































































Duration, h	0.250
Area Type	Other
PHF	0.92
Analysis Period	1> 7:00



## Demand Information

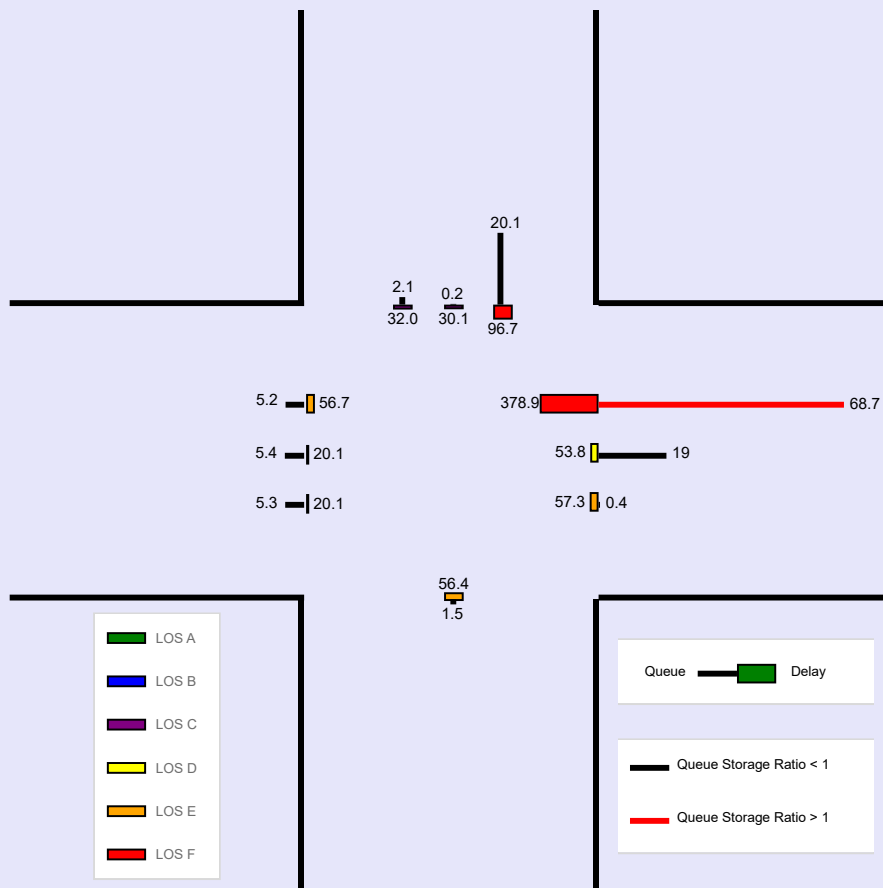
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	163	588	9	12	1138	911	9	25	13	463	11	92

## Signal Information

Cycle, s	111.8	Reference Phase	2																																	
Offset, s	0	Reference Point	End	Green	2.0	5.0	40.0	30.0	4.8	0.0																										
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	4.0	0.0																										
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0																										

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	132.5	136	133.2	9.6	482.8	1745		36.7		509.5	5.9	52.9
Back of Queue ( Q ), veh/ln ( 50 th percentile)	5.2	5.4	5.3	0.4	19.0	68.7		1.5		20.1	0.2	2.1
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.47	0.14	0.14	0.05	0.48	8.31		0.18		0.51	0.02	0.19
Control Delay ( d ), s/veh	56.7	20.1	20.1	57.3	53.8	378.9		56.4		96.7	30.1	32.0
Level of Service (LOS)	E	C	C	E	D	F		E		F	C	C
Approach Delay, s/veh / LOS	28.0		C	197.5		F	56.4		E	84.9		F
Intersection Delay, s/veh / LOS	139.5						F					





### **--- Messages ---**

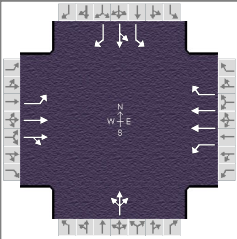
WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

WARNING: The shared-plus-exclusive turn lane solution is an approximation of the HCM method, because more than three lane groups cannot be accommodated. Input data for Percent Turns in Shared Lane are used to specify proportion of turning vehicles in the shared lane.

### **--- Comments ---**

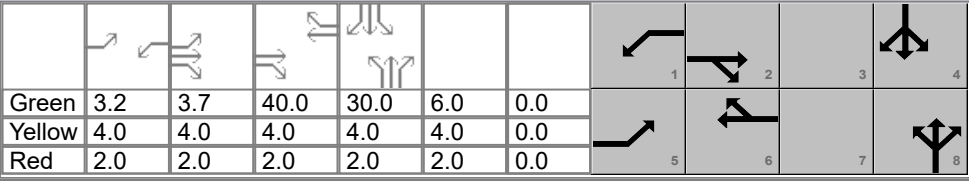
# HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering				Duration, h	0.250						
Analyst	MLT	Analysis Date	2/17/2020		Area Type	Other						
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak		PHF	0.92						
Urban Street	SR 374 (Richview Drive)	Analysis Year	2023		Analysis Period	1 > 7:00						
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2023 Existing.xus									
Project Description	Existing Conditions											

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	159	1545	27	22	1179	650	16	16	34	807	17	115

Signal Information														
Cycle, s	112.9	Reference Phase	2	Green	3.2	3.7	40.0	30.0	6.0	0.0	1	2	3	4
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	4.0	4.0	0.0	5	6	7	8
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.0	2.0	2.0	2.0	2.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	On											

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	159	1545	27	22	1179	650	16	16	34	807	17	115
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %	2	2		0	2	2		0		2	0	2
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0	12.0		12.0		12.0	12.0	12.0
Turn Bay Length, ft	280	1000		200	1000	210		200		1000	275	275
Grade (Pg), %		0			0			0			0	
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

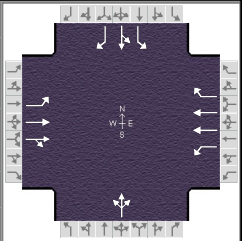
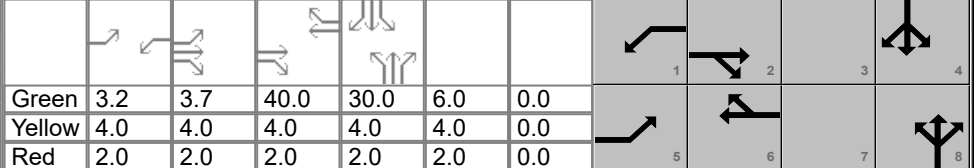
  

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	20.0	40.0	20.0	40.0		30.0		30.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R <sub>c</sub> ), s	2.0	2.0	2.0	2.0		2.0		2.0
Minimum Green ( G <sub>min</sub> ), s	6	6	6	6		6		6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0	2.0	2.0		2.0		2.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

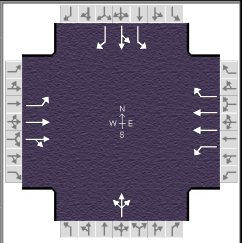
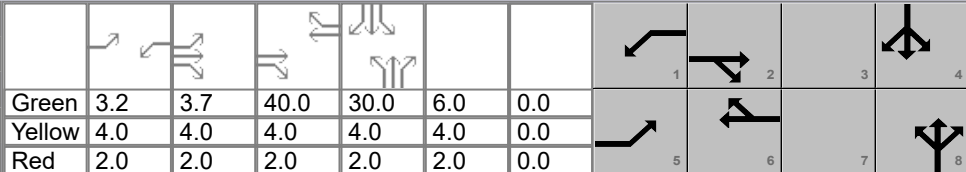
  

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

General Information						Intersection Information									
Agency		TRC Worldwide Engineering				Duration, h		0.250							
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other					
Jurisdiction		Clarksville MPO		Time Period		DHV Afternoon Peak		PHF		0.92					
Urban Street		SR 374 (Richview Drive)		Analysis Year		2023		Analysis Period		1> 7:00					
Intersection		US 41A (SR 112-Madiso...		File Name		SR 374 w US 41A PM DHV Yr 2023 Existing.xus									
Project Description		Existing Condtions													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				159	1545	27	22	1179	650	16	16	34	807	17	115
Signal Information															
Cycle, s	112.9	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On		Green	3.2	3.7	40.0	30.0	6.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	On		Yellow	4.0	4.0	4.0	4.0	4.0	0.0				
				Red	2.0	2.0	2.0	2.0	2.0	0.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				5	2	1	6		8		4				
Case Number				2.0	4.0	2.0	3.0		12.0		9.0				
Phase Duration, s				18.9	55.7	9.2	46.0		12.0		36.0				
Change Period, ( Y+R c ), s				6.0	6.0	6.0	6.0		6.0		6.0				
Max Allow Headway ( MAH ), s				3.1	3.0	3.1	3.0		3.2		3.1				
Queue Clearance Time ( g s ), s				12.7	51.7	3.5	42.0		6.7		32.0				
Green Extension Time ( g e ), s				0.2	0.0	0.0	0.0		0.1		0.0				
Phase Call Probability				1.00	1.00	0.53	1.00		0.89		1.00				
Max Out Probability				0.01	1.00	0.00	1.00		0.00		1.00				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h				173	855	853	24	1282	707		72		877	18	125
Adjusted Saturation Flow Rate ( s ), veh/h/ln				1781	1870	1859	1810	1781	1585		1720		1781	1900	1585
Queue Service Time ( g s ), s				10.7	49.7	49.7	1.5	40.0	40.0		4.7		30.0	0.8	7.1
Cycle Queue Clearance Time ( g c ), s				10.7	49.7	49.7	1.5	40.0	40.0		4.7		30.0	0.8	7.1
Green Ratio ( g/C )				0.11	0.44	0.44	0.03	0.35	0.35		0.05		0.27	0.27	0.27
Capacity ( c ), veh/h				203	823	818	51	1262	562		92		473	505	421
Volume-to-Capacity Ratio ( X )				0.852	1.039	1.043	0.471	1.016	1.258		0.779		1.853	0.037	0.297
Back of Queue ( Q ), ft/ln ( 50 th percentile)				129.9	776	765.9	17.3	550.2	889.1		52.7		1631.5	9.2	0.4
Back of Queue ( Q ), veh/ln ( 50 th percentile)				5.1	30.5	30.6	0.7	21.7	35.0		2.1		64.2	0.4	0.0
Queue Storage Ratio ( RQ ) ( 50 th percentile)				0.46	0.78	0.78	0.09	0.55	4.23		0.26		1.63	0.03	0.00
Uniform Delay ( d 1 ), s/veh				49.1	31.6	31.6	54.0	36.4	36.4		52.8		41.4	30.7	33.0
Incremental Delay ( d 2 ), s/veh				7.7	42.0	43.2	2.5	29.3	130.1		5.3		392.0	0.0	0.1
Initial Queue Delay ( d 3 ), s/veh				0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
Control Delay ( d ), s/veh				56.8	73.6	74.8	56.5	65.8	166.5		58.0		433.5	30.7	33.2
Level of Service (LOS)				E	F	F	E	F	F		E		F	C	C
Approach Delay, s/veh / LOS				72.6	E	101.0	F	58.0	E	377.2	F				
Intersection Delay, s/veh / LOS				146.2						F					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				1.69	B	2.12	B	2.48	B	2.31	B				
Bicycle LOS Score / LOS				2.04	B	2.15	B	0.61	A	2.17	B				

# HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information										
Agency		TRC Worldwide Engineering				Duration, h		0.250								
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other						
Jurisdiction		Clarksville MPO		Time Period		DHV Afternoon Peak		PHF		0.92						
Urban Street		SR 374 (Richview Drive)		Analysis Year		2023		Analysis Period		1> 7:00						
Intersection		US 41A (SR 112-Madiso...		File Name		SR 374 w US 41A PM DHV Yr 2023 Existing.xus										
Project Description		Existing Condtions														
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand ( v ), veh/h				159	1545	27	22	1179	650	16	16	34	807	17	115	
Signal Information																
Cycle, s	112.9	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	Yes	Simult. Gap E/W	On													
Force Mode	Fixed	Simult. Gap N/S	On													
				Green	3.2	3.7	40.0	30.0	6.0	0.0						
				Yellow	4.0	4.0	4.0	4.0	4.0	0.0						
				Red	2.0	2.0	2.0	2.0	2.0	0.0						
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R	
Lane Width Adjustment Factor (f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Heavy Vehicles and Grade Factor (f <sub>HVg</sub> )				0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984	
Parking Activity Adjustment Factor (f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Bus Blockage Adjustment Factor (f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Area Type Adjustment Factor (f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Lane Utilization Adjustment Factor (f <sub>LU</sub> )				1.000	1.000	1.000	1.000	0.952	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Left-Turn Adjustment Factor (f <sub>LT</sub> )				0.952	0.000		0.952	0.000		0.905	0.905		0.952	0.000		
Right-Turn Adjustment Factor (f <sub>RT</sub> )					0.994	0.994		0.000	0.847		0.000	0.000		0.000	0.847	
Left-Turn Pedestrian Adjustment Factor (f <sub>LPb</sub> )				1.000			1.000			1.000			1.000			
Right-Turn Ped-Bike Adjustment Factor (f <sub>RPb</sub> )						1.000			1.000			1.000			1.000	
Work Zone Adjustment Factor (f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
DDI Factor (f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Movement Saturation Flow Rate (s), veh/h				1781	3665	64	1810	3561	1585	417	417	886	1781	1900	1585	
Proportion of Vehicles Arriving on Green (P)				0.11	0.44	0.44	0.03	0.35	0.35	0.05	0.05	0.05	0.27	0.27	0.27	
Incremental Delay Factor (k)				0.08	0.50	0.50	0.04	0.50	0.50		0.04		0.50	0.04	0.04	
Signal Timing / Movement Groups				EBL	EBT/R		WBL	WBT/R		NBL	NBT/R		SBL	SBT/R		
Lost Time (t <sub>L</sub> )				6.0	6.0		6.0	6.0			6.0			4.0		
Green Ratio (g/C)				0.11	0.44		0.03	0.35			0.05			0.27		
Permitted Saturation Flow Rate (s <sub>p</sub> ), veh/h/ln				0	0		0	0			0			1781		
Shared Saturation Flow Rate (s <sub>sh</sub> ), veh/h/ln																
Permitted Effective Green Time (g <sub>p</sub> ), s				0.0	0.0		0.0	0.0			0.0			0.0		
Permitted Service Time (g <sub>u</sub> ), s				0.0	0.0		0.0	0.0			0.0			0.0		
Permitted Queue Service Time (g <sub>ps</sub> ), s																
Time to First Blockage (g <sub>t</sub> ), s				0.0	0.0		0.0	0.0			0.0			0.0		
Queue Service Time Before Blockage (g <sub>ts</sub> ), s																
Protected Right Saturation Flow (s <sub>R</sub> ), veh/h/ln								0						0		
Protected Right Effective Green Time (g <sub>R</sub> ), s								0.0						0.0		
Multimodal				EB			WB			NB			SB			
Pedestrian F <sub>w</sub> / F <sub>v</sub>				0.972	0.000		1.389	0.000		1.710	0.000		1.557	0.000		
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.115		0.000	0.127		0.000	0.167		0.000	0.157		
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>																
Bicycle c <sub>b</sub> / d <sub>b</sub>				880.25	17.69		708.61	23.53			63.67		107.03	50.57		
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	1.55		-3.64	1.66		-3.64	0.12		-3.64	1.68		

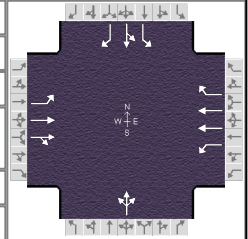
# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering		
Analyst	MLT	Analysis Date	2/17/2020
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak
Urban Street	SR 374 (Richview Drive)	Analysis Year	2023
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2023 Existing.xus
Project Description	Existing Condtions		

## Intersection Information



























Duration, h	0.250
Area Type	Other
PHF	0.92
Analysis Period	1> 7:00



## Demand Information

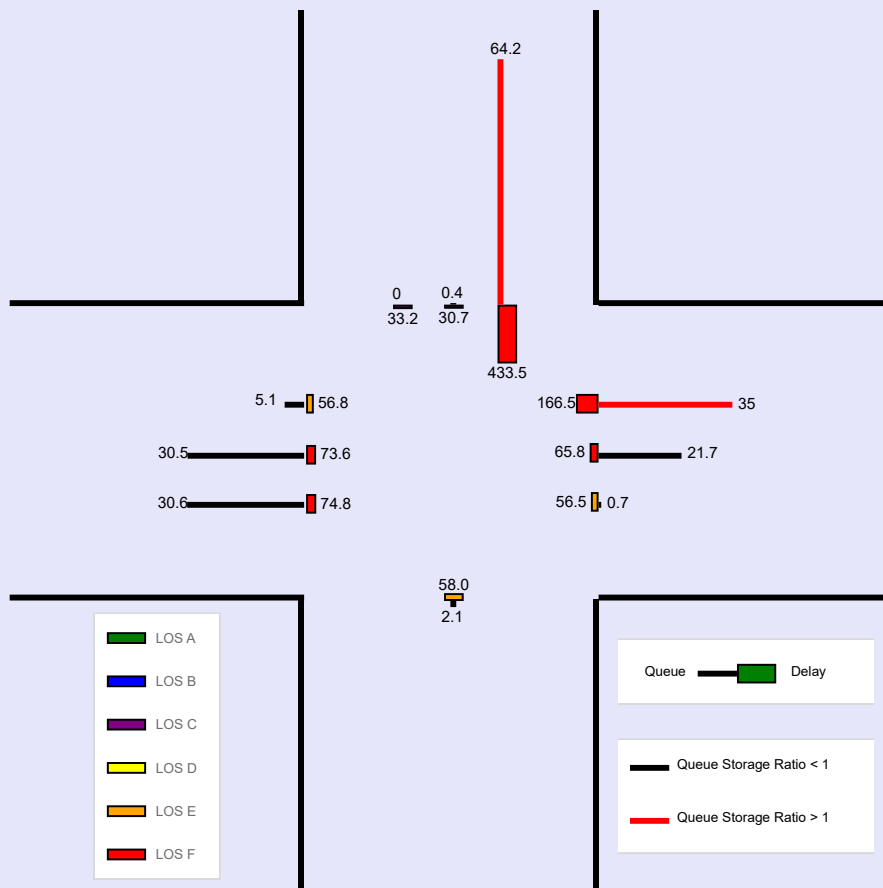
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	159	1545	27	22	1179	650	16	16	34	807	17	115

## Signal Information

Cycle, s	112.9	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	3.2	3.7	40.0	30.0	6.0	0.0						
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	4.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0						

## Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	129.9	776	765.9	17.3	550.2	889.1		52.7		1631.5	9.2	0.4
Back of Queue ( Q ), veh/ln ( 50 th percentile)	5.1	30.5	30.6	0.7	21.7	35.0		2.1		64.2	0.4	0.0
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.46	0.78	0.78	0.09	0.55	4.23		0.26		1.63	0.03	0.00
Control Delay ( d ), s/veh	56.8	73.6	74.8	56.5	65.8	166.5		58.0		433.5	30.7	33.2
Level of Service (LOS)	E	F	F	E	F	F		E		F	C	C
Approach Delay, s/veh / LOS	72.6		E	101.0		F	58.0		E	377.2		F
Intersection Delay, s/veh / LOS	146.2						F					





### **--- Messages ---**

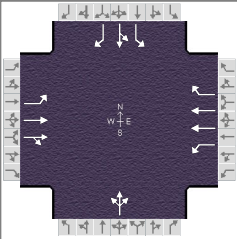
WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

WARNING: The shared-plus-exclusive turn lane solution is an approximation of the HCM method, because more than three lane groups cannot be accommodated. Input data for Percent Turns in Shared Lane are used to specify proportion of turning vehicles in the shared lane.

### **--- Comments ---**

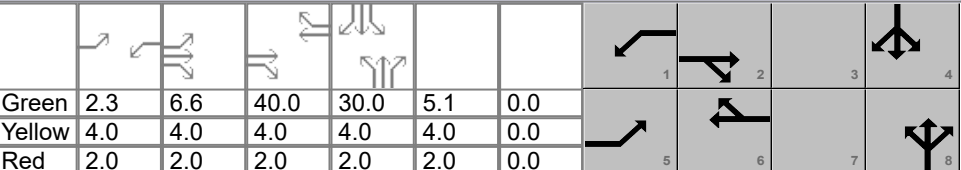
# HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering				Duration, h	0.250						
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other					
Jurisdiction	Clarksville MPO		Time Period	DHV Morning Peak		PHF	0.92					
Urban Street	SR 374 (Richview Drive)		Analysis Year	2033		Analysis Period	1 > 7:00					
Intersection	US 41A (SR 112-Madiso...		File Name	SR 374 w US 41A AM DHV Yr 2033 Existing.xus								
Project Description	Existing Conditions											

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	187	647	10	14	1252	1048	10	29	15	532	13	106

Signal Information																	
Cycle, s	114.0	Reference Phase	2	Green	2.3	6.6	40.0	30.0	5.1	0.0	Green	2.3	6.6	40.0	30.0	5.1	0.0
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	4.0	4.0	0.0	Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.0	2.0	2.0	2.0	2.0	0.0	Red	2.0	2.0	2.0	2.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On														

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	187	647	10	14	1252	1048	10	29	15	532	13	106
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %	2	2		0	2	2		0		2	0	2
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0	12.0		12.0		12.0	12.0	12.0
Turn Bay Length, ft	280	1000		200	1000	210		200		1000	275	275
Grade (Pg), %		0			0			0			0	
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

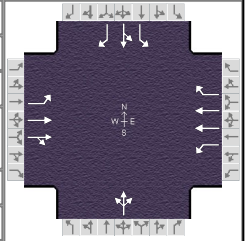
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	20.0	40.0	20.0	40.0		30.0		30.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R <sub>c</sub> ), s	2.0	2.0	2.0	2.0		2.0		2.0
Minimum Green ( G <sub>min</sub> ), s	6	6	6	6		6		6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0	2.0	2.0		2.0		2.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	































# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2033 Existing.xus		
Project Description	Existing Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	187	647	10	14	1252	1048	10	29	15	532	13	106

Signal Information												
Cycle, s	114.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	2.3	6.6	40.0	30.0	5.1	0.0		
				Yellow	4.0	4.0	4.0	4.0	4.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0		

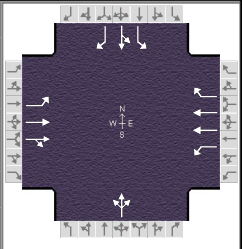
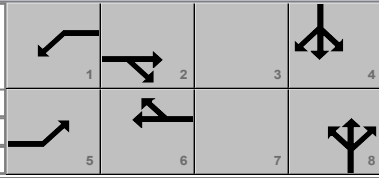
														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	3.0		12.0		9.0
Phase Duration, s	20.9	58.6	8.3	46.0		11.1		36.0
Change Period, ( $Y+R_c$ ), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway ( $MAH$ ), s	3.1	3.1	3.1	3.1		3.1		3.1
Queue Clearance Time ( $g_s$ ), s	14.8	16.5	2.9	42.0		5.7		32.0
Green Extension Time ( $g_e$ ), s	0.2	11.5	0.0	0.0		0.1		0.0
Phase Call Probability	1.00	1.00	0.38	1.00		0.84		1.00
Max Out Probability	0.11	0.40	0.00	1.00		0.00		1.00

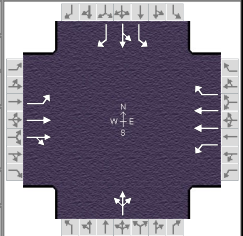
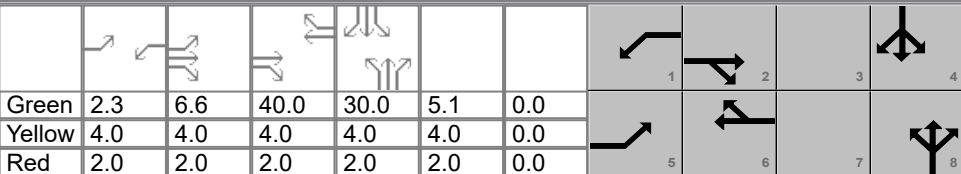
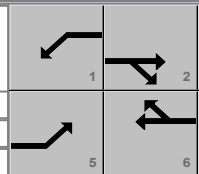
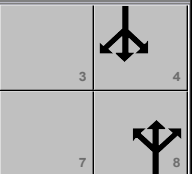
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	203	358	356	15	1361	1139		59		578	14	115
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1781	1870	1860	1810	1781	1585		1794		1781	1900	1585
Queue Service Time ( $g_s$ ), s	12.8	14.5	14.5	0.9	40.0	40.0		3.7		30.0	0.6	6.6
Cycle Queue Clearance Time ( $g_c$ ), s	12.8	14.5	14.5	0.9	40.0	40.0		3.7		30.0	0.6	6.6
Green Ratio ( $g/C$ )	0.13	0.46	0.46	0.02	0.35	0.35		0.04		0.26	0.26	0.26
Capacity ( $c$ ), veh/h	233	863	859	36	1250	556		80		469	500	417
Volume-to-Capacity Ratio ( $X$ )	0.873	0.415	0.415	0.418	1.089	2.048		0.736		1.233	0.028	0.276
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	165.5	154.7	151.5	11.3	655.6	2249.7		43.5		728	7.1	63.5
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	6.5	6.1	6.1	0.5	25.8	88.6		1.7		28.7	0.3	2.5
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.59	0.15	0.15	0.06	0.66	10.71		0.22		0.73	0.03	0.23
Uniform Delay ( $d_1$ ), s/veh	48.6	20.4	20.4	55.2	37.0	37.0		53.8		42.0	31.2	33.4
Incremental Delay ( $d_2$ ), s/veh	15.0	0.1	0.1	2.8	53.2	477.7		4.9		122.4	0.0	0.1
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	63.6	20.5	20.6	58.0	90.2	514.7		58.6		164.4	31.2	33.5
Level of Service (LOS)	E	C	C	E	F	F		E		F	C	C
Approach Delay, s/veh / LOS	30.1	C		282.2	F		58.6	E		140.4	F	
Intersection Delay, s/veh / LOS	200.1						F					

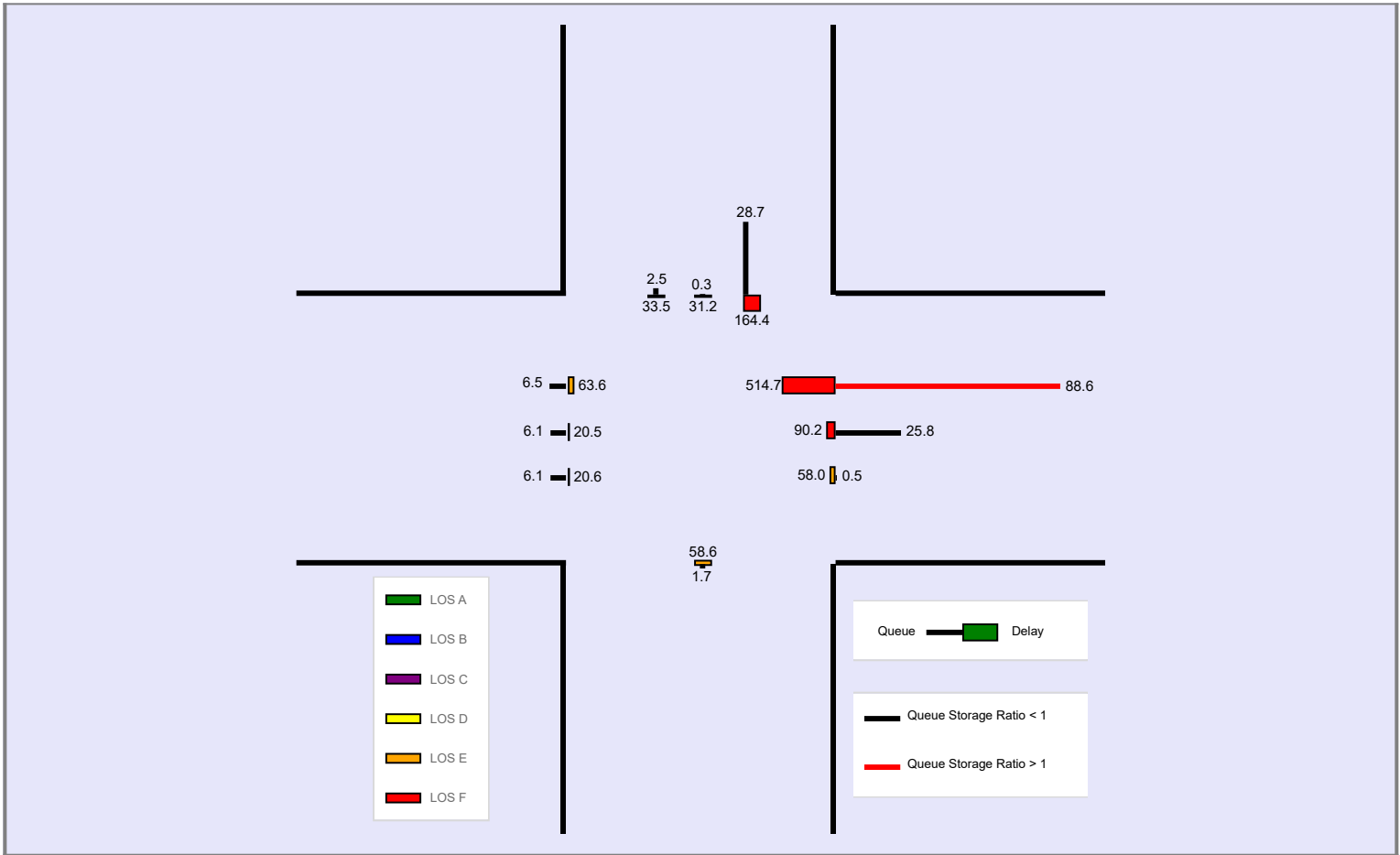
Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.68	B		2.12	B		2.48	B		2.32	B	
Bicycle LOS Score / LOS	1.24	A		2.56	C		0.58	A		1.66	B	

# HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information									
Agency		TRC Worldwide Engineering				Duration, h		0.250							
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other					
Jurisdiction		Clarksville MPO		Time Period		DHV Morning Peak		PHF		0.92					
Urban Street		SR 374 (Richview Drive)		Analysis Year		2033		Analysis Period		1> 7:00					
Intersection		US 41A (SR 112-Madiso...		File Name		SR 374 w US 41A AM DHV Yr 2033 Existing.xus									
Project Description		Existing Condtions													
															
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				187	647	10	14	1252	1048	10	29	15	532	13	106
Signal Information															
Cycle, s	114.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	2.3	6.6	40.0	30.0	5.1	0.0					
				Yellow	4.0	4.0	4.0	4.0	4.0	0.0					
				Red	2.0	2.0	2.0	2.0	2.0	0.0					
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor (f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor (f <sub>HVg</sub> )				0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984
Parking Activity Adjustment Factor (f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor (f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor (f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor (f <sub>LU</sub> )				1.000	1.000	1.000	1.000	0.952	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Left-Turn Adjustment Factor (f <sub>LT</sub> )				0.952	0.000		0.952	0.000		0.944	0.944		0.952	0.000	
Right-Turn Adjustment Factor (f <sub>RT</sub> )					0.995	0.995		0.000	0.847		0.000	0.000		0.000	0.847
Left-Turn Pedestrian Adjustment Factor (f <sub>LPb</sub> )				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor (f <sub>RPb</sub> )						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor (f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor (f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h				1781	3674	57	1810	3561	1585	332	963	498	1781	1900	1585
Proportion of Vehicles Arriving on Green (P)				0.13	0.46	0.46	0.02	0.35	0.35	0.04	0.04	0.04	0.26	0.26	0.26
Incremental Delay Factor (k)				0.18	0.04	0.04	0.04	0.50	0.50		0.04		0.50	0.04	0.04
Signal Timing / Movement Groups				EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R				
Lost Time (t <sub>L</sub> )				6.0	6.0	6.0	6.0		6.0		4.0				
Green Ratio (g/C)				0.13	0.46	0.02	0.35		0.04		0.26				
Permitted Saturation Flow Rate (s <sub>p</sub> ), veh/h/ln				0	0	0	0		0		1781				
Shared Saturation Flow Rate (s <sub>sh</sub> ), veh/h/ln															
Permitted Effective Green Time (g <sub>p</sub> ), s				0.0	0.0	0.0	0.0		0.0		0.0				
Permitted Service Time (g <sub>u</sub> ), s				0.0	0.0	0.0	0.0		0.0		0.0				
Permitted Queue Service Time (g <sub>ps</sub> ), s															
Time to First Blockage (g <sub>t</sub> ), s				0.0	0.0	0.0	0.0		0.0		0.0				
Queue Service Time Before Blockage (g <sub>ts</sub> ), s															
Protected Right Saturation Flow (s <sub>R</sub> ), veh/h/ln							0				0				
Protected Right Effective Green Time (g <sub>R</sub> ), s							0.0				0.0				
Multimodal				EB			WB			NB			SB		
Pedestrian F <sub>w</sub> / F <sub>v</sub>				0.972	0.000	1.389	0.000	1.710	0.000	1.557	0.000	1.557	0.000	1.557	0.000
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.112	0.000	0.127	0.000	0.167	0.000	0.167	0.000	0.158	0.000	
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>															
Bicycle c <sub>b</sub> / d <sub>b</sub>				923.18	16.52	701.97	24.00		64.20	88.89	52.03	88.89	52.03	88.89	52.03
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	0.76	-3.64	2.08	-3.64	0.10	-3.64	0.10	-3.64	1.17	-3.64	1.17

# HCS7 Signalized Intersection Results Graphical Summary

General Information						Intersection Information									
Agency	TRC Worldwide Engineering					Duration, h	0.250								
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other								
Jurisdiction	Clarksville MPO		Time Period	DHV Morning Peak		PHF	0.92								
Urban Street	SR 374 (Richview Drive)		Analysis Year	2033		Analysis Period	1> 7:00								
Intersection	US 41A (SR 112-Madison Avenue)		File Name	SR 374 w US 41A AM DHV Yr 2033 Existing.xus											
Project Description	Existing Conditions														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				187	647	10	14	1252	1048	10	29	15	532	13	106
Signal Information															
Cycle, s	114.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	2.3	6.6	40.0	30.0	5.1	0.0					
				Yellow	4.0	4.0	4.0	4.0	4.0	0.0					
				Red	2.0	2.0	2.0	2.0	2.0	0.0					
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)				165.5	154.7	151.5	11.3	655.6	2249.7		43.5		728	7.1	63.5
Back of Queue ( Q ), veh/ln ( 50 th percentile)				6.5	6.1	6.1	0.5	25.8	88.6		1.7		28.7	0.3	2.5
Queue Storage Ratio ( RQ ) ( 50 th percentile)				0.59	0.15	0.15	0.06	0.66	10.71		0.22		0.73	0.03	0.23
Control Delay ( d ), s/veh				63.6	20.5	20.6	58.0	90.2	514.7		58.6		164.4	31.2	33.5
Level of Service (LOS)				E	C	C	E	F	F		E		F	C	C
Approach Delay, s/veh / LOS				30.1		C	282.2		F	58.6		E	140.4		F
Intersection Delay, s/veh / LOS				200.1						F					



### **--- Messages ---**

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

WARNING: The shared-plus-exclusive turn lane solution is an approximation of the HCM method, because more than three lane groups cannot be accommodated. Input data for Percent Turns in Shared Lane are used to specify proportion of turning vehicles in the shared lane.

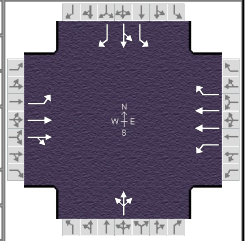
### **--- Comments ---**

# HCS7 Signalized Intersection Input Data

General Information					Intersection Information											
Agency	TRC Worldwide Engineering				Duration, h	0.250										
Analyst	MLT	Analysis Date	2/17/2020		Area Type	Other										
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak		PHF	0.92										
Urban Street	SR 374 (Richview Drive)	Analysis Year	2033		Analysis Period	1 > 7:00										
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2033 Existing.xus													
Project Description		Existing Condtions														
Demand Information					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h					183	1700	31	25	1297	748	18	19	39	928	20	132
Signal Information																
Cycle, s	115.9	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	3.5	5.3	40.0	30.0	7.1	0.0						
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	4.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0						
Traffic Information					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h					183	1700	31	25	1297	748	18	19	39	928	20	132
Initial Queue (Q <sub>b</sub> ), veh/h					0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h					1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h					None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %					2	2		0	2	2		0		2	0	2
Ped / Bike / RTOR, /h					0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h					0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)					3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)					1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft					12.0	12.0		12.0	12.0	12.0		12.0		12.0	12.0	12.0
Turn Bay Length, ft					280	1000		200	1000	210		200		1000	275	275
Grade (Pg), %						0			0			0			0	
Speed Limit, mi/h					40	40	40	40	40	40	40	40	40	40	40	40
Phase Information					EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Maximum Green (G <sub>max</sub> ) or Phase Split, s					20.0	40.0	20.0	40.0		30.0		30.0				
Yellow Change Interval (Y), s					4.0	4.0	4.0	4.0		4.0		4.0				
Red Clearance Interval (R <sub>c</sub> ), s					2.0	2.0	2.0	2.0		2.0		2.0				
Minimum Green ( G <sub>min</sub> ), s					6	6	6	6		6		6				
Start-Up Lost Time ( lt), s					2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0				
Extension of Effective Green (e), s					2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0				
Passage (PT), s					2.0	2.0	2.0	2.0		2.0		2.0				
Recall Mode					Off	Min	Off	Min		Off		Off				
Dual Entry					No	Yes	No	Yes		Yes		Yes				
Walk (Walk), s						0.0		0.0		0.0		0.0				
Pedestrian Clearance Time (PC), s						0.0		0.0		0.0		0.0				
Multimodal Information					EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius					0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft					9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb					0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft					12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking					No	0.50	No	0.50	No	0.50	No	0.50	No	0.50		

















# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2033 Existing.xus		
Project Description	Existing Condtions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	183	1700	31	25	1297	748	18	19	39	928	20	132

Signal Information												
Cycle, s	115.9	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	3.5	5.3	40.0	30.0	7.1	0.0		
				Yellow	4.0	4.0	4.0	4.0	4.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0		

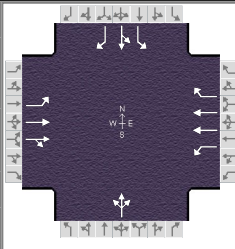
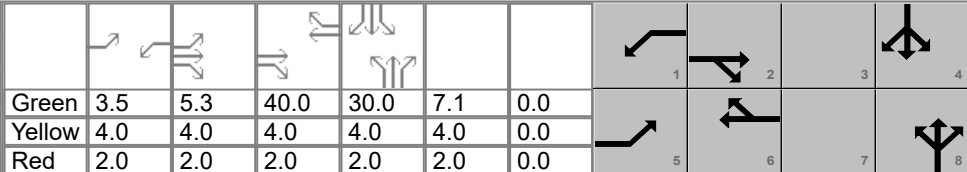
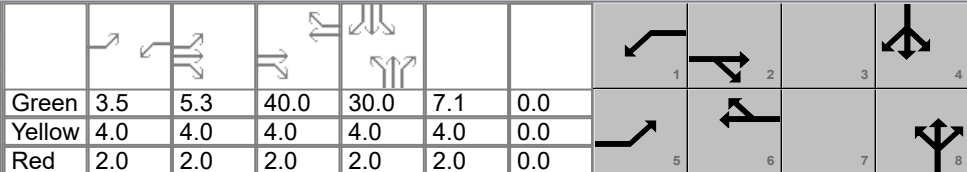
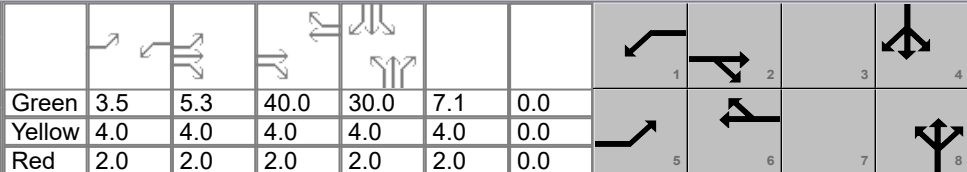
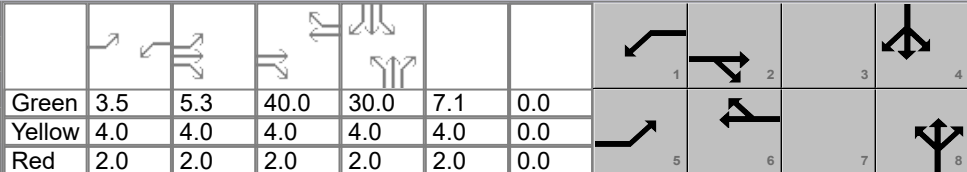
																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	3.0		12.0		9.0
Phase Duration, s	20.8	57.3	9.5	46.0		13.1		36.0
Change Period, ( $Y+R_c$ ), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway ( $MAH$ ), s	3.1	3.0	3.1	3.0		3.2		3.1
Queue Clearance Time ( $g_s$ ), s	14.7	53.3	3.7	42.0		7.5		32.0
Green Extension Time ( $g_e$ ), s	0.2	0.0	0.0	0.0		0.1		0.0
Phase Call Probability	1.00	1.00	0.58	1.00		0.93		1.00
Max Out Probability	0.10	1.00	0.00	1.00		0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	199	941	940	27	1410	813		83		1009	22	143
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1781	1870	1858	1810	1781	1585		1721		1781	1900	1427
Queue Service Time ( $g_s$ ), s	12.7	51.3	51.3	1.7	40.0	40.0		5.5		30.0	1.0	9.6
Cycle Queue Clearance Time ( $g_c$ ), s	12.7	51.3	51.3	1.7	40.0	40.0		5.5		30.0	1.0	9.6
Green Ratio ( $g/C$ )	0.13	0.44	0.44	0.03	0.35	0.35		0.06		0.26	0.26	0.26
Capacity ( $c$ ), veh/h	228	828	823	55	1229	547		105		461	492	369
Volume-to-Capacity Ratio ( $X$ )	0.872	1.136	1.142	0.497	1.147	1.487		0.786		2.188	0.044	0.389
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	164.7	994.7	987.4	20.2	753.4	1258.7		61.8		2086.3	11.3	83.8
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	6.5	39.2	39.5	0.8	29.7	49.6		2.5		82.1	0.5	3.3
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.59	0.99	1.00	0.10	0.75	5.99		0.31		2.09	0.04	0.30
Uniform Delay ( $d_1$ ), s/veh	49.6	32.3	32.3	55.3	38.0	38.0		53.7		43.0	32.2	35.4
Incremental Delay ( $d_2$ ), s/veh	15.0	75.9	78.4	2.6	76.2	228.6		4.8		541.7	0.0	0.2
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	64.6	108.2	110.7	57.9	114.2	266.5		58.5		584.7	32.2	35.7
Level of Service (LOS)	E	F	F	E	F	F		E		F	C	D
Approach Delay, s/veh / LOS	105.2	F		168.5	F		58.5	E		507.4	F	
Intersection Delay, s/veh / LOS	214.5						F					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.69	B		2.12	B		2.48	B		2.31	B	
Bicycle LOS Score / LOS	2.20	B		2.34	B		0.62	A		2.42	B	

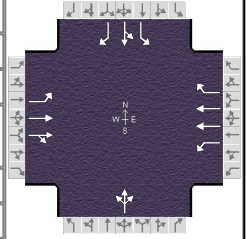
# HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information									
Agency		TRC Worldwide Engineering				Duration, h		0.250							
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other					
Jurisdiction		Clarksville MPO		Time Period		DHV Afternoon Peak		PHF		0.92					
Urban Street		SR 374 (Richview Drive)		Analysis Year		2033		Analysis Period		1> 7:00					
Intersection		US 41A (SR 112-Madiso...		File Name		SR 374 w US 41A PM DHV Yr 2033 Existing.xus									
Project Description		Existing Condtions													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				183	1700	31	25	1297	748	18	19	39	928	20	132
Signal Information															
Cycle, s	115.9	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green				3.5	5.3	40.0	30.0	7.1	0.0	1			2		
Yellow				4.0	4.0	4.0	4.0	4.0	0.0	3			4		
Red				2.0	2.0	2.0	2.0	2.0	0.0	5			6		
7				8											
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor (f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor (f <sub>HVg</sub> )				0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984
Parking Activity Adjustment Factor (f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.900
Bus Blockage Adjustment Factor (f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor (f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor (f <sub>LU</sub> )				1.000	1.000	1.000	1.000	0.952	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Left-Turn Adjustment Factor (f <sub>LT</sub> )				0.952	0.000		0.952	0.000		0.906	0.906		0.952	0.000	
Right-Turn Adjustment Factor (f <sub>RT</sub> )					0.994	0.994		0.000	0.847		0.000	0.000		0.000	0.847
Left-Turn Pedestrian Adjustment Factor (f <sub>LPb</sub> )				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor (f <sub>RPb</sub> )						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor (f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor (f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h				1781	3662	67	1810	3561	1585	408	430	883	1781	1900	1427
Proportion of Vehicles Arriving on Green (P)				0.13	0.44	0.44	0.03	0.35	0.35	0.06	0.06	0.06	0.26	0.26	0.26
Incremental Delay Factor (k)				0.18	0.50	0.50	0.04	0.50	0.50		0.04		0.50	0.04	0.04
Signal Timing / Movement Groups				EBL	EBT/R		WBL	WBT/R		NBL	NBT/R		SBL	SBT/R	
Lost Time (t <sub>L</sub> )				6.0	6.0		6.0	6.0			6.0			4.0	
Green Ratio (g/C)				0.13	0.44		0.03	0.35			0.06			0.26	
Permitted Saturation Flow Rate (s <sub>p</sub> ), veh/h/ln				0	0		0	0			0			1781	
Shared Saturation Flow Rate (s <sub>sh</sub> ), veh/h/ln															
Permitted Effective Green Time (g <sub>p</sub> ), s				0.0	0.0		0.0	0.0			0.0			0.0	
Permitted Service Time (g <sub>u</sub> ), s				0.0	0.0		0.0	0.0			0.0			0.0	
Permitted Queue Service Time (g <sub>ps</sub> ), s															
Time to First Blockage (g <sub>t</sub> ), s				0.0	0.0		0.0	0.0			0.0			0.0	
Queue Service Time Before Blockage (g <sub>ts</sub> ), s															
Protected Right Saturation Flow (s <sub>R</sub> ), veh/h/ln								0						0	
Protected Right Effective Green Time (g <sub>R</sub> ), s								0.0						0.0	
Multimodal				EB			WB			NB			SB		
Pedestrian F <sub>w</sub> / F <sub>v</sub>				0.972	0.000		1.389	0.000		1.710	0.000		1.557	0.000	
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.116		0.000	0.129		0.000	0.167		0.000	0.158	
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>															
Bicycle c <sub>b</sub> / d <sub>b</sub>				885.82	17.99		690.14	24.86			65.17		122.10	51.10	
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	1.72		-3.64	1.86		-3.64	0.14		-3.64	1.94	

# HCS7 Signalized Intersection Results Graphical Summary

## General Information











































Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2033 Existing.xus		
Project Description	Existing Condtions				



## Demand Information

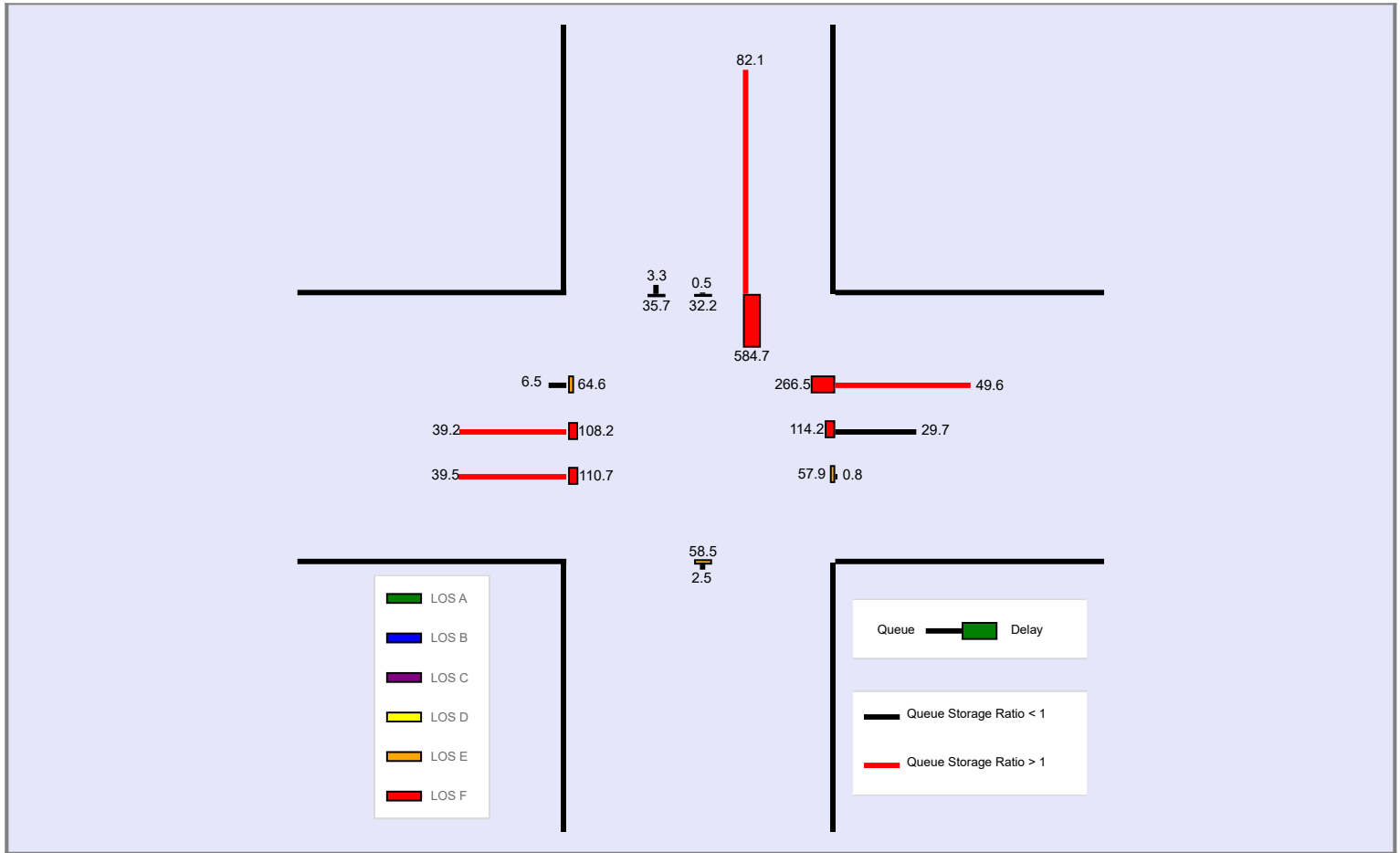
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	183	1700	31	25	1297	748	18	19	39	928	20	132

## Signal Information

Cycle, s	115.9	Reference Phase	2																
Offset, s	0	Reference Point	End	Green	3.5	5.3	40.0	30.0	7.1	0.0									
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	4.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0									

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	164.7	994.7	987.4	20.2	753.4	1258.7		61.8		2086.3	11.3	83.8
Back of Queue ( Q ), veh/ln ( 50 th percentile)	6.5	39.2	39.5	0.8	29.7	49.6		2.5		82.1	0.5	3.3
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.59	0.99	1.00	0.10	0.75	5.99		0.31		2.09	0.04	0.30
Control Delay ( d ), s/veh	64.6	108.2	110.7	57.9	114.2	266.5		58.5		584.7	32.2	35.7
Level of Service ( LOS)	E	F	F	E	F	F		E		F	C	D
Approach Delay, s/veh / LOS	105.2		F	168.5		F	58.5		E	507.4		F
Intersection Delay, s/veh / LOS	214.5						F					



### **--- Messages ---**

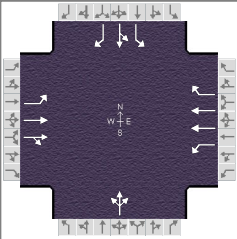
WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

WARNING: The shared-plus-exclusive turn lane solution is an approximation of the HCM method, because more than three lane groups cannot be accommodated. Input data for Percent Turns in Shared Lane are used to specify proportion of turning vehicles in the shared lane.

### **--- Comments ---**

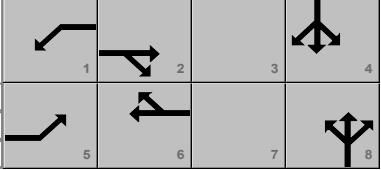
# HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering				Duration, h	0.250						
Analyst	MLT	Analysis Date	2/17/2020		Area Type	Other						
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak		PHF	0.92						
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043		Analysis Period	1> 7:00						
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2043 Existing.xus									
Project Description	Existing Conditions											

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	212	706	12	16	1366	1184	12	33	17	602	14	120

Signal Information											
Cycle, s	116.6	Reference Phase	2	Green	2.6	8.4	40.0	30.0	5.7	0.0	
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	4.0	4.0	0.0	
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.0	2.0	2.0	2.0	2.0	0.0	
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	212	706	12	16	1366	1184	12	33	17	602	14	120
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %	2	2		0	2	2		0		2	0	2
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0	12.0		12.0		12.0	12.0	12.0
Turn Bay Length, ft	280	1000		200	1000	210		200		1000	275	275
Grade (Pg), %		0			0			0			0	
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

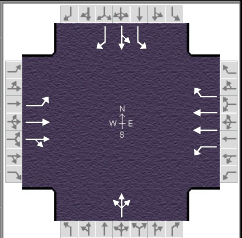
  

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	20.0	40.0	20.0	40.0		30.0		30.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R <sub>c</sub> ), s	2.0	2.0	2.0	2.0		2.0		2.0
Minimum Green ( G <sub>min</sub> ), s	6	6	6	6		6		6
Start-Up Lost Time ( lt ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0	2.0	2.0		2.0		2.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

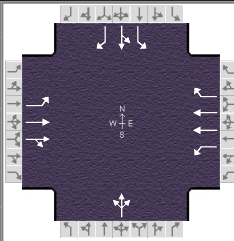
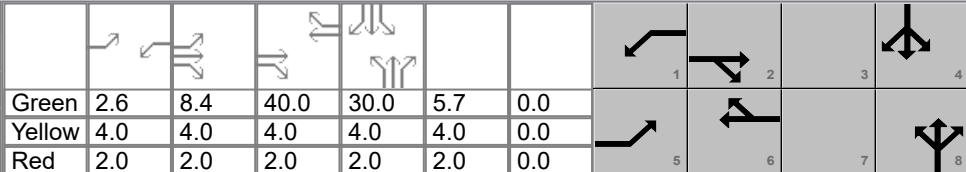
  

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

General Information						Intersection Information									
Agency		TRC Worldwide Engineering				Duration, h		0.250							
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other					
Jurisdiction		Clarksville MPO		Time Period		DHV Morning Peak		PHF		0.92					
Urban Street		SR 374 (Richview Drive)		Analysis Year		2043		Analysis Period		1> 7:00					
Intersection		US 41A (SR 112-Madiso...		File Name		SR 374 w US 41A AM DHV Yr 2043 Existing.xus									
Project Description		Existing Condtions													
															
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				212	706	12	16	1366	1184	12	33	17	602	14	120
Signal Information															
Cycle, s	116.6	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On	Green	2.6	8.4	40.0	30.0	5.7	0.0					
				Yellow	4.0	4.0	4.0	4.0	4.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				5	2	1	6		8		4				
Case Number				2.0	4.0	2.0	3.0		12.0		9.0				
Phase Duration, s				22.9	60.4	8.6	46.0		11.7		36.0				
Change Period, ( Y+R c ), s				6.0	6.0	6.0	6.0		6.0		6.0				
Max Allow Headway ( MAH ), s				3.1	3.1	3.1	3.1		3.1		3.1				
Queue Clearance Time ( g s ), s				16.8	18.5	3.1	42.0		6.3		32.0				
Green Extension Time ( g e ), s				0.1	13.1	0.0	0.0		0.1		0.0				
Phase Call Probability				1.00	1.00	0.43	1.00		0.89		1.00				
Max Out Probability				0.89	0.57	0.00	1.00		0.00		1.00				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h				230	391	389	17	1485	1287		67		654	15	130
Adjusted Saturation Flow Rate ( s ), veh/h/ln				1781	1870	1859	1810	1781	1585		1794		1781	1900	1585
Queue Service Time ( g s ), s				14.8	16.5	16.5	1.1	40.0	40.0		4.3		30.0	0.7	7.8
Cycle Queue Clearance Time ( g c ), s				14.8	16.5	16.5	1.1	40.0	40.0		4.3		30.0	0.7	7.8
Green Ratio ( g/C )				0.15	0.47	0.47	0.02	0.34	0.34		0.05		0.26	0.26	0.26
Capacity ( c ), veh/h				259	872	866	40	1221	544		88		458	489	408
Volume-to-Capacity Ratio ( X )				0.891	0.449	0.449	0.433	1.216	2.368		0.769		1.428	0.031	0.320
Back of Queue ( Q ), ft/ln ( 50 th percentile)				203	176.2	172.4	13.2	875	2759		51.2		987.2	8	75.2
Back of Queue ( Q ), veh/ln ( 50 th percentile)				8.0	6.9	6.9	0.5	34.4	108.6		2.0		38.9	0.3	3.0
Queue Storage Ratio ( RQ ) ( 50 th percentile)				0.72	0.18	0.18	0.07	0.87	13.14		0.26		0.99	0.03	0.27
Uniform Delay ( d 1 ), s/veh				48.9	21.0	21.0	56.3	38.3	38.3		54.8		43.3	32.4	35.1
Incremental Delay ( d 2 ), s/veh				21.6	0.1	0.1	2.7	104.8	621.1		5.2		205.0	0.0	0.2
Initial Queue Delay ( d 3 ), s/veh				0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
Control Delay ( d ), s/veh				70.5	21.2	21.2	59.0	143.1	659.4		60.0		248.3	32.4	35.2
Level of Service (LOS)				E	C	C	E	F	F		E		F	C	D
Approach Delay, s/veh / LOS				32.4	C		380.8	F		60.0	E		209.5	F	
Intersection Delay, s/veh / LOS				271.3						F					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				1.68	B		2.12	B		2.48	B		2.32	B	
Bicycle LOS Score / LOS				1.32	A		2.79	C		0.60	A		1.81	B	

# HCS7 Signalized Intersection Intermediate Values

General Information					Intersection Information												
Agency	TRC Worldwide Engineering					Duration, h		0.250									
Analyst	MLT		Analysis Date		2/17/2020		Area Type		Other								
Jurisdiction	Clarksville MPO		Time Period		DHV Morning Peak		PHF		0.92								
Urban Street	SR 374 (Richview Drive)		Analysis Year		2043		Analysis Period		1> 7:00								
Intersection	US 41A (SR 112-Madiso...		File Name		SR 374 w US 41A AM DHV Yr 2043 Existing.xus												
Project Description	Existing Conditions																
Demand Information				EB			WB			NB			SB				
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R		
Demand ( v ), veh/h				212	706	12	16	1366	1184	12	33	17	602	14	120		
Signal Information																	
Cycle, s	116.6	Reference Phase	2														
Offset, s	0	Reference Point	End														
Uncoordinated	Yes	Simult. Gap E/W	On														
Force Mode	Fixed	Simult. Gap N/S	On														
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R		
Lane Width Adjustment Factor (f_w)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
Heavy Vehicles and Grade Factor (f_HVg)				0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984		
Parking Activity Adjustment Factor (f_p)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
Bus Blockage Adjustment Factor (f_bb)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
Area Type Adjustment Factor (f_a)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
Lane Utilization Adjustment Factor (f_LU)				1.000	1.000	1.000	1.000	0.952	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
Left-Turn Adjustment Factor (f_LT)				0.952	0.000		0.952	0.000		0.944	0.944		0.952	0.000			
Right-Turn Adjustment Factor (f_RT)					0.994	0.994		0.000	0.847		0.000	0.000		0.000	0.847		
Left-Turn Pedestrian Adjustment Factor (f_Lpb)				1.000			1.000			1.000			1.000				
Right-Turn Ped-Bike Adjustment Factor (f_Rpb)						1.000			1.000			1.000			1.000		
Work Zone Adjustment Factor (f_wz)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
DDI Factor (f_DDI)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
Movement Saturation Flow Rate (s), veh/h				1781	3667	62	1810	3561	1585	347	955	492	1781	1900	1585		
Proportion of Vehicles Arriving on Green (P)				0.15	0.47	0.47	0.02	0.34	0.34	0.05	0.05	0.05	0.26	0.26	0.26		
Incremental Delay Factor (k)				0.27	0.04	0.04	0.04	0.50	0.50		0.04		0.50	0.04	0.04		
Signal Timing / Movement Groups				EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R						
Lost Time (t_L)				6.0	6.0	6.0	6.0		6.0		4.0						
Green Ratio (g/C)				0.15	0.47	0.02	0.34		0.05		0.26						
Permitted Saturation Flow Rate (s_p), veh/h/ln				0	0	0	0		0		1781						
Shared Saturation Flow Rate (s_sh), veh/h/ln																	
Permitted Effective Green Time (g_p), s				0.0	0.0	0.0	0.0		0.0		0.0						
Permitted Service Time (g_u), s				0.0	0.0	0.0	0.0		0.0		0.0						
Permitted Queue Service Time (g_ps), s																	
Time to First Blockage (g_t), s				0.0	0.0	0.0	0.0		0.0		0.0						
Queue Service Time Before Blockage (g_ts), s																	
Protected Right Saturation Flow (s_R), veh/h/ln							0				0						
Protected Right Effective Green Time (g_R), s							0.0				0.0						
Multimodal				EB			WB			NB			SB				
Pedestrian F_w / F_v				0.972	0.000	1.389	0.000	1.710	0.000	1.557	0.000	1.557	0.000				
Pedestrian F_s / F_delay				0.000	0.113	0.000	0.129	0.000	0.168	0.000	0.168	0.000	0.159				
Pedestrian M_corner / M_cw																	
Bicycle c_b / d_b				932.02	16.63	685.91	25.18		65.53	97.67	52.76						
Bicycle F_w / F_v				-3.64	0.83	-3.64	2.30	-3.64	0.11	-3.64	1.32						

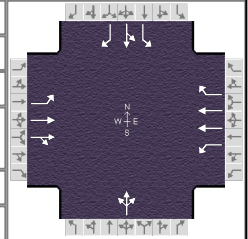
# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering		
Analyst	MLT	Analysis Date	2/17/2020
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2043 Existing.xus
Project Description	Existing Conditions		

## Intersection Information





































Duration, h	0.250
Area Type	Other
PHF	0.92
Analysis Period	1> 7:00



## Demand Information

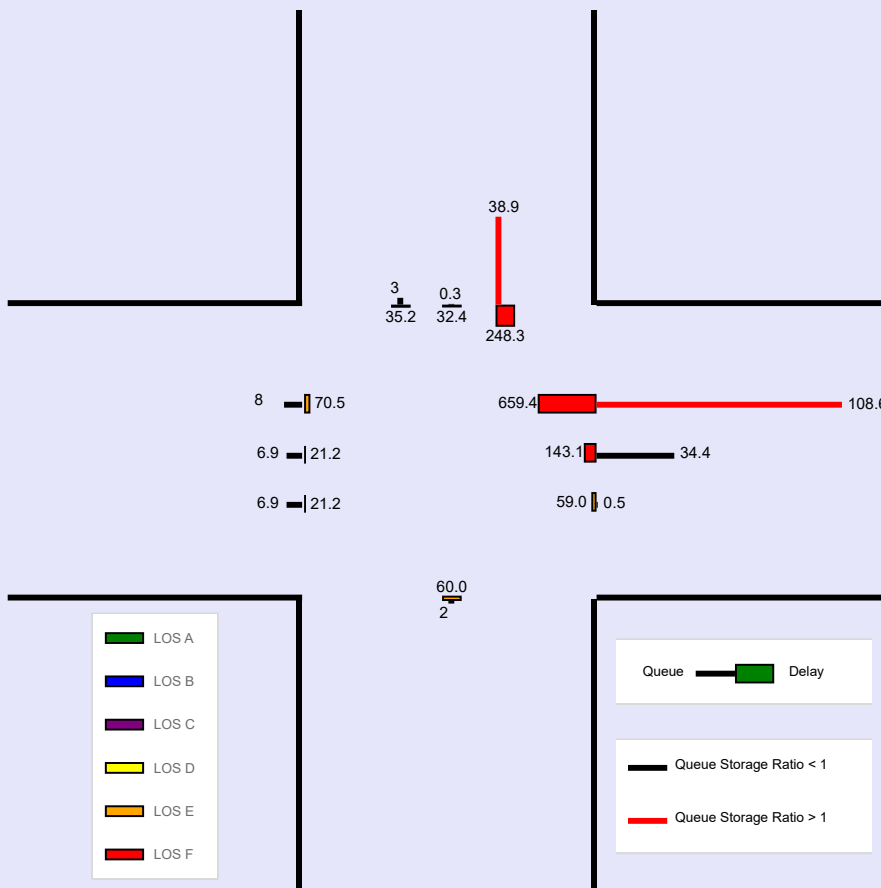
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	212	706	12	16	1366	1184	12	33	17	602	14	120

## Signal Information

Cycle, s	116.6	Reference Phase	2																	
Offset, s	0	Reference Point	End	Green	2.6	8.4	40.0	30.0	5.7	0.0										
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	4.0	0.0										
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0										

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	203	176.2	172.4	13.2	875	2759		51.2		987.2	8	75.2
Back of Queue ( Q ), veh/ln ( 50 th percentile)	8.0	6.9	6.9	0.5	34.4	108.6		2.0		38.9	0.3	3.0
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.72	0.18	0.18	0.07	0.87	13.14		0.26		0.99	0.03	0.27
Control Delay ( d ), s/veh	70.5	21.2	21.2	59.0	143.1	659.4		60.0		248.3	32.4	35.2
Level of Service (LOS)	E	C	C	E	F	F		E		F	C	D
Approach Delay, s/veh / LOS	32.4		C	380.8		F	60.0		E	209.5		F
Intersection Delay, s/veh / LOS	271.3						F					





### **--- Messages ---**

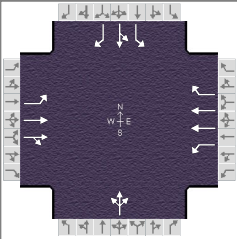
WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

WARNING: The shared-plus-exclusive turn lane solution is an approximation of the HCM method, because more than three lane groups cannot be accommodated. Input data for Percent Turns in Shared Lane are used to specify proportion of turning vehicles in the shared lane.

### **--- Comments ---**

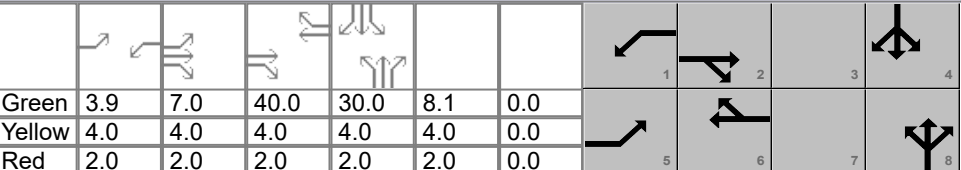
# HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering				Duration, h	0.250						
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other					
Jurisdiction	Clarksville MPO		Time Period	DHV Afternoon Peak		PHF	0.92					
Urban Street	SR 374 (Richview Drive)		Analysis Year	2043		Analysis Period	1 > 7:00					
Intersection	US 41A (SR 112-Madiso...		File Name	SR 374 w US 41A PM DHV Yr 2043 Existing.xus								
Project Description	Existing Conditions											

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	207	1854	35	29	1415	845	21	21	44	1049	22	150

Signal Information																								
Cycle, s	119.0	Reference Phase	2	Green	3.9	7.0	40.0	30.0	8.1	0.0	Yellow	4.0	4.0	4.0	4.0	4.0	0.0	Red	2.0	2.0	2.0	2.0	2.0	0.0
Offset, s	0	Reference Point	End	Uncoordinated	Yes	Simult. Gap E/W	On	Force Mode	Fixed	Simult. Gap N/S	On													

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	207	1854	35	29	1415	845	21	21	44	1049	22	150
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %	2	2		0	2	2		0		2	0	2
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0	12.0		12.0		12.0	12.0	12.0
Turn Bay Length, ft	280	1000		200	1000	210		200		1000	275	275
Grade (Pg), %		0			0			0			0	
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

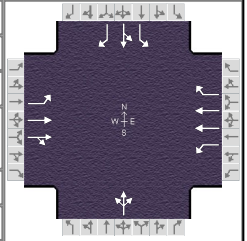
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	20.0	40.0	20.0	40.0		30.0		30.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R <sub>c</sub> ), s	2.0	2.0	2.0	2.0		2.0		2.0
Minimum Green ( G <sub>min</sub> ), s	6	6	6	6		6		6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0	2.0	2.0		2.0		2.0
Recall Mode	Ped	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	







# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2043 Existing.xus		
Project Description	Existing Condtns				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	207	1854	35	29	1415	845	21	21	44	1049	22	150

Signal Information												
Cycle, s	119.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	3.9	7.0	40.0	30.0	8.1	0.0		
				Yellow	4.0	4.0	4.0	4.0	4.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0		

											
1		2		3		4					
											
5		6		7		8					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	3.0		12.0		9.0
Phase Duration, s	22.9	59.0	9.9	46.0		14.1		36.0
Change Period, ( $Y+R_c$ ), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway ( $MAH$ ), s	3.1	3.0	3.1	3.0		3.2		3.1
Queue Clearance Time ( $g_s$ ), s	16.8	55.0	4.0	42.0		8.4		32.0
Green Extension Time ( $g_e$ ), s	0.1	0.0	0.0	0.0		0.1		0.0
Phase Call Probability	1.00	1.00	0.65	1.00		0.95		1.00
Max Out Probability	0.85	1.00	0.00	1.00		0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	225	1027	1027	32	1538	918		93		1140	24	163
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1781	1870	1858	1810	1781	1585		1721		1781	1900	1585
Queue Service Time ( $g_s$ ), s	14.8	53.0	53.0	2.0	40.0	40.0		6.4		30.0	1.1	10.2
Cycle Queue Clearance Time ( $g_c$ ), s	14.8	53.0	53.0	2.0	40.0	40.0		6.4		30.0	1.1	10.2
Green Ratio ( $g/C$ )	0.14	0.45	0.45	0.03	0.34	0.34		0.07		0.25	0.25	0.25
Capacity ( $c$ ), veh/h	253	833	827	59	1197	533		117		449	479	400
Volume-to-Capacity Ratio ( $X$ )	0.890	1.232	1.241	0.534	1.285	1.724		0.796		2.539	0.050	0.408
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)	320.1	1780.8	1775.1	43.4	1459.3	2556.7		128.7		3997.4	23.4	178.9
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	12.6	70.1	71.0	1.7	57.5	100.7		5.1		157.4	0.9	7.0
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	1.14	1.78	1.80	0.22	1.46	12.17		0.64		4.00	0.09	0.65
Uniform Delay ( $d_1$ ), s/veh	50.2	33.0	33.0	56.7	39.5	39.5		54.6		44.5	33.7	37.1
Incremental Delay ( $d_2$ ), s/veh	21.8	115.0	118.6	2.8	134.7	333.7		4.6		699.2	0.0	0.2
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	71.9	148.0	151.6	59.4	174.2	373.2		59.2		743.7	33.7	37.4
Level of Service (LOS)	E	F	F	E	F	F		E		F	C	D
Approach Delay, s/veh / LOS	142.1	F		246.2	F		59.2	E		644.2	F	
Intersection Delay, s/veh / LOS	290.4						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.69	B	2.12	B	2.48	B	2.32	B
Bicycle LOS Score / LOS	2.37	B	2.54	C	0.64	A	2.68	C

# HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information							
Agency		TRC Worldwide Engineering				Duration, h		0.250					
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other			
Jurisdiction		Clarksville MPO		Time Period		DHV Afternoon Peak		PHF		0.92			
Urban Street		SR 374 (Richview Drive)		Analysis Year		2043		Analysis Period		1> 7:00			
Intersection		US 41A (SR 112-Madiso...		File Name		SR 374 w US 41A PM DHV Yr 2043 Existing.xus							
Project Description		Existing Condtions											

Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				207	1854	35	29	1415	845	21	21	44	1049	22	150

Signal Information																
Cycle, s	119.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	Yes	Simult. Gap E/W	On	Green	3.9	7.0	40.0	30.0	8.1	0.0						
				Yellow	4.0	4.0	4.0	4.0	4.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0						

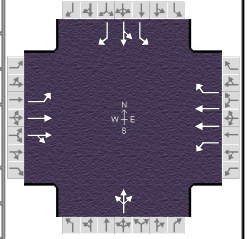
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor (f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor (f <sub>HVg</sub> )				0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984
Parking Activity Adjustment Factor (f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor (f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor (f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor (f <sub>LU</sub> )				1.000	1.000	1.000	1.000	0.952	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Left-Turn Adjustment Factor (f <sub>LT</sub> )				0.952	0.000		0.952	0.000		0.906	0.906		0.952	0.000	
Right-Turn Adjustment Factor (f <sub>RT</sub> )					0.993	0.993		0.000	0.847		0.000	0.000		0.000	0.847
Left-Turn Pedestrian Adjustment Factor (f <sub>LPb</sub> )				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor (f <sub>RPb</sub> )						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor (f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor (f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h				1781	3659	69	1810	3561	1585	420	420	880	1781	1900	1585
Proportion of Vehicles Arriving on Green (P)				0.14	0.45	0.45	0.03	0.34	0.34	0.07	0.07	0.07	0.25	0.25	0.25
Incremental Delay Factor (k)				0.27	0.50	0.50	0.04	0.50	0.50		0.04		0.50	0.04	0.04

Signal Timing / Movement Groups				EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R
Lost Time (t <sub>L</sub> )				6.0	6.0	6.0	6.0		6.0		4.0
Green Ratio (g/C)				0.14	0.45	0.03	0.34		0.07		0.25
Permitted Saturation Flow Rate (s <sub>p</sub> ), veh/h/ln				0	0	0	0		0		1781
Shared Saturation Flow Rate (s <sub>sh</sub> ), veh/h/ln											
Permitted Effective Green Time (g <sub>p</sub> ), s				0.0	0.0	0.0	0.0		0.0		0.0
Permitted Service Time (g <sub>u</sub> ), s				0.0	0.0	0.0	0.0		0.0		0.0
Permitted Queue Service Time (g <sub>ps</sub> ), s											
Time to First Blockage (g <sub>t</sub> ), s				0.0	0.0	0.0	0.0		0.0		0.0
Queue Service Time Before Blockage (g <sub>ts</sub> ), s											
Protected Right Saturation Flow (s <sub>R</sub> ), veh/h/ln							0				0
Protected Right Effective Green Time (g <sub>R</sub> ), s							0.0				0.0

Multimodal				EB			WB			NB			SB		
Pedestrian F <sub>w</sub> / F <sub>v</sub>				0.972	0.000	1.389	0.000	1.710	0.000	1.557	0.000	1.557	0.000	1.557	0.000
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.117	0.000	0.131	0.000	0.168	0.000	0.168	0.000	0.158	0.000	
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>															
Bicycle c <sub>b</sub> / d <sub>b</sub>				890.72	18.31	672.23	26.23		66.71	136.50	51.66	890.72	18.31	672.23	26.23
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	1.88	-3.64	2.05	-3.64	0.15	-3.64	2.19	-3.64	1.88	-3.64	2.19























































































































































































































































































































































































# HCS7 Signalized Intersection Results Graphical Summary

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043	Analysis Period	1 > 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2043 Existing.xus		
Project Description	Existing Conditions				

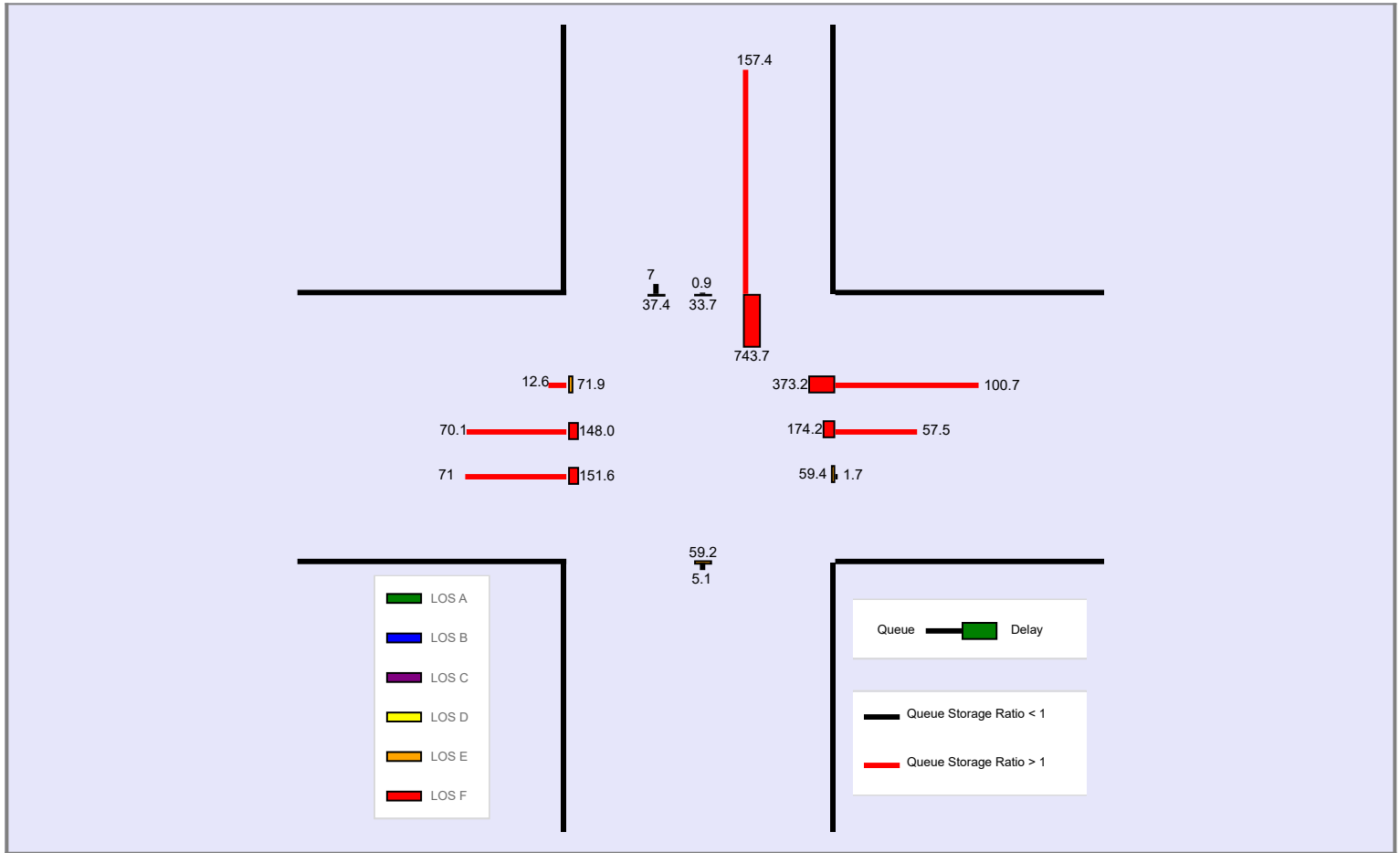


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	207	1854	35	29	1415	845	21	21	44	1049	22	150

Signal Information												
Cycle, s	119.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	3.9	7.0	40.0	30.0	8.1	0.0		
				Yellow	4.0	4.0	4.0	4.0	4.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	0.0		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 95 th percentile)	320.1	1780.8	1775.1	43.4	1459.3	2556.7		128.7		3997.4	23.4	178.9
Back of Queue ( Q ), veh/ln ( 95 th percentile)	12.6	70.1	71.0	1.7	57.5	100.7		5.1		157.4	0.9	7.0
Queue Storage Ratio ( RQ ) ( 95 th percentile)	1.14	1.78	1.80	0.22	1.46	12.17		0.64		4.00	0.09	0.65
Control Delay ( d ), s/veh	71.9	148.0	151.6	59.4	174.2	373.2		59.2		743.7	33.7	37.4
Level of Service (LOS)	E	F	F	E	F	F		E		F	C	D
Approach Delay, s/veh / LOS	142.1		F	246.2		F	59.2		E	644.2		F
Intersection Delay, s/veh / LOS	290.4						F					



### **--- Messages ---**

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

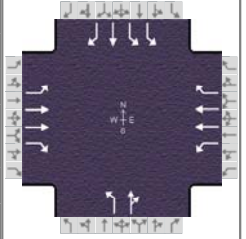
WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

WARNING: The shared-plus-exclusive turn lane solution is an approximation of the HCM method, because more than three lane groups cannot be accommodated. Input data for Percent Turns in Shared Lane are used to specify proportion of turning vehicles in the shared lane.

### **--- Comments ---**

# HCS7 Signalized Intersection Input Data

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2023 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL AM Peak				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	163	588	9	12	1138	911	9	25	13	463	11	92

Signal Information											
Cycle, s	98.5	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.2	54.4	10.0	5.9	0.0	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0	
				Red	2.0	2.0	0.0	2.0	0.0	0.0	

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	163	588	9	12	1138	911	9	25	13	463	11	92
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %	2	2	0	0	2	2	0	0		2	0	2
Ped / Bike / RTOR, /h	0	0	0	0	0	100	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	12.0
Turn Bay Length, ft	280	1500	0	200	1000	375	0	200		1000	275	275
Grade (P <sub>g</sub> ), %		0			0			0			0	
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

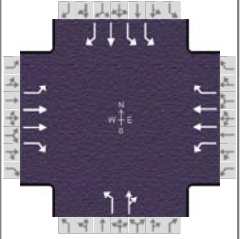
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	20.0	72.0		72.0		10.0	10.0	20.0
Yellow Change Interval (Y), s	4.0	4.0		4.0		4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s	2.0	2.0		2.0		2.0	0.0	2.0
Minimum Green ( G <sub>min</sub> ), s	6	6		6		6	6	6
Start-Up Lost Time ( lt ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0		2.0		2.0	2.0	2.0
Recall Mode	Off	Min		Min		Off	Off	Off
Dual Entry	No	Yes		Yes		Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2023 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL AM Peak				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	163	588	9	12	1138	911	9	25	13	463	11	92

## Signal Information

Cycle, s	98.5	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.2	54.4	10.0	5.9	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	2.0	2.0	0.0	2.0	0.0	0.0		

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8	7	4
Case Number	1.0	3.0		5.3		6.3	1.0	3.0
Phase Duration, s	12.2	72.6		60.4		11.9	14.0	25.9
Change Period, ( Y+R <sub>c</sub> ), s	6.0	6.0		6.0		6.0	4.0	6.0
Max Allow Headway ( MAH ), s	3.1	3.1		3.1		3.2	3.1	3.2
Queue Clearance Time ( g <sub>s</sub> ), s	6.0	9.0		44.7		4.2	12.0	6.9
Green Extension Time ( g <sub>e</sub> ), s	0.2	10.9		9.7		0.0	0.0	0.2
Phase Call Probability	0.99	1.00		1.00		0.99	1.00	1.00
Max Out Probability	0.00	0.01		0.17		0.06	1.00	0.00

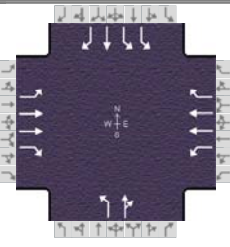












## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	177	639	10	13	1237	882	10	41		503	12	100
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1781	1781	1610	802	1781	1585	1425	1790		1730	1900	1585
Queue Service Time ( g <sub>s</sub> ), s	4.0	7.0	0.2	0.7	23.5	42.7	0.6	2.2		10.0	0.5	4.9
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	4.0	7.0	0.2	0.7	23.5	42.7	0.6	2.2		10.0	0.5	4.9
Green Ratio ( g/C )	0.64	0.68	0.68	0.55	0.55	0.65	0.06	0.06		0.18	0.20	0.26
Capacity ( c ), veh/h	326	2407	1088	516	1967	1037	159	108		601	384	420
Volume-to-Capacity Ratio ( X )	0.543	0.266	0.009	0.025	0.629	0.850	0.062	0.383		0.837	0.031	0.238
Back of Queue ( Q ), ft/ln ( 50 th percentile)	34.2	54.7	1.4	3	214.7	335.8	5.6	24.3		50.7	5.6	45.8
Back of Queue ( Q ), veh/ln ( 50 th percentile)	1.3	2.2	0.1	0.1	8.5	13.2	0.2	1.0		2.0	0.2	1.8
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.12	0.04	0.00	0.01	0.21	0.90	0.03	0.12		0.05	0.02	0.17
Uniform Delay ( d <sub>1</sub> ), s/veh	12.7	6.3	5.2	10.0	15.1	13.3	43.8	44.5		39.9	31.5	28.4
Incremental Delay ( d <sub>2</sub> ), s/veh	0.5	0.0	0.0	0.0	0.1	3.7	0.1	0.8		9.6	0.0	0.1
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay ( d ), s/veh	13.2	6.3	5.2	10.0	15.2	16.9	43.9	45.4		49.4	31.6	28.5
Level of Service ( LOS )	B	A	A	B	B	B	D	D		D	C	C
Approach Delay, s/veh / LOS	7.8		A	15.9		B	45.1		D	45.7		D
Intersection Delay, s/veh / LOS	19.5						B					

## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.86		B	2.25		B	2.60		C	2.45		B
Bicycle LOS Score / LOS	1.17		A	2.25		B	0.57		A	1.50		B

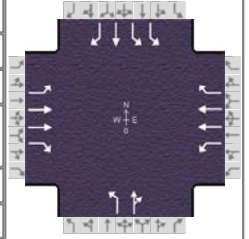
## HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information									
Agency		TRC Worldwide Engineering				Duration, h		0.250							
Analyst		MLT		Analysis Date		Mar 11, 2020		Area Type		Other					
Jurisdiction		Clarksville MPO		Time Period		DHV Morning Peak		PHF		0.92					
Urban Street		SR 374 (Richview Drive)		Analysis Year		2023		Analysis Period		1> 7:00					
Intersection		US 41A (SR 112-Madison Avenue)		File Name		SR 374 w US 41A AM DHV Yr 2023 Future 2 SBL 1 WBR 1 EBL AM Peak									
Project Description		Future 2 SBL 1 WBR 1 EBL AM Peak													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				163	588	9	12	1138	911	9	25	13	463	11	92
Signal Information															
Cycle, s	98.5	Reference Phase	2												
Offset, s	0	Reference Point	End	Green	6.2	54.4	10.0	5.9	0.0	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	0.0	2.0	0.0	0.0					
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( f <sub>HVg</sub> )				0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984
Parking Activity Adjustment Factor ( f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( f <sub>LU</sub> )				1.000	0.952	1.000	1.000	0.952	1.000	1.000	1.000	1.000	0.971	1.000	1.000
Left-Turn Adjustment Factor ( f <sub>LT</sub> )				0.952	0.000		0.422	0.000		0.750	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( f <sub>RT</sub> )					0.000	0.847		0.000	0.847		0.942	0.942		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( f <sub>LPB</sub> )				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( f <sub>RPB</sub> )						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate ( s ), veh/h				1781	3561	1610	802	3561	1585	1425	1177	612	3459	1900	1585
Proportion of Vehicles Arriving on Green ( P )				0.06	0.68	0.68	0.55	0.55	0.55	0.06	0.06	0.06	0.10	0.20	0.20
Incremental Delay Factor ( k )				0.04	0.04	0.04	0.04	0.04	0.19	0.04	0.04		0.35	0.04	0.04
Signal Timing / Movement Groups				EBL	EBT/R		WBL	WBT/R		NBL	NBT/R		SBL	SBT/R	
Lost Time ( t <sub>L</sub> )				6.0	6.0			6.0			6.0		4.0	6.0	
Green Ratio ( g/C )				0.64	0.68			0.55			0.06		0.18	0.20	
Permitted Saturation Flow Rate ( s <sub>p</sub> ), veh/h/ln				450	0			802			1425		1366	0	
Shared Saturation Flow Rate ( s <sub>sh</sub> ), veh/h/ln															
Permitted Effective Green Time ( g <sub>p</sub> ), s				56.4	0.0			54.4			5.9		7.9	0.0	
Permitted Service Time ( g <sub>u</sub> ), s				31.0	0.0			54.5			5.9		3.7	0.0	
Permitted Queue Service Time ( g <sub>ps</sub> ), s				16.5				0.7			0.6		3.7		
Time to First Blockage ( g <sub>t</sub> ), s				0.0	0.0			0.0			0.0		0.0	0.0	
Queue Service Time Before Blockage ( g <sub>ts</sub> ), s															
Protected Right Saturation Flow ( s <sub>R</sub> ), veh/h/ln					0			1585						1585	
Protected Right Effective Green Time ( g <sub>R</sub> ), s					0.0			10.0						6.2	
Multimodal				EB			WB			NB			SB		
Pedestrian F <sub>w</sub> / F <sub>v</sub>				1.198	0.000		1.557	0.000		1.710	0.142		1.710	0.000	
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.066		0.000	0.092		0.000	0.151		0.000	0.138	
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>															
Bicycle c <sub>b</sub> / d <sub>b</sub>				1351.68	5.18		1104.74	9.87		120.42	43.50		404.66	31.34	
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	0.68		-3.64	1.76		-3.64	0.08		-3.64	1.02	

# HCS7 Signalized Intersection Results Graphical Summary

## General Information





















Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2023 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL AM Peak				



## Demand Information

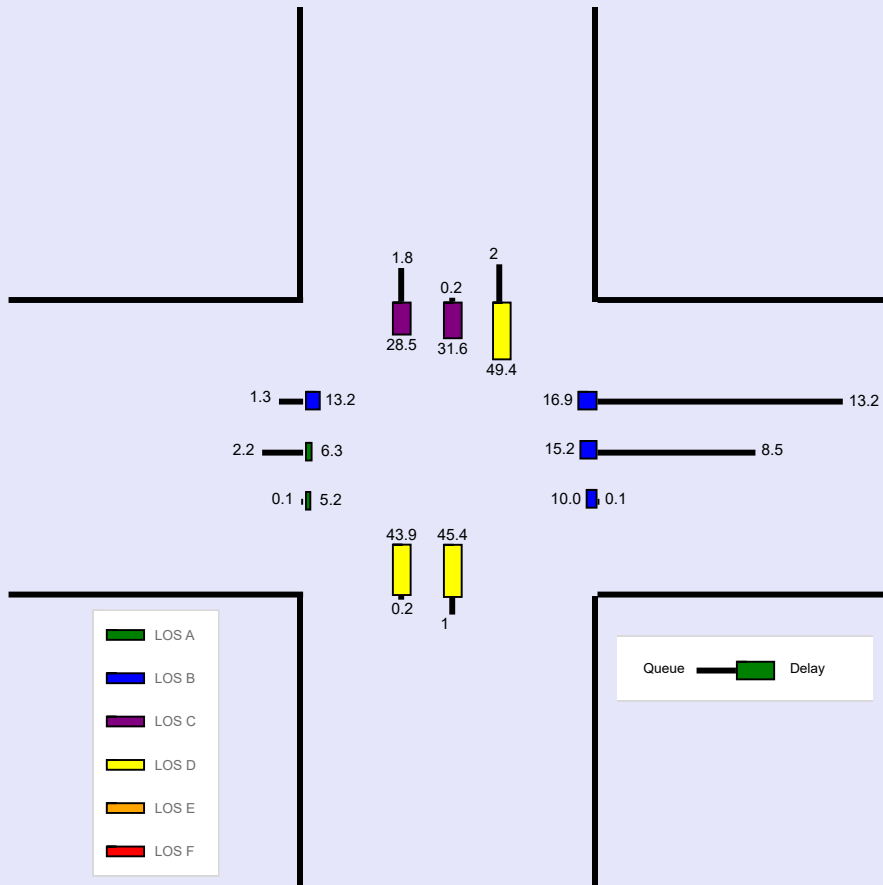
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	163	588	9	12	1138	911	9	25	13	463	11	92

## Signal Information

Cycle, s	98.5	Reference Phase	2											
Offset, s	0	Reference Point	End	Green	6.2	54.4	10.0	5.9	0.0	0.0				
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	0.0	2.0	0.0	0.0				

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	34.2	54.7	1.4	3	214.7	335.8	5.6	24.3		50.7	5.6	45.8
Back of Queue ( Q ), veh/ln ( 50 th percentile)	1.3	2.2	0.1	0.1	8.5	13.2	0.2	1.0		2.0	0.2	1.8
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.12	0.04	0.00	0.01	0.21	0.90	0.03	0.12		0.05	0.02	0.17
Control Delay ( d ), s/veh	13.2	6.3	5.2	10.0	15.2	16.9	43.9	45.4		49.4	31.6	28.5
Level of Service (LOS)	B	A	A	B	B	B	D	D		D	C	C
Approach Delay, s/veh / LOS	7.8	A		15.9	B		45.1	D		45.7	D	
Intersection Delay, s/veh / LOS	19.5						B					





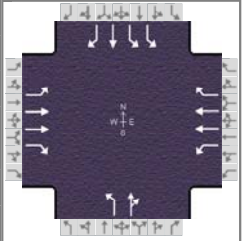
**--- Messages ---**

No errors or warnings exist.

**--- Comments ---**

# HCS7 Signalized Intersection Input Data

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2023 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL PM Peak				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	159	1545	27	22	1179	650	16	16	34	807	17	115

Signal Information												
Cycle, s	115.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	7.7	54.4	25.0	5.9	0.0	0.0		
				Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	0.0	2.0	0.0	0.0		


Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	159	1545	27	22	1179	650	16	16	34	807	17	115
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			0	L		None			R	0	
Heavy Vehicles (P <sub>HV</sub> ), %	2	2	0	0	2	2	0	0		2	0	2
Ped / Bike / RTOR, /h	0	0	0	0	0	120	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	12.0
Turn Bay Length, ft	280	1500	0	200	1000	375	0	200		1000	275	275
Grade (P <sub>g</sub> ), %	0			0			0			0		
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

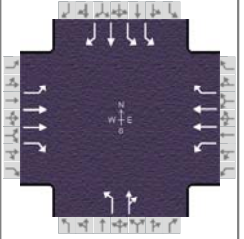
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	20.0	75.0		75.0		10.0	25.0	10.0
Yellow Change Interval (Y), s	4.0	4.0		4.0		4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s	2.0	2.0		2.0		2.0	0.0	2.0
Minimum Green ( G <sub>min</sub> ), s	6	6		6		6	6	6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0		2.0		2.0	2.0	2.0
Recall Mode	Off	Min		Min		Off	Off	Off
Dual Entry	No	Yes		Yes		Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2023 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL PM Peak				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	159	1545	27	22	1179	650	16	16	34	807	17	115

## Signal Information

Cycle, s	115.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8	7	4
Case Number	1.0	3.0		5.3		6.3	1.0	3.0
Phase Duration, s	13.7	74.1		60.4		11.9	29.0	40.9
Change Period, ( Y+R <sub>c</sub> ), s	6.0	6.0		6.0		6.0	4.0	6.0
Max Allow Headway ( MAH ), s	3.1	3.1		3.1		3.2	3.1	3.2
Queue Clearance Time ( g <sub>s</sub> ), s	7.5	43.8		38.0		5.6	27.0	8.9
Green Extension Time ( g <sub>e</sub> ), s	0.2	15.5		16.6		0.1	0.0	0.0
Phase Call Probability	1.00	1.00		1.00		1.00	1.00	1.00
Max Out Probability	0.00	0.33		0.26		0.34	1.00	1.00

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	173	1679	29	24	1282	576	17	54		877	18	125
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1781	1781	1610	299	1781	1585	1416	1693		1730	1900	1427
Queue Service Time ( g <sub>s</sub> ), s	5.5	41.8	0.9	7.7	34.0	20.3	1.4	3.6		25.0	0.8	6.9
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	5.5	41.8	0.9	36.0	34.0	20.3	1.4	3.6		25.0	0.8	6.9
Green Ratio ( g/C )	0.56	0.59	0.59	0.47	0.47	0.69	0.05	0.05		0.29	0.30	0.37
Capacity ( c ), veh/h	257	2108	953	131	1684	1095	135	87		931	577	528
Volume-to-Capacity Ratio ( X )	0.671	0.797	0.031	0.183	0.761	0.526	0.129	0.627		0.942	0.032	0.237
Back of Queue ( Q ), ft/ln ( 50 th percentile)	54.4	402.8	7.3	14.1	346.5	151.3	12	39.5		345.3	8.8	58.5
Back of Queue ( Q ), veh/ln ( 50 th percentile)	2.1	15.9	0.3	0.6	13.6	6.0	0.5	1.6		13.6	0.4	2.3
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.19	0.27	0.00	0.07	0.35	0.40	0.06	0.20		0.35	0.03	0.21
Uniform Delay ( d <sub>1</sub> ), s/veh	21.8	18.1	9.7	37.3	24.9	8.6	52.3	53.4		39.9	28.1	25.0
Incremental Delay ( d <sub>2</sub> ), s/veh	1.1	1.6	0.0	0.2	0.6	0.1	0.2	2.8		16.9	0.0	0.1
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay ( d ), s/veh	23.0	19.7	9.8	37.5	25.5	8.8	52.5	56.2		56.8	28.1	25.0
Level of Service ( LOS )	C	B	A	D	C	A	D	E		E	C	C
Approach Delay, s/veh / LOS	19.9		B	20.5		C	55.3		E	52.4		D
Intersection Delay, s/veh / LOS	27.5						C					

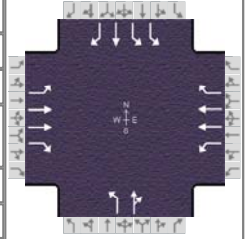
## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.89		B	2.27		B	2.64		C	2.44		B
Bicycle LOS Score / LOS	2.04		B	2.04		B	0.61		A	2.17		B

# HCS7 Signalized Intersection Intermediate Values

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2023 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL PM Peak				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	159	1545	27	22	1179	650	16	16	34	807	17	115

## Signal Information

Cycle, s	115.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	7.7	54.4	25.0	5.9	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	2.0	2.0	0.0	2.0	0.0	0.0		

## Saturation Flow / Delay

	L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( $f_w$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( $f_{HVg}$ )	0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984
Parking Activity Adjustment Factor ( $f_p$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.900
Bus Blockage Adjustment Factor ( $f_{bb}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( $f_a$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( $f_{LU}$ )	1.000	0.952	1.000	1.000	0.952	1.000	1.000	1.000	1.000	0.971	1.000	1.000
Left-Turn Adjustment Factor ( $f_{LT}$ )	0.952	0.000		0.157	0.000		0.745	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( $f_{RT}$ )		0.000	0.847		0.000	0.847		0.891	0.891		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( $f_{LPB}$ )	1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( $f_{RPB}$ )			1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( $f_{wz}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( $f_{DDI}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h	1781	3561	1610	299	3561	1585	1416	542	1151	3459	1900	1427
Proportion of Vehicles Arriving on Green (P)	0.07	0.59	0.59	0.47	0.47	0.47	0.05	0.05	0.05	0.22	0.30	0.30
Incremental Delay Factor (k)	0.04	0.24	0.04	0.04	0.09	0.04	0.04	0.04		0.45	0.04	0.04

## Signal Timing / Movement Groups

	EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R
Lost Time ( $t_L$ )	6.0	6.0		6.0		6.0	4.0	6.0
Green Ratio (g/C)	0.56	0.59		0.47		0.05	0.29	0.30
Permitted Saturation Flow Rate ( $s_p$ ), veh/h/ln	431	0		299		1416	1350	0
Shared Saturation Flow Rate ( $s_{sh}$ ), veh/h/ln								
Permitted Effective Green Time ( $g_p$ ), s	56.3	0.0		54.3		5.9	7.9	0.0
Permitted Service Time ( $g_u$ ), s	20.2	0.0		26.1		5.9	2.3	0.0
Permitted Queue Service Time ( $g_{ps}$ ), s	20.2			7.7		1.4	2.3	
Time to First Blockage ( $g_t$ ), s	0.0	0.0		0.0		0.0	0.0	0.0
Queue Service Time Before Blockage ( $g_{ts}$ ), s								
Protected Right Saturation Flow ( $s_R$ ), veh/h/ln		0		1585				1427
Protected Right Effective Green Time ( $g_R$ ), s		0.0		25.0				7.7

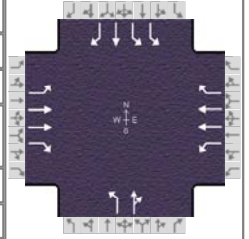
## Multimodal

	EB	WB	NB	SB
Pedestrian $F_w / F_v$	1.198	0.000	1.710	0.000
Pedestrian $F_s / F_{delay}$	0.000	0.091	0.000	0.133
Pedestrian $M_{corner} / M_{cw}$				
Bicycle $c_b / d_b$	1184.50	9.56	102.31	606.73
Bicycle $F_w / F_v$	-3.64	1.55	-3.64	1.68

# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2023 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL PM Peak				



## Demand Information

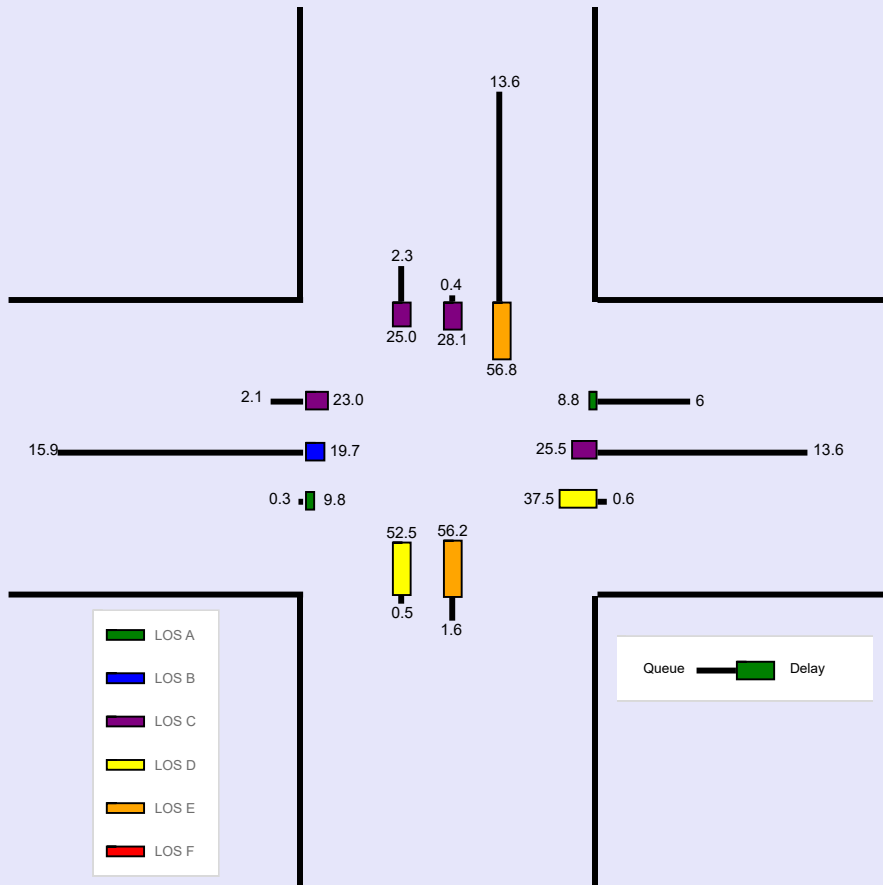
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	159	1545	27	22	1179	650	16	16	34	807	17	115

## Signal Information

Cycle, s	115.0	Reference Phase	2											
Offset, s	0	Reference Point	End	Green	7.7	54.4	25.0	5.9	0.0	0.0				
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	0.0	2.0	0.0	0.0				

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	54.4	402.8	7.3	14.1	346.5	151.3	12	39.5		345.3	8.8	58.5
Back of Queue ( Q ), veh/ln ( 50 th percentile)	2.1	15.9	0.3	0.6	13.6	6.0	0.5	1.6		13.6	0.4	2.3
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.19	0.27	0.00	0.07	0.35	0.40	0.06	0.20		0.35	0.03	0.21
Control Delay ( d ), s/veh	23.0	19.7	9.8	37.5	25.5	8.8	52.5	56.2		56.8	28.1	25.0
Level of Service (LOS)	C	B	A	D	C	A	D	E		E	C	C
Approach Delay, s/veh / LOS	19.9		B	20.5		C	55.3		E	52.4		D
Intersection Delay, s/veh / LOS	27.5						C					





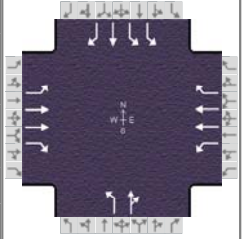
**--- Messages ---**

No errors or warnings exist.

**--- Comments ---**

# HCS7 Signalized Intersection Input Data

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2033 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL AM Peak				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	187	647	10	14	1252	1048	10	29	15	532	13	106

Signal Information												
Cycle, s	117.1	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	7.7	63.3	20.3	5.8	0.0	0.0		
				Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	2.0	0.0	2.0	0.0	0.0		

1		2		3		4					
5		6		7		8					

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	187	647	10	14	1252	1048	10	29	15	532	13	106
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %	2	2	0	0	2	2	0	0		2	0	2
Ped / Bike / RTOR, /h	0	0	0	0	0	120	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	12.0
Turn Bay Length, ft	280	1500	0	200	1000	375	0	200		1000	275	275
Grade (P <sub>g</sub> ), %		0			0			0			0	
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

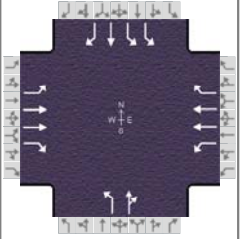
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	8.0	65.0		65.0		20.0	22.0	20.0
Yellow Change Interval (Y), s	4.0	4.0		4.0		4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s	0.0	2.0		2.0		2.0	0.0	2.0
Minimum Green ( G <sub>min</sub> ), s	6	6		6		6	6	6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0		2.0		2.0	2.0	2.0
Recall Mode	Off	Min		Min		Off	Off	Off
Dual Entry	No	Yes		Yes		Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2033 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL AM Peak				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	187	647	10	14	1252	1048	10	29	15	532	13	106

## Signal Information

Cycle, s	117.1	Reference Phase	2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8	7	4
Case Number	1.0	3.0		5.3		6.3	1.0	3.0
Phase Duration, s	11.7	81.0		69.3		11.8	24.3	36.1
Change Period, ( Y+R <sub>c</sub> ), s	4.0	6.0		6.0		6.0	4.0	6.0
Max Allow Headway ( MAH ), s	3.1	3.1		3.1		3.2	3.1	3.2
Queue Clearance Time ( g <sub>s</sub> ), s	7.7	12.4		60.6		5.1	19.9	8.2
Green Extension Time ( g <sub>e</sub> ), s	0.0	13.9		2.7		0.1	0.4	0.3
Phase Call Probability	1.00	1.00		1.00		1.00	1.00	1.00
Max Out Probability	1.00	0.07		0.93		0.00	1.00	0.00

## Movement Group Results

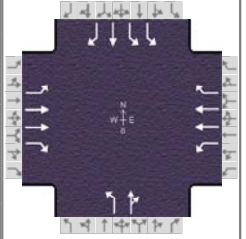
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	203	703	11	15	1361	1009	11	48		578	14	115
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1781	1781	1610	756	1781	1585	1422	1790		1730	1900	1585
Queue Service Time ( g <sub>s</sub> ), s	5.7	10.4	0.3	1.1	33.3	58.6	0.9	3.1		17.9	0.7	6.2
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	5.7	10.4	0.3	1.1	33.3	58.6	0.9	3.1		17.9	0.7	6.2
Green Ratio ( g/C )	0.62	0.64	0.64	0.54	0.54	0.71	0.05	0.05		0.24	0.26	0.32
Capacity ( c ), veh/h	281	2282	1032	470	1926	1132	132	88		785	488	511
Volume-to-Capacity Ratio ( X )	0.723	0.308	0.011	0.032	0.706	0.891	0.083	0.541		0.736	0.029	0.225
Back of Queue ( Q ), ft/ln ( 50 th percentile)	82.4	93	2.3	4.5	330.5	487.7	7.6	35		196	7.4	59.2
Back of Queue ( Q ), veh/ln ( 50 th percentile)	3.2	3.7	0.1	0.2	13.0	19.2	0.3	1.4		7.7	0.3	2.3
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.29	0.06	0.00	0.02	0.33	1.30	0.04	0.18		0.20	0.03	0.22
Uniform Delay ( d <sub>1</sub> ), s/veh	20.0	9.4	7.6	12.6	20.0	13.2	53.3	54.4		40.8	32.6	29.0
Incremental Delay ( d <sub>2</sub> ), s/veh	7.4	0.0	0.0	0.0	1.0	8.5	0.1	1.9		2.7	0.0	0.1
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay ( d ), s/veh	27.4	9.4	7.6	12.6	20.9	21.7	53.4	56.3		43.5	32.6	29.1
Level of Service ( LOS )	C	A	A	B	C	C	D	E		D	C	C
Approach Delay, s/veh / LOS	13.4		B	21.2		C	55.8		E	40.9		D
Intersection Delay, s/veh / LOS	23.4						C					

## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.88		B	2.26		B	2.64		C	2.45		B
Bicycle LOS Score / LOS	1.24		A	2.46		B	0.58		A	1.66		B





## HCS7 Signalized Intersection Intermediate Values

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2033 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL AM Peak				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	187	647	10	14	1252	1048	10	29	15	532	13	106

Signal Information												
Cycle, s	117.1	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	7.7	63.3	20.3	5.8	0.0	0.0		
				Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	2.0	0.0	2.0	0.0	0.0		

Saturation Flow / Delay	L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( $f_w$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( $f_{HVg}$ )	0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984
Parking Activity Adjustment Factor ( $f_p$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( $f_{bb}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( $f_a$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( $f_{LU}$ )	1.000	0.952	1.000	1.000	0.952	1.000	1.000	1.000	1.000	0.971	1.000	1.000
Left-Turn Adjustment Factor ( $f_{LT}$ )	0.952	0.000		0.398	0.000		0.748	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( $f_{RT}$ )		0.000	0.847		0.000	0.847		0.942	0.942		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( $f_{LPB}$ )	1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( $f_{RPB}$ )			1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( $f_{wz}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( $f_{DDI}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h	1781	3561	1610	756	3561	1585	1422	1180	610	3459	1900	1585
Proportion of Vehicles Arriving on Green (P)	0.07	0.64	0.64	0.54	0.54	0.54	0.05	0.05	0.05	0.17	0.26	0.26
Incremental Delay Factor (k)	0.23	0.04	0.04	0.04	0.21	0.38	0.04	0.04		0.22	0.04	0.04

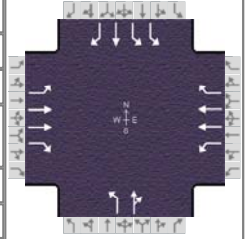
Signal Timing / Movement Groups	EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R
Lost Time ( $t_L$ )	4.0	6.0		6.0		6.0	4.0	6.0
Green Ratio (g/C)	0.62	0.64		0.54		0.05	0.24	0.26
Permitted Saturation Flow Rate ( $s_p$ ), veh/h/ln	400	0		756		1422	1358	0
Shared Saturation Flow Rate ( $s_{sh}$ ), veh/h/ln								
Permitted Effective Green Time ( $g_p$ ), s	65.4	0.0		63.4		5.8	7.8	0.0
Permitted Service Time ( $g_u$ ), s	30.1	0.0		63.4		5.8	2.7	0.0
Permitted Queue Service Time ( $g_{ps}$ ), s	30.1			1.1		0.9	1.4	
Time to First Blockage ( $g_t$ ), s	0.0	0.0		0.0		0.0	0.0	0.0
Queue Service Time Before Blockage ( $g_{ts}$ ), s								
Protected Right Saturation Flow ( $s_R$ ), veh/h/ln		0		1585				1585
Protected Right Effective Green Time ( $g_R$ ), s		0.0		20.3				7.7

Multimodal	EB		WB		NB		SB	
Pedestrian $F_w / F_v$	1.198	0.000	1.557	0.000	1.710	0.171	1.710	0.000
Pedestrian $F_s / F_{delay}$	0.000	0.081	0.000	0.101	0.000	0.159	0.000	0.139
Pedestrian $M_{corner} / M_{cw}$								
Bicycle $c_b / d_b$	1281.48	7.56	1081.92	12.34	98.83	52.91	513.55	32.34
Bicycle $F_w / F_v$	-3.64	0.76	-3.64	1.97	-3.64	0.10	-3.64	1.17

# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2033 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL AM Peak				



## Demand Information

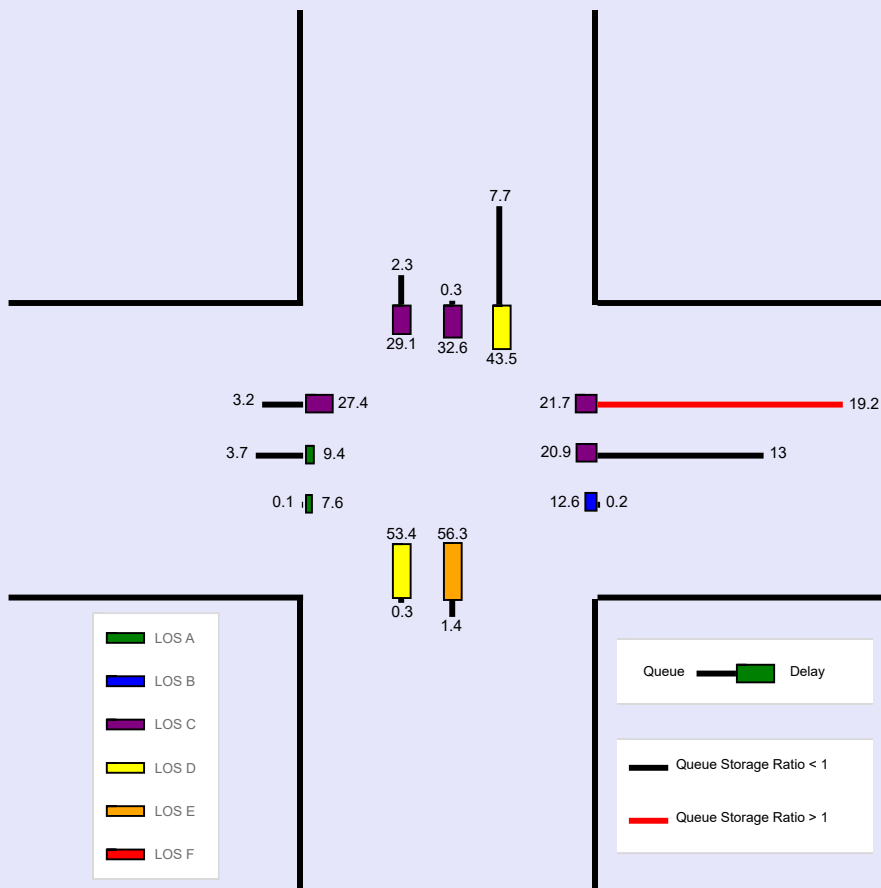
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	187	647	10	14	1252	1048	10	29	15	532	13	106

## Signal Information

Cycle, s	117.1	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	82.4	93	2.3	4.5	330.5	487.7	7.6	35		196	7.4	59.2
Back of Queue ( Q ), veh/ln ( 50 th percentile)	3.2	3.7	0.1	0.2	13.0	19.2	0.3	1.4		7.7	0.3	2.3
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.29	0.06	0.00	0.02	0.33	1.30	0.04	0.18		0.20	0.03	0.22
Control Delay ( d ), s/veh	27.4	9.4	7.6	12.6	20.9	21.7	53.4	56.3		43.5	32.6	29.1
Level of Service (LOS)	C	A	A	B	C	C	D	E		D	C	C
Approach Delay, s/veh / LOS	13.4		B	21.2		C	55.8		E	40.9		D
Intersection Delay, s/veh / LOS	23.4						C					





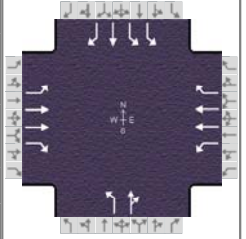
**--- Messages ---**

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

**--- Comments ---**

# HCS7 Signalized Intersection Input Data

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2033 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL PM Peak				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	183	1700	31	25	1297	748	18	19	39	928	20	132

Signal Information											
Cycle, s	148.3	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	10.7	70.0	40.0	7.6	0.0	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0	
				Red	0.0	2.0	0.0	2.0	0.0	0.0	

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	183	1700	31	25	1297	748	18	19	39	928	20	132
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			None			None			R		
Heavy Vehicles (P <sub>HV</sub> ), %	2	2	0	0	2	2	0	0		2	0	2
Ped / Bike / RTOR, /h	0	0	0	0	0	120	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	12.0
Turn Bay Length, ft	280	1500	0	200	1000	375	0	200		1000	275	275
Grade (P <sub>g</sub> ), %	0			0			0			0		
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

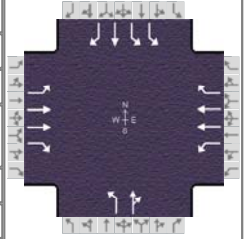
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	40.0	81.0		70.0		20.0	40.0	10.0
Yellow Change Interval (Y), s	4.0	4.0		4.0		4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s	0.0	2.0		2.0		2.0	0.0	2.0
Minimum Green ( G <sub>min</sub> ), s	6	6		6		6	6	6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0		2.0		2.0	2.0	2.0
Recall Mode	Off	Min		Min		Off	Off	Off
Dual Entry	No	Yes		Yes		Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2033 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL PM Peak				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	183	1700	31	25	1297	748	18	19	39	928	20	132

## Signal Information

Cycle, s	148.3	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	10.7	70.0	40.0	7.6	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	0.0	2.0	0.0	2.0	0.0	0.0		

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8	7	4
Case Number	1.0	3.0		5.3		6.3	1.0	3.0
Phase Duration, s	14.7	90.7		76.0		13.6	44.0	57.6
Change Period, ( $Y+R_c$ ), s	4.0	6.0		6.0		6.0	4.0	6.0
Max Allow Headway ( $MAH$ ), s	3.1	3.1		3.1		3.2	3.1	3.2
Queue Clearance Time ( $g_s$ ), s	10.3	70.6		71.5		7.4	42.0	11.6
Green Extension Time ( $g_e$ ), s	0.3	8.4		0.0		0.1	0.0	0.0
Phase Call Probability	1.00	1.00		1.00		1.00	1.00	1.00
Max Out Probability	0.00	0.82		1.00		0.00	1.00	1.00

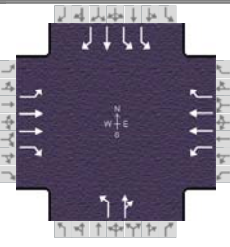
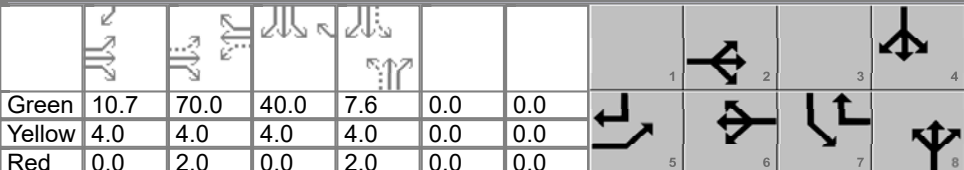
## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	199	1848	34	27	1410	683	20	63		1009	22	143
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1781	1781	1610	254	1781	1585	1412	1695		1730	1900	1427
Queue Service Time ( $g_s$ ), s	8.3	68.6	1.4	15.8	51.4	29.0	2.0	5.4		40.0	1.1	9.6
Cycle Queue Clearance Time ( $g_c$ ), s	8.3	68.6	1.4	69.5	51.4	29.0	2.0	5.4		40.0	1.1	9.6
Green Ratio ( $g/C$ )	0.56	0.57	0.57	0.47	0.47	0.74	0.05	0.05		0.33	0.35	0.42
Capacity ( $c$ ), veh/h	226	2035	920	76	1680	1175	121	87		1068	660	600
Volume-to-Capacity Ratio ( $X$ )	0.882	0.908	0.037	0.355	0.839	0.581	0.162	0.728		0.945	0.033	0.239
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	92.6	743.9	12.4	25.9	568.8	227	18	61.2		494.7	13	83.5
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	3.6	29.3	0.5	1.0	22.4	8.9	0.7	2.4		19.5	0.5	3.3
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.33	0.50	0.01	0.13	0.57	0.61	0.09	0.31		0.49	0.05	0.30
Uniform Delay ( $d_1$ ), s/veh	31.9	28.3	13.9	65.8	34.3	8.7	67.8	69.4		46.8	31.9	27.7
Incremental Delay ( $d_2$ ), s/veh	4.4	6.3	0.0	1.0	3.7	0.5	0.2	4.3		15.8	0.0	0.1
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	36.3	34.6	13.9	66.9	38.0	9.2	68.0	73.7		62.6	32.0	27.8
Level of Service (LOS)	D	C	B	E	D	A	E	E		E	C	C
Approach Delay, s/veh / LOS	34.4		C	29.1		C	72.4		E	57.8		E
Intersection Delay, s/veh / LOS	38.0						D					

## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.90		B	2.28		B	2.65		C	2.45		B
Bicycle LOS Score / LOS	2.20		B	2.24		B	0.62		A	2.42		B

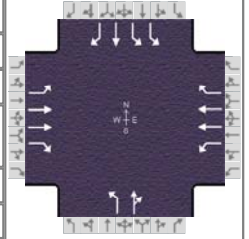
## HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information									
Agency		TRC Worldwide Engineering				Duration, h		0.250							
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other					
Jurisdiction		Clarksville MPO		Time Period		DHV Afternoon Peak		PHF		0.92					
Urban Street		SR 374 (Richview Drive)		Analysis Year		2033		Analysis Period		1> 7:00					
Intersection		US 41A (SR 112-Madison Avenue)		File Name		SR 374 w US 41A PM DHV Yr 2033 Future 2 SBL 1 WBR 1 EBL PM Peak									
Project Description		Future 2 SBL 1 WBR 1 EBL PM Peak													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				183	1700	31	25	1297	748	18	19	39	928	20	132
Signal Information															
Cycle, s	148.3	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	10.7	70.0	40.0	7.6	0.0	0.0					
				Yellow	4.0	4.0	4.0	4.0	0.0	0.0					
				Red	0.0	2.0	0.0	2.0	0.0	0.0					
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( f <sub>HVg</sub> )				0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984
Parking Activity Adjustment Factor ( f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.900
Bus Blockage Adjustment Factor ( f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( f <sub>LU</sub> )				1.000	0.952	1.000	1.000	0.952	1.000	1.000	1.000	1.000	0.971	1.000	1.000
Left-Turn Adjustment Factor ( f <sub>LT</sub> )				0.952	0.000		0.134	0.000		0.743	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( f <sub>RT</sub> )					0.000	0.847		0.000	0.847		0.892	0.892		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( f <sub>LPB</sub> )				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( f <sub>RPB</sub> )						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate ( s ), veh/h				1781	3561	1610	254	3561	1585	1412	555	1140	3459	1900	1427
Proportion of Vehicles Arriving on Green ( P )				0.07	0.57	0.57	0.47	0.47	0.47	0.05	0.05	0.05	0.27	0.35	0.35
Incremental Delay Factor ( k )				0.04	0.42	0.04	0.04	0.35	0.11	0.04	0.04		0.45	0.04	0.04
Signal Timing / Movement Groups				EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R				
Lost Time ( t <sub>L</sub> )				4.0	6.0		6.0		6.0	4.0	6.0				
Green Ratio ( g/C )				0.56	0.57		0.47		0.05	0.33	0.35				
Permitted Saturation Flow Rate ( s <sub>p</sub> ), veh/h/ln				382	0		254		1412	1339	0				
Shared Saturation Flow Rate ( s <sub>sh</sub> ), veh/h/ln															
Permitted Effective Green Time ( g <sub>p</sub> ), s				72.0	0.0		70.0		7.6	9.6	0.0				
Permitted Service Time ( g <sub>u</sub> ), s				18.3	0.0		16.3		7.6	2.1	0.0				
Permitted Queue Service Time ( g <sub>ps</sub> ), s				18.3			15.8		2.0	2.1					
Time to First Blockage ( g <sub>t</sub> ), s				0.0	0.0		0.0		0.0	0.0	0.0				
Queue Service Time Before Blockage ( g <sub>ts</sub> ), s															
Protected Right Saturation Flow ( s <sub>R</sub> ), veh/h/ln					0		1585								
Protected Right Effective Green Time ( g <sub>R</sub> ), s					0.0		40.0								
Multimodal				EB			WB			NB			SB		
Pedestrian F <sub>w</sub> / F <sub>v</sub>				1.198	0.000		1.557	0.000		1.710	0.171		1.710	0.000	
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.105		0.000	0.121		0.000	0.168		0.000	0.138	
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>															
Bicycle c <sub>b</sub> / d <sub>b</sub>				1142.68	13.63		943.94	20.68		102.14	66.78		695.46	31.55	
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	1.72		-3.64	1.75		-3.64	0.14		-3.64	1.94	

# HCS7 Signalized Intersection Results Graphical Summary

## General Information





















Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2033 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL PM Peak				



## Demand Information

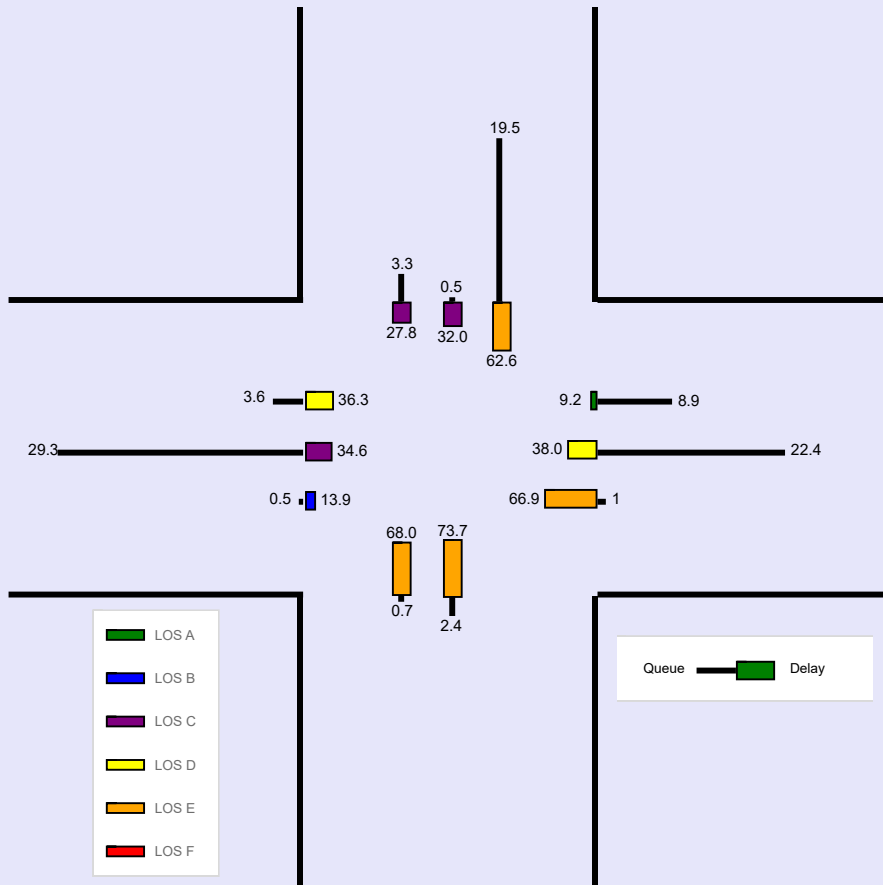
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	183	1700	31	25	1297	748	18	19	39	928	20	132

## Signal Information

Cycle, s	148.3	Reference Phase	2											
Offset, s	0	Reference Point	End	Green	10.7	70.0	40.0	7.6	0.0	0.0				
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	2.0	0.0	2.0	0.0	0.0				

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	92.6	743.9	12.4	25.9	568.8	227	18	61.2		494.7	13	83.5
Back of Queue ( Q ), veh/ln ( 50 th percentile)	3.6	29.3	0.5	1.0	22.4	8.9	0.7	2.4		19.5	0.5	3.3
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.33	0.50	0.01	0.13	0.57	0.61	0.09	0.31		0.49	0.05	0.30
Control Delay ( d ), s/veh	36.3	34.6	13.9	66.9	38.0	9.2	68.0	73.7		62.6	32.0	27.8
Level of Service (LOS)	D	C	B	E	D	A	E	E		E	C	C
Approach Delay, s/veh / LOS	34.4		C	29.1		C	72.4		E	57.8		E
Intersection Delay, s/veh / LOS	38.0						D					





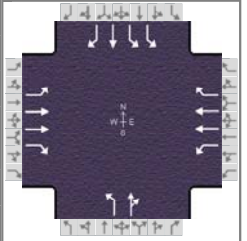
**--- Messages ---**

No errors or warnings exist.

**--- Comments ---**





































































































## HCS7 Signalized Intersection Input Data

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2043 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL AM Peak				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	212	706	12	16	1366	1184	12	33	17	602	14	120

Signal Information												
Cycle, s	185.2	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	11.0	111.6	34.9	7.6	0.0	0.0		
				Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	2.0	0.0	2.0	0.0	0.0		

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	212	706	12	16	1366	1184	12	33	17	602	14	120
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %	2	2	0	0	2	2	0	0		2	0	2
Ped / Bike / RTOR, /h	0	0	0	0	0	120	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	12.0
Turn Bay Length, ft	280	1500	0	200	1000	375	0	200		1000	275	275
Grade (P <sub>g</sub> ), %		0			0			0			0	
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

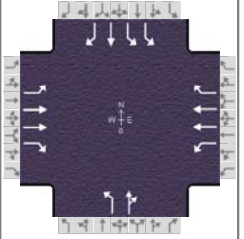
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	12.0	115.0		115.0		10.0	35.0	20.0
Yellow Change Interval (Y), s	4.0	4.0		4.0		4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s	0.0	2.0		2.0		2.0	0.0	2.0
Minimum Green ( G <sub>min</sub> ), s	6	6		6		6	6	6
Start-Up Lost Time ( lt ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0		2.0		2.0	2.0	2.0
Recall Mode	Off	Min		Min		Off	Off	Off
Dual Entry	No	Yes		Yes		Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2043 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL AM Peak				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	212	706	12	16	1366	1184	12	33	17	602	14	120

## Signal Information

Cycle, s	185.2	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8	7	4
Case Number	1.0	3.0		5.3		6.3	1.0	3.0
Phase Duration, s	15.0	132.7		117.6		13.6	38.9	52.5
Change Period, ( Y+R <sub>c</sub> ), s	4.0	6.0		6.0		6.0	4.0	6.0
Max Allow Headway ( MAH ), s	3.1	3.1		3.1		3.2	3.1	3.2
Queue Clearance Time ( g <sub>s</sub> ), s	11.0	18.1		106.3		7.6	34.8	13.4
Green Extension Time ( g <sub>e</sub> ), s	0.0	19.6		5.3		0.0	0.0	0.2
Phase Call Probability	1.00	1.00		1.00		1.00	1.00	1.00
Max Out Probability	1.00	0.03		0.81		1.00	1.00	0.04

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	230	767	13	17	1485	1157	13	54		654	15	130
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1781	1781	1610	712	1781	1585	1420	1790		1730	1900	1585
Queue Service Time ( g <sub>s</sub> ), s	9.0	16.1	0.5	1.9	52.6	104.3	1.6	5.6		32.8	1.1	11.4
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	9.0	16.1	0.5	2.9	52.6	104.3	1.7	5.6		32.8	1.1	11.4
Green Ratio ( g/C )	0.67	0.68	0.68	0.60	0.60	0.79	0.04	0.04		0.24	0.25	0.31
Capacity ( c ), veh/h	258	2436	1102	464	2147	1254	97	73		759	477	492
Volume-to-Capacity Ratio ( X )	0.892	0.315	0.012	0.037	0.691	0.922	0.134	0.740		0.862	0.032	0.265
Back of Queue ( Q ), ft/ln ( 50 th percentile)	215.2	160.5	4.3	7.8	558.7	897.6	15.3	70.7		391.6	13.5	116.3
Back of Queue ( Q ), veh/ln ( 50 th percentile)	8.5	6.3	0.2	0.3	22.0	35.3	0.6	2.8		15.4	0.5	4.6
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.77	0.11	0.00	0.04	0.56	2.39	0.08	0.35		0.39	0.05	0.42
Uniform Delay ( d <sub>1</sub> ), s/veh	31.7	11.8	9.3	15.4	25.0	14.9	85.9	87.8		66.1	52.4	47.9
Incremental Delay ( d <sub>2</sub> ), s/veh	27.4	0.0	0.0	0.0	0.7	10.7	0.2	12.3		9.5	0.0	0.1
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay ( d ), s/veh	59.1	11.8	9.3	15.4	25.8	25.6	86.2	100.1		75.7	52.4	48.1
Level of Service ( LOS )	E	B	A	B	C	C	F	F		E	D	D
Approach Delay, s/veh / LOS	22.5		C	25.6		C	97.4		F	70.7		E
Intersection Delay, s/veh / LOS	34.0						C					

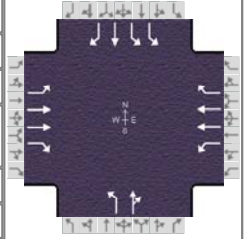
## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.89		B	2.26		B	2.66		C	2.47		B
Bicycle LOS Score / LOS	1.32		A	2.68		C	0.60		A	1.81		B

## HCS7 Signalized Intersection Intermediate Values

### General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41AAM DHV Yr 2043 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL AM Peak				



### Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	212	706	12	16	1366	1184	12	33	17	602	14	120

### Signal Information

Cycle, s	185.2	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	11.0	111.6	34.9	7.6	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	0.0	2.0	0.0	2.0	0.0	0.0		

### Saturation Flow / Delay

	L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( $f_w$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( $f_{HVg}$ )	0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984
Parking Activity Adjustment Factor ( $f_p$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( $f_{bb}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( $f_a$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( $f_{LU}$ )	1.000	0.952	1.000	1.000	0.952	1.000	1.000	1.000	1.000	0.971	1.000	1.000
Left-Turn Adjustment Factor ( $f_{LT}$ )	0.952	0.000		0.375	0.000		0.748	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( $f_{RT}$ )		0.000	0.847		0.000	0.847		0.942	0.942		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( $f_{LPB}$ )	1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( $f_{RPB}$ )			1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( $f_{wz}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( $f_{DDI}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h	1781	3561	1610	712	3561	1585	1420	1182	609	3459	1900	1585
Proportion of Vehicles Arriving on Green (P)	0.06	0.68	0.68	0.60	0.60	0.60	0.04	0.04	0.04	0.19	0.25	0.25
Incremental Delay Factor (k)	0.37	0.04	0.04	0.04	0.20	0.41	0.04	0.10		0.37	0.04	0.04

### Signal Timing / Movement Groups

	EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R
Lost Time ( $t_L$ )	4.0	6.0		6.0		6.0	4.0	6.0
Green Ratio ( $g/C$ )	0.67	0.68		0.60		0.04	0.24	0.25
Permitted Saturation Flow Rate ( $s_p$ ), veh/h/ln	355	0		712		1420	1350	0
Shared Saturation Flow Rate ( $s_{sh}$ ), veh/h/ln								
Permitted Effective Green Time ( $g_p$ ), s	113.7	0.0		111.7		7.6	9.6	0.0
Permitted Service Time ( $g_u$ ), s	59.1	0.0		110.7		7.6	2.0	0.0
Permitted Queue Service Time ( $g_{ps}$ ), s	59.1			1.9		1.6	2.0	
Time to First Blockage ( $g_t$ ), s	0.0	0.0		0.0		0.0	0.0	0.0
Queue Service Time Before Blockage ( $g_{ts}$ ), s								
Protected Right Saturation Flow ( $s_R$ ), veh/h/ln		0		1585				1585
Protected Right Effective Green Time ( $g_R$ ), s		0.0		34.9				11.0

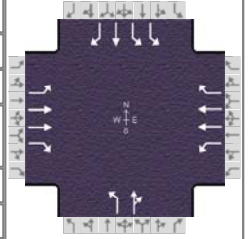
### Multimodal

	EB		WB		NB		SB	
Pedestrian $F_w / F_v$	1.198	0.000	1.557	0.000	1.710	0.171	1.710	0.000
Pedestrian $F_s / F_{delay}$	0.000	0.089	0.000	0.107	0.000	0.178	0.000	0.158
Pedestrian $M_{corner} / M_{cw}$								
Bicycle $c_b / d_b$	1368.38	9.23	1205.93	14.59	82.02	85.14	501.98	51.94
Bicycle $F_w / F_v$	-3.64	0.83	-3.64	2.19	-3.64	0.11	-3.64	1.32

# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A AM DHV Yr 2043 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL AM Peak				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	212	706	12	16	1366	1184	12	33	17	602	14	120

## Signal Information

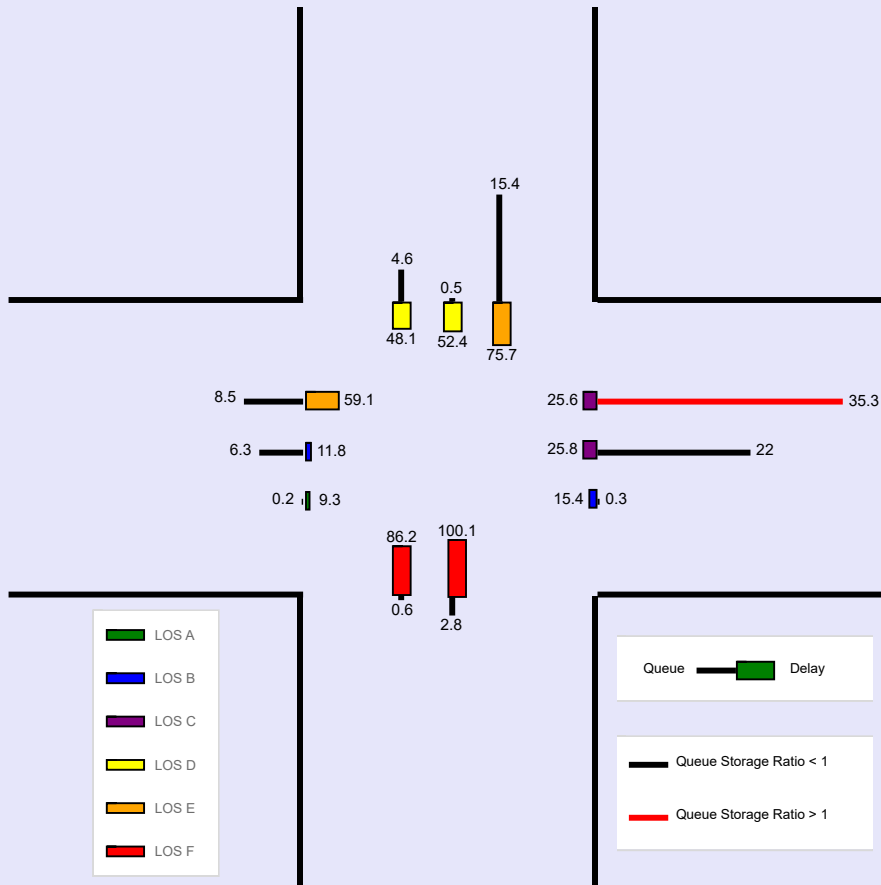
Cycle, s	185.2	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	11.0	111.6	34.9	7.6	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	0.0	2.0	0.0	2.0	0.0	0.0

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	215.2	160.5	4.3	7.8	558.7	897.6	15.3	70.7		391.6	13.5	116.3
Back of Queue ( Q ), veh/ln ( 50 th percentile)	8.5	6.3	0.2	0.3	22.0	35.3	0.6	2.8		15.4	0.5	4.6
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.77	0.11	0.00	0.04	0.56	2.39	0.08	0.35		0.39	0.05	0.42
Control Delay ( d ), s/veh	59.1	11.8	9.3	15.4	25.8	25.6	86.2	100.1		75.7	52.4	48.1
Level of Service (LOS)	E	B	A	B	C	C	F	F		E	D	D
Approach Delay, s/veh / LOS	22.5		C	25.6		C	97.4		F	70.7		E
Intersection Delay, s/veh / LOS	34.0						C					



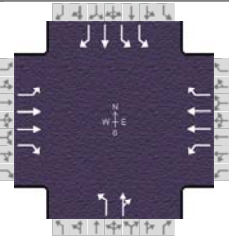


**--- Messages ---**

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

**--- Comments ---**

## HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering				Duration, h	0.250						
Analyst	MLT	Analysis Date	2/17/2020		Area Type	Other						
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak		PHF	0.92						
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043		Analysis Period	1 > 7:00						
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2043 Future 2 SBL...									
Project Description										Future 2 SBL 1 WBR 1 EBL PM Peak		

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	207	1854	35	29	1415	845	21	21	44	1049	22	150

Signal Information													
Cycle, s	177.2	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	20.4	70.0	57.4	9.4	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0			
				Red	0.0	2.0	0.0	2.0	0.0	0.0			

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	207	1854	35	29	1415	845	21	21	44	1049	22	150
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h		None			None			None			R	0
Heavy Vehicles (P <sub>HV</sub> ), %	2	2	0	0	2	2	0	0		2	0	2
Ped / Bike / RTOR, /h	0	0	0	0	0	120	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	12.0
Turn Bay Length, ft	280	1500	0	200	1050	375	0	200		1000	275	275
Grade (P <sub>g</sub> ), %		0			0			0			0	
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	40.0	85.0		70.0		15.0	62.0	15.0
Yellow Change Interval (Y), s	4.0	4.0		4.0		4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s	0.0	2.0		2.0		2.0	0.0	2.0
Minimum Green ( G <sub>min</sub> ), s	6	6		6		6	6	6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0		2.0		2.0	2.0	2.0
Recall Mode	Off	Off		Ped		Off	Off	Off
Dual Entry	No	Yes		Yes		Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

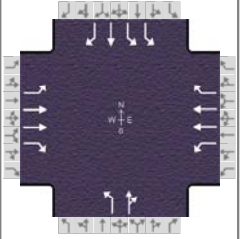
  

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2043 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL PM Peak				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	207	1854	35	29	1415	845	21	21	44	1049	22	150

## Signal Information

Cycle, s	177.2	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8	7	4
Case Number	1.0	3.0		5.3		6.3	1.0	3.0
Phase Duration, s	24.4	100.4		76.0		15.4	61.4	76.8
Change Period, ( Y+R <sub>c</sub> ), s	4.0	6.0		6.0		6.0	4.0	6.0
Max Allow Headway ( MAH ), s	3.1	3.1		3.1		3.2	3.1	3.2
Queue Clearance Time ( g <sub>s</sub> ), s	20.0	96.4		72.0		9.3	55.3	13.1
Green Extension Time ( g <sub>e</sub> ), s	0.4	0.0		0.0		0.1	2.0	0.1
Phase Call Probability	1.00	1.00		1.00		1.00	1.00	1.00
Max Out Probability	0.00	1.00		1.00		0.13	0.31	1.00

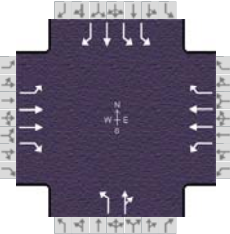
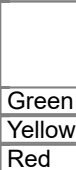
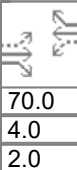
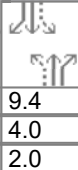
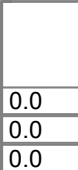



## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	225	2015	38	32	1538	788	23	71		1140	24	163
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1781	1781	1610	215	1781	1585	1409	1694		1730	1900	1427
Queue Service Time ( g <sub>s</sub> ), s	18.0	94.4	2.0	0.0	70.0	49.3	2.8	7.3		53.3	1.4	11.1
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	18.0	94.4	2.0	70.0	70.0	49.3	2.8	7.3		53.3	1.4	11.1
Green Ratio ( g/C )	0.52	0.53	0.53	0.39	0.39	0.72	0.05	0.05		0.39	0.40	0.51
Capacity ( c ), veh/h	246	1897	858	41	1406	1139	115	90		1233	759	734
Volume-to-Capacity Ratio ( X )	0.915	1.062	0.044	0.776	1.094	0.692	0.198	0.785		0.925	0.032	0.222
Back of Queue ( Q ), ft/ln ( 50 th percentile)	267	1279.4	19.2	52.4	1048	430.6	25.4	83.2		622.3	15.9	96.4
Back of Queue ( Q ), veh/ln ( 50 th percentile)	10.5	50.4	0.8	2.1	41.3	17.0	1.0	3.3		24.5	0.6	3.8
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.95	0.85	0.01	0.26	1.00	1.15	0.13	0.42		0.62	0.06	0.35
Uniform Delay ( d <sub>1</sub> ), s/veh	60.4	41.4	19.8	88.6	53.6	13.9	80.8	82.9		49.8	32.4	23.6
Incremental Delay ( d <sub>2</sub> ), s/veh	6.4	39.5	0.0	57.5	53.9	1.5	0.3	5.6		10.3	0.0	0.1
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay ( d ), s/veh	66.8	80.9	19.8	146.1	107.5	15.5	81.1	88.5		60.1	32.4	23.6
Level of Service ( LOS )	E	F	B	F	F	B	F	F		E	C	C
Approach Delay, s/veh / LOS	78.5		E	77.3		E	86.7		F	55.1		E
Intersection Delay, s/veh / LOS	73.0						E					

## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.92		B	2.30		B	2.66		C	2.45		B
Bicycle LOS Score / LOS	2.37		B	2.43		B	0.64		A	2.68		C

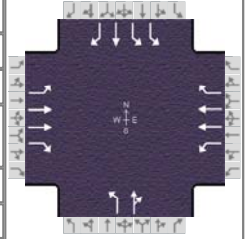
## HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information									
Agency	TRC Worldwide Engineering					Duration, h	0.250								
Analyst	MLT	Analysis Date	2/17/2020			Area Type	Other								
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak			PHF	0.92								
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043			Analysis Period	1> 7:00								
Intersection	US 41A (SR 112-Madison Ave)	File Name	SR 374 w US 41A PM DHV Yr 2043 Future 2 SBL...												
Project Description	Future 2 SBL 1 WBR 1 EBL PM Peak														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				207	1854	35	29	1415	845	21	21	44	1049	22	150
Signal Information															
Cycle, s	177.2	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	20.4	70.0	57.4	9.4	0.0	0.0					
				Yellow	4.0	4.0	4.0	4.0	0.0	0.0					
				Red	0.0	2.0	0.0	2.0	0.0	0.0					
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( f <sub>HVg</sub> )				0.984	0.984	1.000	1.000	0.984	0.984	1.000	1.000	1.000	0.984	1.000	0.984
Parking Activity Adjustment Factor ( f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.900
Bus Blockage Adjustment Factor ( f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( f <sub>LU</sub> )				1.000	0.952	1.000	1.000	0.952	1.000	1.000	1.000	1.000	0.971	1.000	1.000
Left-Turn Adjustment Factor ( f <sub>LT</sub> )				0.952	0.000		0.113	0.000		0.742	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( f <sub>RT</sub> )					0.000	0.847		0.000	0.847		0.891	0.891		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( f <sub>LPB</sub> )				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( f <sub>RPB</sub> )						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate ( s ), veh/h				1781	3561	1610	215	3561	1585	1409	547	1146	3459	1900	1427
Proportion of Vehicles Arriving on Green ( P )				0.12	0.53	0.53	0.39	0.39	0.39	0.05	0.05	0.05	0.32	0.40	0.40
Incremental Delay Factor ( k )				0.05	0.50	0.04	0.29	0.50	0.22	0.04	0.04		0.37	0.04	0.04
Signal Timing / Movement Groups				EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R				
Lost Time ( t <sub>L</sub> )				4.0	6.0		6.0		6.0	4.0	6.0				
Green Ratio ( g/C )				0.52	0.53		0.39		0.05	0.39	0.40				
Permitted Saturation Flow Rate ( s <sub>p</sub> ), veh/h/ln				337	0		215		1409	1330	0				
Shared Saturation Flow Rate ( s <sub>sh</sub> ), veh/h/ln															
Permitted Effective Green Time ( g <sub>p</sub> ), s				72.0	0.0		70.0		9.4	11.4	0.0				
Permitted Service Time ( g <sub>u</sub> ), s				0.0	0.0		0.0		9.4	2.1	0.0				
Permitted Queue Service Time ( g <sub>ps</sub> ), s				0.0			0.0		2.8	2.1					
Time to First Blockage ( g <sub>t</sub> ), s				0.0	0.0		0.0		0.0	0.0	0.0				
Queue Service Time Before Blockage ( g <sub>ts</sub> ), s															
Protected Right Saturation Flow ( s <sub>R</sub> ), veh/h/ln					0		1585					1427			
Protected Right Effective Green Time ( g <sub>R</sub> ), s					0.0		57.4					20.4			
Multimodal				EB			WB			NB			SB		
Pedestrian F <sub>w</sub> / F <sub>v</sub>				1.198	0.000		1.557	0.000		1.710	0.171		1.710	0.000	
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.119		0.000	0.140		0.000	0.175		0.000	0.139	
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>															
Bicycle c <sub>b</sub> / d <sub>b</sub>				1065.60	19.34		789.95	32.44		106.18	79.45		798.94	31.96	
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	1.88		-3.64	1.95		-3.64	0.15		-3.64	2.19	

# HCS7 Signalized Intersection Results Graphical Summary

## General Information





















Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Drive)	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	US 41A (SR 112-Madiso...	File Name	SR 374 w US 41A PM DHV Yr 2043 Future 2 SBL...		
Project Description	Future 2 SBL 1 WBR 1 EBL PM Peak				



## Demand Information

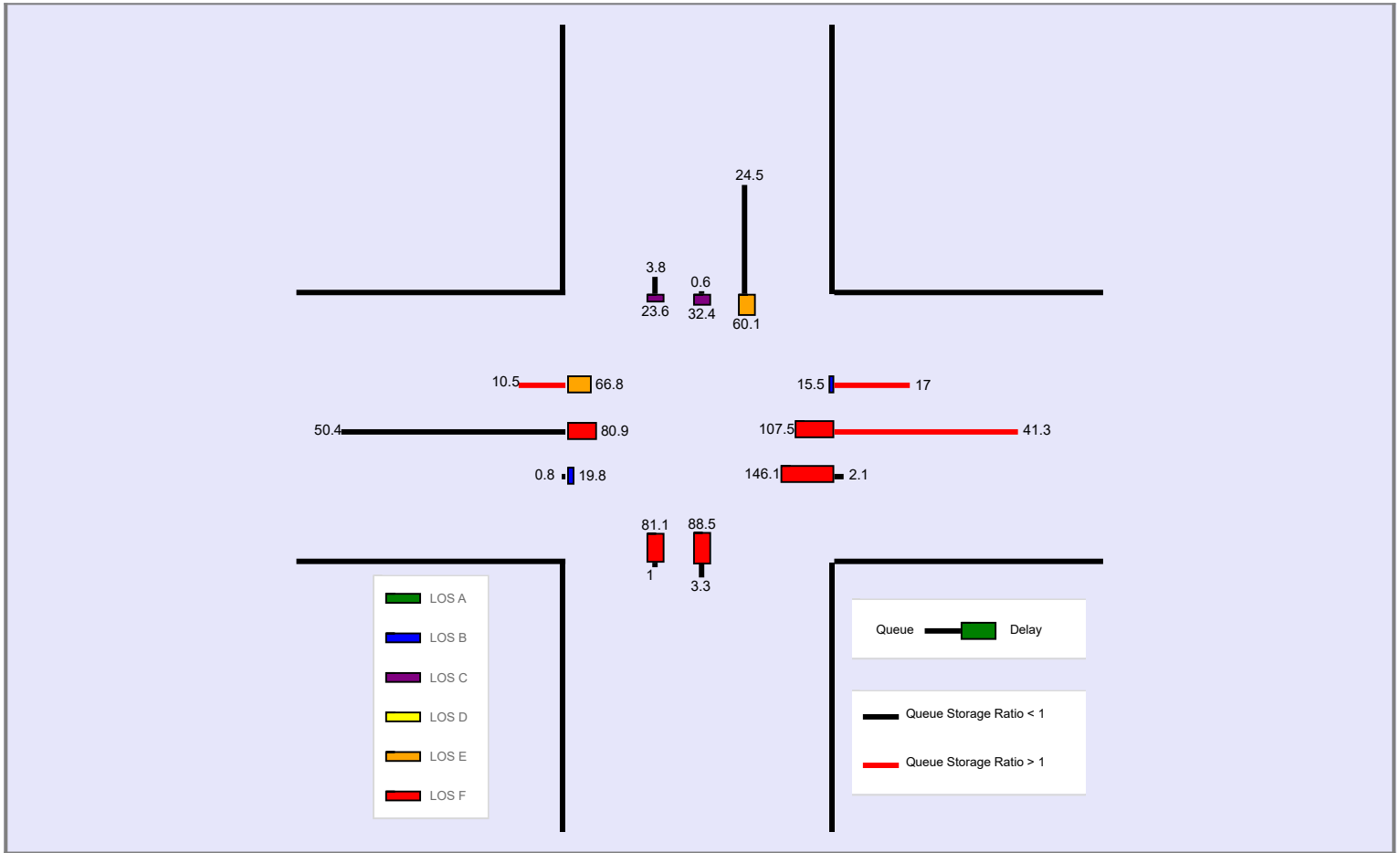
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	207	1854	35	29	1415	845	21	21	44	1049	22	150

## Signal Information

Cycle, s	177.2	Reference Phase	2											
Offset, s	0	Reference Point	End	Green	20.4	70.0	57.4	9.4	0.0	0.0				
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	2.0	0.0	2.0	0.0	0.0				

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	267	1279.4	19.2	52.4	1048	430.6	25.4	83.2		622.3	15.9	96.4
Back of Queue ( Q ), veh/ln ( 50 th percentile)	10.5	50.4	0.8	2.1	41.3	17.0	1.0	3.3		24.5	0.6	3.8
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.95	0.85	0.01	0.26	1.00	1.15	0.13	0.42		0.62	0.06	0.35
Control Delay ( d ), s/veh	66.8	80.9	19.8	146.1	107.5	15.5	81.1	88.5		60.1	32.4	23.6
Level of Service (LOS)	E	F	B	F	F	B	F	F		E	C	C
Approach Delay, s/veh / LOS	78.5		E	77.3		E	86.7		F	55.1		E
Intersection Delay, s/veh / LOS	73.0						E					



**--- Messages ---**

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

**--- Comments ---**

# HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering, Inc.				Duration, h	0.250						
Analyst	MLT	Analysis Date	2/17/2020		Area Type	Other						
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak		PHF	0.92						
Urban Street	SR 374 (Richview Dr./W...	Analysis Year	2023		Analysis Period	1> 7:00						
Intersection	Memorial Dr.	File Name	SR 374 w Memorial Dr AM DHV Yr 2023 Existing....									
Project Description	Existing Conditions											

Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				471	125	136	120	264	311	164	510	92	182	333	428

Signal Information														
Cycle, s	136.4	Reference Phase	2	Green	11.6	0.9	50.0	9.7	4.3	30.0	1	2	3	4
Offset, s	0	Reference Point	End	Yellow	4.0	0.0	4.0	4.0	4.0	4.0	5	6	7	8
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.0	0.0	2.0	2.0	2.0	2.0				
Force Mode	Fixed	Simult. Gap N/S	On											

Traffic Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				471	125	136	120	264	311	164	510	92	182	333	428
Initial Queue (Q <sub>b</sub> ), veh/h				0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h				1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h					None			None			None			None	
Heavy Vehicles (P <sub>HV</sub> ), %				2	2		2	2		2	2		2	0	
Ped / Bike / RTOR, /h				0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h				0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)				3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft				12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Turn Bay Length, ft				375	1000		1000	160		325	1000		430	1000	
Grade (Pg), %					0			0			0			0	
Speed Limit, mi/h				40	40	40	40	40	40	40	40	40	40	40	40

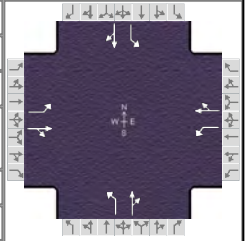
Phase Information		EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s		20.0	30.0	20.0	30.0	20.0	50.0	20.0	50.0
Yellow Change Interval (Y), s		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Green ( G <sub>min</sub> ), s		6	6	6	6	6	6	6	6
Start-Up Lost Time ( lt), s		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode		Off	Ped	Off	Off	Off	Min	Off	Min
Dual Entry		No	Yes	No	Yes	No	Yes	No	Yes
Walk (Walk), s			0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s			0.0		0.0		0.0		0.0

Multimodal Information				EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft				9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb				0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft				12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking				No		0.50	No		0.50	No		0.50	No		0.50














# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TRC Worldwide Engineering, Inc.			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Dr./W...	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	Memorial Dr.	File Name	SR 374 w Memorial Dr AM DHV Yr 2023 Existing....		
Project Description	Existing Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	471	125	136	120	264	311	164	510	92	182	333	428

Signal Information												
Cycle, s	136.4	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	11.6	0.9	50.0	9.7	4.3	30.0		
				Yellow	4.0	0.0	4.0	4.0	4.0	4.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	0.0	2.0	2.0	2.0	2.0		

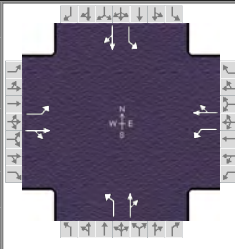
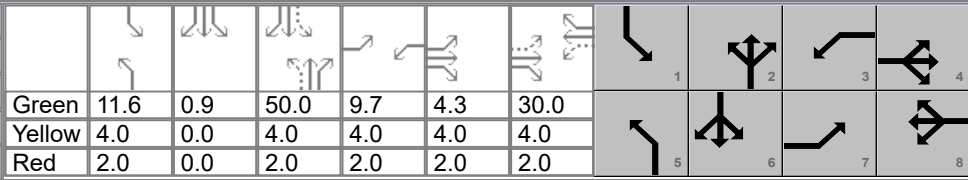
												
1	2	3	4	5	6	7	8	9	10	11	12	13

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	4.0
Phase Duration, s	26.0	46.3	15.7	36.0	17.6	56.0	18.4	56.9
Change Period, ( $Y+R_c$ ), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway ( $MAH$ ), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time ( $g_s$ ), s	22.0	21.1	9.6	32.0	11.4	50.5	12.2	52.9
Green Extension Time ( $g_e$ ), s	0.0	1.6	0.1	0.0	0.2	0.0	0.2	0.0
Phase Call Probability	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	0.13	0.00	1.00	0.00	1.00	0.01	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( $v$ ), veh/h	512	284		130	625		178	654		198	827	
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1781	1710		1781	1704		1781	1820		1781	1725	
Queue Service Time ( $g_s$ ), s	20.0	19.1		7.6	30.0		9.4	48.5		10.2	50.9	
Cycle Queue Clearance Time ( $g_c$ ), s	20.0	19.1		7.6	30.0		9.4	48.5		10.2	50.9	
Green Ratio ( $g/C$ )	0.38	0.30		0.29	0.22		0.45	0.37		0.46	0.37	
Capacity ( $c$ ), veh/h	314	505		333	375		204	667		224	643	
Volume-to-Capacity Ratio ( $X$ )	1.631	0.562		0.391	1.668		0.875	0.981		0.885	1.286	
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	854.4	204.9		84.7	1144.9		102.8	677.1		119.2	1149.9	
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	33.6	8.1		3.3	45.1		4.0	26.7		4.7	46.0	
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	2.28	0.20		0.08	7.16		0.32	0.68		0.28	1.15	
Uniform Delay ( $d_1$ ), s/veh	42.3	40.6		37.5	53.2		37.9	42.7		36.5	42.8	
Incremental Delay ( $d_2$ ), s/veh	298.1	0.9		0.3	312.0		10.6	29.9		14.1	140.2	
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay ( $d$ ), s/veh	340.4	41.5		37.8	365.2		48.5	72.6		50.6	183.0	
Level of Service (LOS)	F	D		D	F		D	E		D	F	
Approach Delay, s/veh / LOS	233.8	F		308.7	F		67.5	E		157.5	F	
Intersection Delay, s/veh / LOS	186.8						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	1.95	B	1.93	B	1.93	B
Bicycle LOS Score / LOS	1.80	B	1.73	B	1.86	B	2.18	B

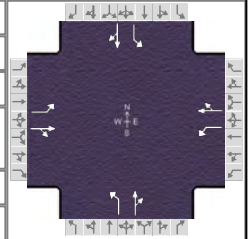
# HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information									
Agency		TRC Worldwide Engineering, Inc.				Duration, h		0.250							
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other					
Jurisdiction		Clarksville MPO		Time Period		DHV Morning Peak		PHF		0.92					
Urban Street		SR 374 (Richview Dr./W...		Analysis Year		2023		Analysis Period		1> 7:00					
Intersection		Memorial Dr.		File Name		SR 374 w Memorial Dr AM DHV Yr 2023 Existing....									
Project Description		Existing Conditions													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				471	125	136	120	264	311	164	510	92	182	333	428
Signal Information															
Cycle, s	136.4	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	11.6	0.9	50.0	9.7	4.3	30.0					
				Yellow	4.0	0.0	4.0	4.0	4.0	4.0					
				Red	2.0	0.0	2.0	2.0	2.0	2.0					
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( f <sub>HVg</sub> )				0.984	0.984	1.000	0.984	0.984	1.000	0.984	0.984	1.000	0.984	1.000	1.000
Parking Activity Adjustment Factor ( f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( f <sub>LU</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Left-Turn Adjustment Factor ( f <sub>LT</sub> )				0.952	0.000		0.952	0.000		0.952	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( f <sub>RT</sub> )					0.914	0.914		0.911	0.911		0.973	0.973		0.908	0.908
Left-Turn Pedestrian Adjustment Factor ( f <sub>LPb</sub> )				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( f <sub>RPb</sub> )						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate ( s ), veh/h				1781	819	891	1781	783	922	1781	1542	278	1781	755	970
Proportion of Vehicles Arriving on Green ( P )				0.15	0.30	0.30	0.07	0.22	0.22	0.08	0.37	0.37	0.09	0.37	0.37
Incremental Delay Factor ( k )				0.50	0.10		0.04	0.50		0.10	0.48		0.14	0.50	
Signal Timing / Movement Groups				EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R				
Lost Time ( t <sub>L</sub> )				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Green Ratio ( g/C )				0.38	0.30	0.29	0.22	0.45	0.37	0.46	0.37				
Permitted Saturation Flow Rate ( s <sub>p</sub> ), veh/h/ln				800	0	1095	0	663	0	778	0				
Shared Saturation Flow Rate ( s <sub>sh</sub> ), veh/h/ln															
Permitted Effective Green Time ( g <sub>p</sub> ), s				32.0	0.0	30.0	0.0	50.0	0.0	50.0	0.0				
Permitted Service Time ( g <sub>u</sub> ), s				0.0	0.0	19.1	0.0	0.0	0.0	1.5	0.0				
Permitted Queue Service Time ( g <sub>ps</sub> ), s				0.0		1.5		0.0		1.5					
Time to First Blockage ( g <sub>t</sub> ), s				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Queue Service Time Before Blockage ( g <sub>ts</sub> ), s															
Protected Right Saturation Flow ( s <sub>R</sub> ), veh/h/ln															
Protected Right Effective Green Time ( g <sub>R</sub> ), s															
Multimodal				EB		WB		NB		SB					
Pedestrian F <sub>w</sub> / F <sub>v</sub>				1.198	0.000	1.198	0.000	1.198	0.000	1.198	0.000				
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.141	0.000	0.149	0.000	0.133	0.000	0.132				
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>															
Bicycle c <sub>b</sub> / d <sub>b</sub>				590.64	33.87	439.79	41.51	732.99	27.38	745.57	26.84				
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	1.31	-3.64	1.25	-3.64	1.37	-3.64	1.69				

# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering, Inc.			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Dr./W...	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	Memorial Dr.	File Name	SR 374 w Memorial Dr AM DHV Yr 2023 Existing....		
Project Description	Existing Conditions				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	471	125	136	120	264	311	164	510	92	182	333	428

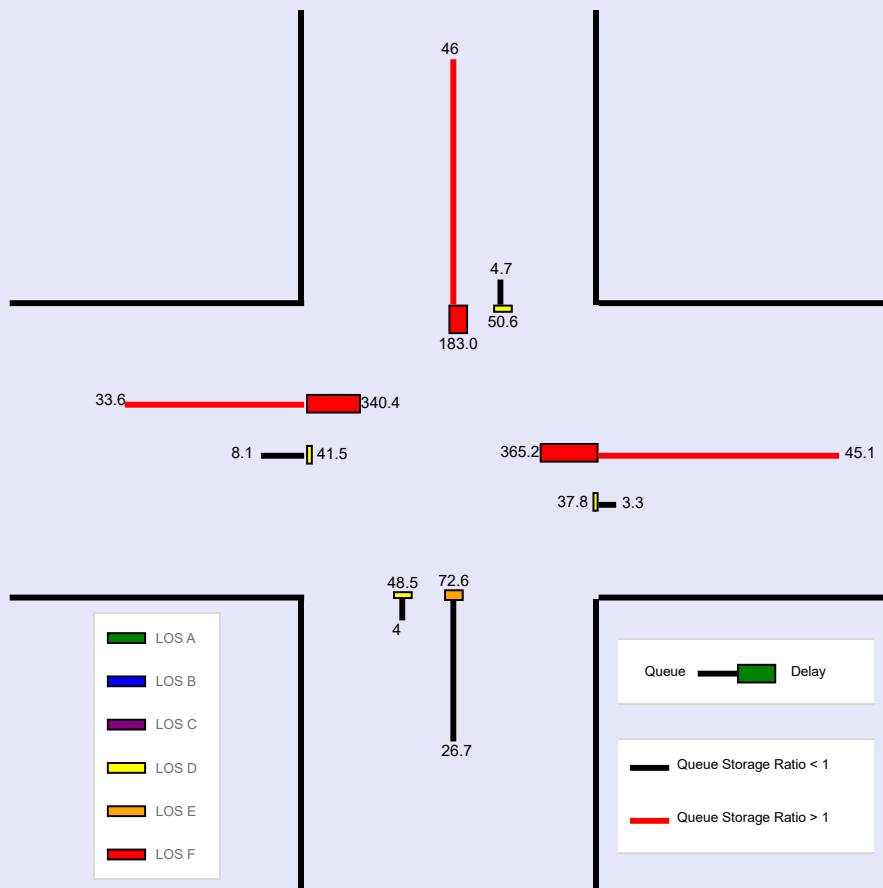
## Signal Information

Cycle, s	136.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

	Green	Yellow	Red
EB	11.6	4.0	2.0
WB	0.9	0.0	0.0
NB	50.0	4.0	2.0
SB	9.7	4.0	2.0
EB	4.3	4.0	2.0
WB	30.0	4.0	2.0
NB	1	2	3
SB	4	6	7

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	854.4	204.9		84.7	1144.9		102.8	677.1		119.2	1149.9	
Back of Queue ( Q ), veh/ln ( 50 th percentile)	33.6	8.1		3.3	45.1		4.0	26.7		4.7	46.0	
Queue Storage Ratio ( RQ ) ( 50 th percentile)	2.28	0.20		0.08	7.16		0.32	0.68		0.28	1.15	
Control Delay ( d ), s/veh	340.4	41.5		37.8	365.2		48.5	72.6		50.6	183.0	
Level of Service (LOS)	F	D		D	F		D	E		D	F	
Approach Delay, s/veh / LOS	233.8	F		308.7	F		67.5	E		157.5	F	
Intersection Delay, s/veh / LOS	186.8						F					





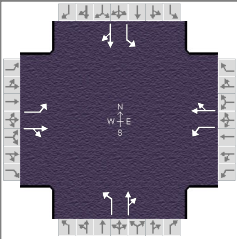
**--- Messages ---**

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

**--- Comments ---**

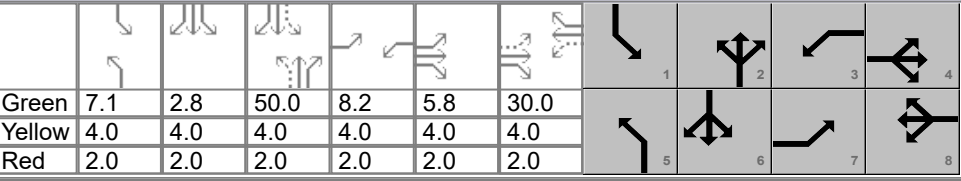
# HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering, Inc.				Duration, h	0.250						
Analyst	MLT	Analysis Date	2/17/2020		Area Type	Other						
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak		PHF	0.92						
Urban Street	SR 374 (Richview Dr./W...	Analysis Year	2023		Analysis Period	1> 7:00						
Intersection	Memorial Dr.	File Name	SR 374 w Memorial Dr PM DHV Yr 2023 Existing....									
Project Description	Existing Conditions											

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	568	183	97	95	204	212	96	636	68	212	675	618

Signal Information																						
Cycle, s	139.9	Reference Phase	2	Green	7.1	2.8	50.0	8.2	5.8	30.0	Yellow	4.0	4.0	4.0	4.0	4.0	Red	2.0	2.0	2.0	2.0	2.0
Offset, s	0	Reference Point	End	Uncoordinated	Yes	Simult. Gap E/W	On	Force Mode	Fixed	Simult. Gap N/S	On											

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	568	183	97	95	204	212	96	636	68	212	675	618
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %	2	2		2	2		2	2		2	0	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Turn Bay Length, ft	375	1000		1000	160		325	1000		430	1000	
Grade (Pg), %	0			0			0			0		
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

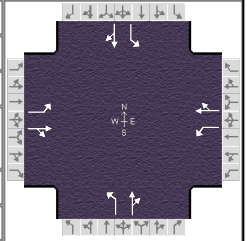
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	20.0	30.0	20.0	30.0	20.0	50.0	20.0	50.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Green ( G <sub>min</sub> ), s	6	6	6	6	6	6	6	6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Off	Ped	Off	Off	Off	Min	Off	Min
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TRC Worldwide Engineering, Inc.			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Dr./W...	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	Memorial Dr.	File Name	SR 374 w Memorial Dr PM DHV Yr 2023 Existing....		
Project Description	Existing Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	568	183	97	95	204	212	96	636	68	212	675	618

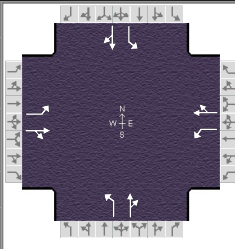
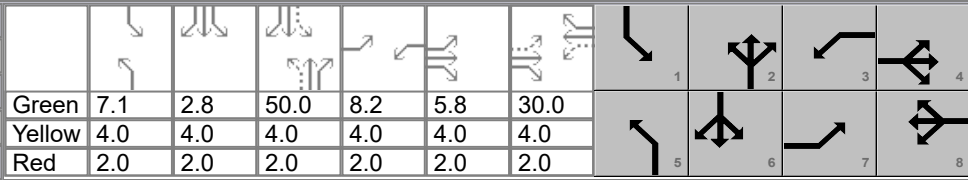
Signal Information											
Cycle, s	139.9	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	7.1	2.8	50.0	8.2	5.8	30.0	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	4.0	4.0	
				Red	2.0	2.0	2.0	2.0	2.0	2.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	4.0
Phase Duration, s	26.0	47.8	14.2	36.0	13.1	56.0	21.9	64.8
Change Period, ( $Y+R_c$ ), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway ( $MAH$ ), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time ( $g_s$ ), s	22.0	22.5	8.3	32.0	7.2	52.0	15.8	60.8
Green Extension Time ( $g_e$ ), s	0.0	1.1	0.1	0.0	0.1	0.0	0.2	0.0
Phase Call Probability	1.00	1.00	0.98	1.00	0.98	1.00	1.00	1.00
Max Out Probability	1.00	0.15	0.00	1.00	0.00	1.00	0.33	1.00

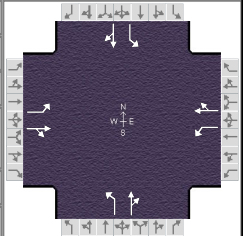
































Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( $v$ ), veh/h	617	304		103	452		104	765		230	1405	
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1781	1761		1781	1713		1781	1838		1781	1749	
Queue Service Time ( $g_s$ ), s	20.0	20.5		6.3	30.0		5.2	50.0		13.8	58.8	
Cycle Queue Clearance Time ( $g_c$ ), s	20.0	20.5		6.3	30.0		5.2	50.0		13.8	58.8	
Green Ratio ( $g/C$ )	0.37	0.30		0.27	0.21		0.41	0.36		0.49	0.42	
Capacity ( $c$ ), veh/h	306	526		304	367		142	657		254	735	
Volume-to-Capacity Ratio ( $X$ )	2.017	0.579		0.340	1.231		0.733	1.165		0.906	1.912	
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	1210.7	227.5		69.9	648.4		58	979.6		154.2	2729.1	
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	47.7	9.0		2.8	25.5		2.3	38.6		6.1	109.2	
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	3.23	0.23		0.07	4.05		0.18	0.98		0.36	2.73	
Uniform Delay ( $d_1$ ), s/veh	43.5	41.6		39.7	55.0		35.0	45.0		43.4	40.6	
Incremental Delay ( $d_2$ ), s/veh	469.2	1.1		0.2	125.6		2.7	90.2		23.8	415.4	
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay ( $d$ ), s/veh	512.8	42.7		40.0	180.6		37.7	135.2		67.2	456.0	
Level of Service (LOS)	F	D		D	F		D	F		E	F	
Approach Delay, s/veh / LOS	357.5	F		154.5	F		123.5	F		401.2	F	
Intersection Delay, s/veh / LOS	296.0						F					

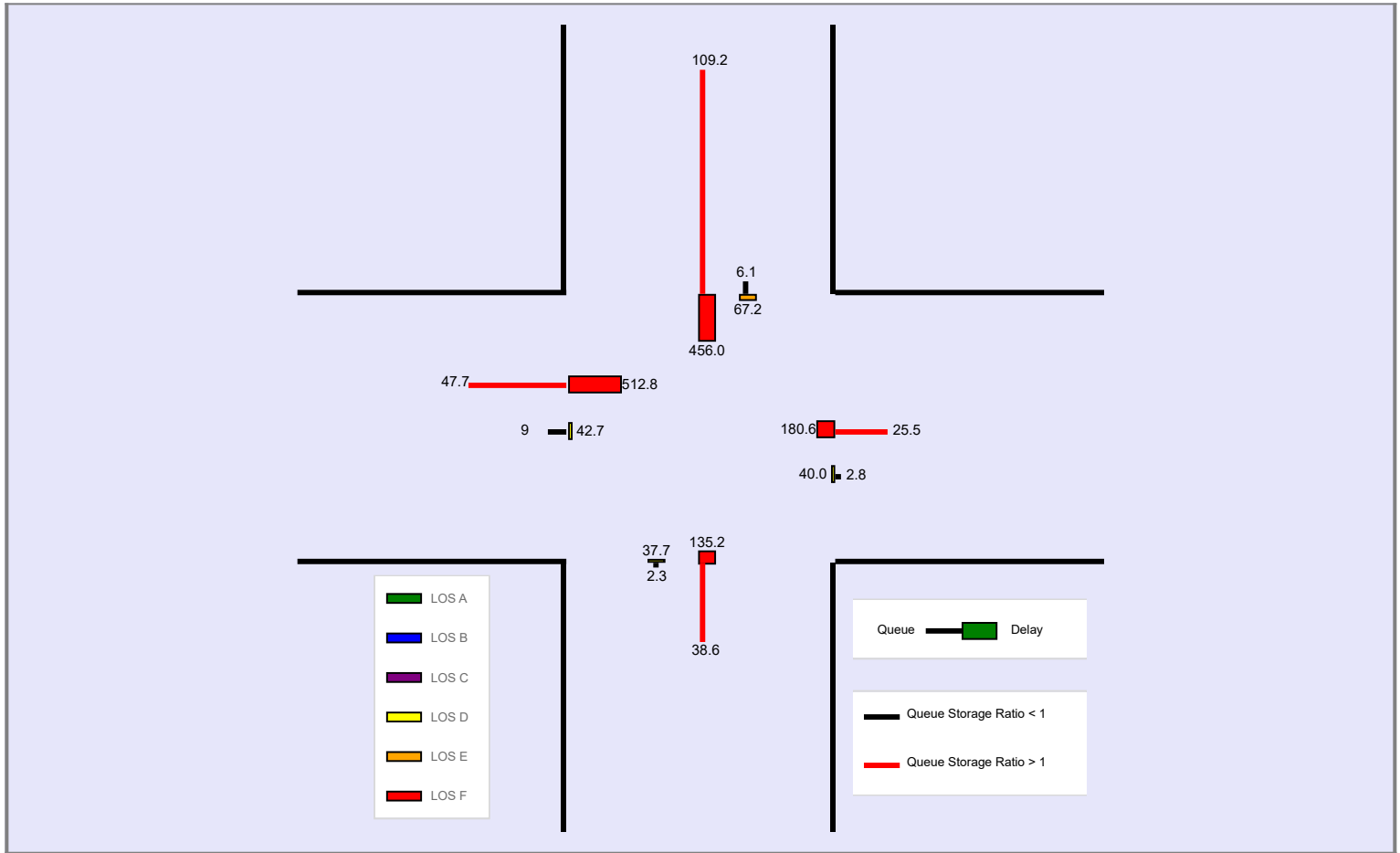
Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.94	B		1.95	B		1.93	B		1.92	B	
Bicycle LOS Score / LOS	2.01	B		1.40	A		1.92	B		3.19	C	

# HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information									
Agency		TRC Worldwide Engineering, Inc.				Duration, h		0.250							
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other					
Jurisdiction		Clarksville MPO		Time Period		DHV Afternoon Peak		PHF		0.92					
Urban Street		SR 374 (Richview Dr./W...		Analysis Year		2023		Analysis Period		1> 7:00					
Intersection		Memorial Dr.		File Name		SR 374 w Memorial Dr PM DHV Yr 2023 Existing....									
Project Description		Existing Conditions													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				568	183	97	95	204	212	96	636	68	212	675	618
Signal Information															
Cycle, s	139.9	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	7.1	2.8	50.0	8.2	5.8	30.0					
				Yellow	4.0	4.0	4.0	4.0	4.0	4.0					
				Red	2.0	2.0	2.0	2.0	2.0	2.0					
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( f <sub>HVg</sub> )				0.984	0.984	1.000	0.984	0.984	1.000	0.984	0.984	1.000	0.984	1.000	1.000
Parking Activity Adjustment Factor ( f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( f <sub>LU</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Left-Turn Adjustment Factor ( f <sub>LT</sub> )				0.952	0.000		0.952	0.000		0.952	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( f <sub>RT</sub> )					0.941	0.941		0.916	0.916		0.983	0.983		0.921	0.921
Left-Turn Pedestrian Adjustment Factor ( f <sub>LPb</sub> )				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( f <sub>RPb</sub> )						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate ( s ), veh/h				1781	1151	610	1781	840	873	1781	1661	178	1781	913	836
Proportion of Vehicles Arriving on Green ( P )				0.14	0.30	0.30	0.06	0.21	0.21	0.05	0.36	0.36	0.11	0.42	0.42
Incremental Delay Factor ( k )				0.50	0.11		0.04	0.50		0.04	0.50		0.27	0.50	
Signal Timing / Movement Groups				EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R				
Lost Time ( t <sub>L</sub> )				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Green Ratio ( g/C )				0.37	0.30	0.27	0.21	0.41	0.36	0.49	0.42				
Permitted Saturation Flow Rate ( s <sub>p</sub> ), veh/h/ln				939	0	1075	0	383	0	702	0				
Shared Saturation Flow Rate ( s <sub>sh</sub> ), veh/h/ln															
Permitted Effective Green Time ( g <sub>p</sub> ), s				32.0	0.0	30.0	0.0	50.0	0.0	52.0	0.0				
Permitted Service Time ( g <sub>u</sub> ), s				0.0	0.0	19.3	0.0	0.0	0.0	0.0	0.0				
Permitted Queue Service Time ( g <sub>ps</sub> ), s				0.0		1.1		0.0		0.0					
Time to First Blockage ( g <sub>t</sub> ), s				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Queue Service Time Before Blockage ( g <sub>ts</sub> ), s															
Protected Right Saturation Flow ( s <sub>R</sub> ), veh/h/ln															
Protected Right Effective Green Time ( g <sub>R</sub> ), s															
Multimodal				EB		WB		NB		SB					
Pedestrian F <sub>w</sub> / F <sub>v</sub>				1.198	0.000	1.198	0.000	1.198	0.000	1.198	0.000				
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.142	0.000	0.151	0.000	0.135	0.000	0.127				
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>															
Bicycle c <sub>b</sub> / d <sub>b</sub>				597.16	34.43	428.74	43.19	714.56	28.90	840.40	23.52				
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	1.52	-3.64	0.92	-3.64	1.43	-3.64	2.70				

# HCS7 Signalized Intersection Results Graphical Summary

General Information						Intersection Information									
Agency	TRC Worldwide Engineering, Inc.					Duration, h	0.250								
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other								
Jurisdiction	Clarksville MPO		Time Period	DHV Afternoon Peak		PHF	0.92								
Urban Street	SR 374 (Richview Dr./W...		Analysis Year	2023		Analysis Period	1> 7:00								
Intersection	Memorial Dr.		File Name	SR 374 w Memorial Dr PM DHV Yr 2023 Existing....											
Project Description	Existing Conditions														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				568	183	97	95	204	212	96	636	68	212	675	618
Signal Information															
Cycle, s	139.9	Reference Phase	2												
Offset, s	0	Reference Point	End	Green	7.1	2.8	50.0	8.2	5.8	30.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	4.0	4.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	2.0					
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)				1210.7	227.5		69.9	648.4		58	979.6		154.2	2729.1	
Back of Queue ( Q ), veh/ln ( 50 th percentile)				47.7	9.0		2.8	25.5		2.3	38.6		6.1	109.2	
Queue Storage Ratio ( RQ ) ( 50 th percentile)				3.23	0.23		0.07	4.05		0.18	0.98		0.36	2.73	
Control Delay ( d ), s/veh				512.8	42.7		40.0	180.6		37.7	135.2		67.2	456.0	
Level of Service (LOS)				F	D		D	F		D	F		E	F	
Approach Delay, s/veh / LOS				357.5	F		154.5	F		123.5	F		401.2	F	
Intersection Delay, s/veh / LOS				296.0						F					



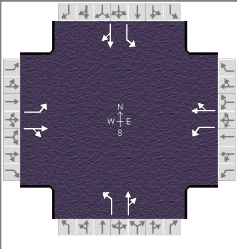
**--- Messages ---**

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

**--- Comments ---**

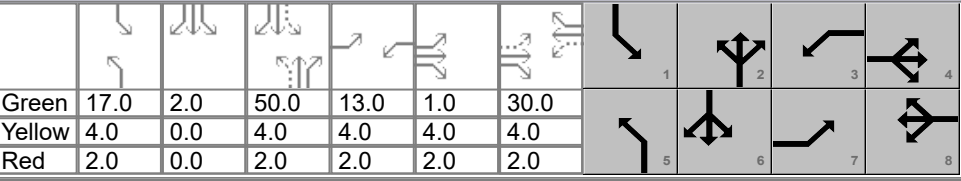
# HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering, Inc.				Duration, h	0.250						
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other					
Jurisdiction	Clarksville MPO		Time Period	DHV Morning Peak		PHF	0.92					
Urban Street	SR 374 (Richview Dr./W...		Analysis Year	2033		Analysis Period	1> 7:00					
Intersection	Memorial Dr.		File Name	SR 374 w Memorial Dr AM DHV Yr 2033 Existing....								
Project Description	Existing Conditions											

Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				632	168	182	161	354	417	220	684	124	244	447	574

Signal Information																						
Cycle, s	143.0	Reference Phase	2	Green	17.0	2.0	50.0	13.0	1.0	30.0	Yellow	4.0	0.0	4.0	4.0	4.0	Red	2.0	0.0	2.0	2.0	2.0
Offset, s	0	Reference Point	End	Uncoordinated	Yes	Simult. Gap E/W	On	Force Mode	Fixed	Simult. Gap N/S	On											

Traffic Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				632	168	182	161	354	417	220	684	124	244	447	574
Initial Queue (Q <sub>b</sub> ), veh/h				0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h				1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h				None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %				2	2		2	2		2	2		2	0	
Ped / Bike / RTOR, /h				0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h				0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)				3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft				12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Turn Bay Length, ft				375	1000		1000	160		325	1000		430	1000	
Grade (Pg), %					0			0			0			0	
Speed Limit, mi/h				40	40	40	40	40	40	40	40	40	40	40	40

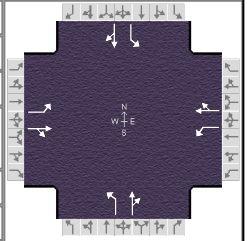
Phase Information		EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s		20.0	30.0	20.0	30.0	20.0	50.0	20.0	50.0
Yellow Change Interval (Y), s		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Green ( G <sub>min</sub> ), s		6	6	6	6	6	6	6	6
Start-Up Lost Time ( lt), s		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode		Off	Ped	Off	Off	Off	Min	Off	Min
Dual Entry		No	Yes	No	Yes	No	Yes	No	Yes
Walk (Walk), s			0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s			0.0		0.0		0.0		0.0

Multimodal Information				EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft				9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb				0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft				12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking				No		0.50	No		0.50	No		0.50	No		0.50














# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TRC Worldwide Engineering, Inc.			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Dr./W...	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	Memorial Dr.	File Name	SR 374 w Memorial Dr AM DHV Yr 2033 Existing....		
Project Description	Existing Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	632	168	182	161	354	417	220	684	124	244	447	574

Signal Information												
Cycle, s	143.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	17.0	2.0	50.0	13.0	1.0	30.0		
				Yellow	4.0	0.0	4.0	4.0	4.0	4.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	0.0	2.0	2.0	2.0	2.0		

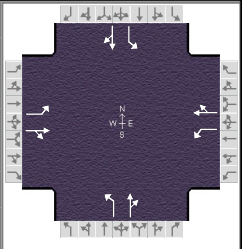
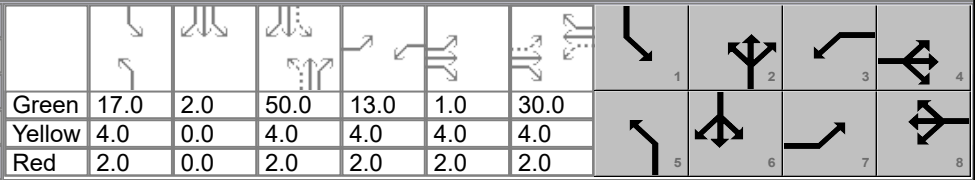
												
1	2	3	4	5	6	7	8	9	10	11	12	13

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	4.0
Phase Duration, s	26.0	43.0	19.0	36.0	23.0	56.0	25.0	58.0
Change Period, ( $Y+R_c$ ), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway ( $MAH$ ), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time ( $g_s$ ), s	22.0	32.3	12.9	32.0	16.9	52.0	18.9	54.0
Green Extension Time ( $g_e$ ), s	0.0	0.0	0.2	0.0	0.1	0.0	0.1	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	1.00	0.01	1.00	0.94	1.00	1.00	1.00

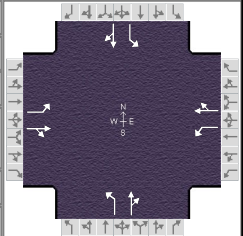
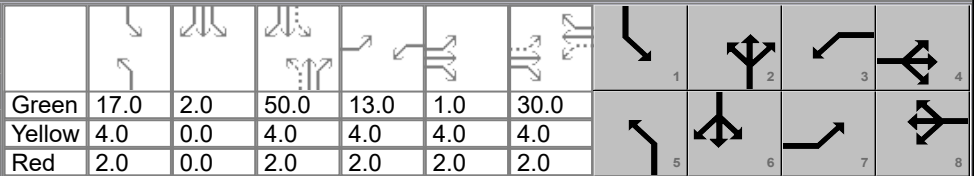
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( $v$ ), veh/h	687	380		175	838		239	878		265	1110	
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1781	1710		1781	1704		1781	1820		1781	1725	
Queue Service Time ( $g_s$ ), s	20.0	30.3		10.9	30.0		14.9	50.0		16.9	52.0	
Cycle Queue Clearance Time ( $g_c$ ), s	20.0	30.3		10.9	30.0		14.9	50.0		16.9	52.0	
Green Ratio ( $g/C$ )	0.36	0.26		0.30	0.21		0.47	0.35		0.48	0.36	
Capacity ( $c$ ), veh/h	299	442		245	358		262	636		287	627	
Volume-to-Capacity Ratio ( $X$ )	2.294	0.861		0.714	2.344		0.912	1.380		0.924	1.769	
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	1452.7	371.5		124.3	1869.8		173.7	1371.1		199.4	2076.4	
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	57.2	14.6		4.9	73.6		6.8	54.0		7.8	83.1	
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	3.87	0.37		0.12	11.69		0.53	1.37		0.46	2.08	
Uniform Delay ( $d_1$ ), s/veh	44.5	50.6		41.5	56.5		44.5	46.5		45.5	45.5	
Incremental Delay ( $d_2$ ), s/veh	592.7	15.1		2.3	613.3		26.8	180.8		31.4	352.5	
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay ( $d$ ), s/veh	637.2	65.6		43.8	669.8		71.2	227.3		76.8	398.0	
Level of Service (LOS)	F	E		D	F		E	F		E	F	
Approach Delay, s/veh / LOS	433.5	F		561.7	F		193.9	F		336.0	F	
Intersection Delay, s/veh / LOS	374.0						F					

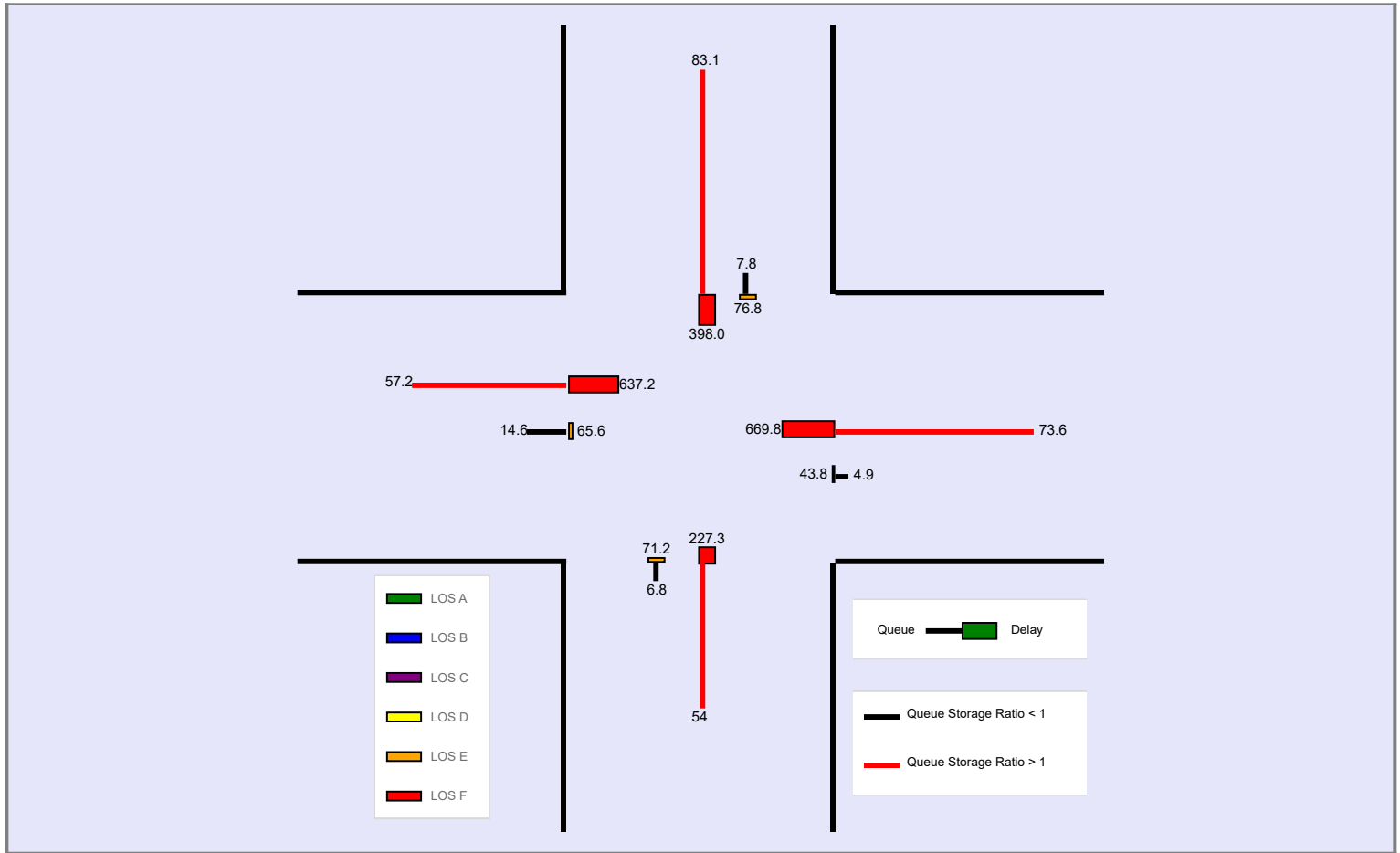
Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.94	B		1.95	B		1.93	B		1.93	B	
Bicycle LOS Score / LOS	2.25	B		2.16	B		2.33	B		2.76	C	

# HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information										
Agency		TRC Worldwide Engineering, Inc.				Duration, h		0.250								
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other						
Jurisdiction		Clarksville MPO		Time Period		DHV Morning Peak		PHF		0.92						
Urban Street		SR 374 (Richview Dr./W...		Analysis Year		2033		Analysis Period		1> 7:00						
Intersection		Memorial Dr.		File Name		SR 374 w Memorial Dr AM DHV Yr 2033 Existing....										
Project Description		Existing Conditions														
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand ( v ), veh/h				632	168	182	161	354	417	220	684	124	244	447	574	
Signal Information																
Cycle, s	143.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	Yes	Simult. Gap E/W	On													
Force Mode	Fixed	Simult. Gap N/S	On	Green	17.0	2.0	50.0	13.0	1.0	30.0	Yellow	4.0	0.0	4.0	4.0	4.0
				Red	2.0	0.0	2.0	2.0	2.0	2.0						
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R	
Lane Width Adjustment Factor ( f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Heavy Vehicles and Grade Factor ( f <sub>HVg</sub> )				0.984	0.984	1.000	0.984	0.984	1.000	0.984	0.984	1.000	0.984	1.000	1.000	
Parking Activity Adjustment Factor ( f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Bus Blockage Adjustment Factor ( f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Area Type Adjustment Factor ( f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Lane Utilization Adjustment Factor ( f <sub>LU</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Left-Turn Adjustment Factor ( f <sub>LT</sub> )				0.952	0.000		0.952	0.000		0.952	0.000		0.952	0.000		
Right-Turn Adjustment Factor ( f <sub>RT</sub> )					0.914	0.914		0.911	0.911		0.973	0.973		0.908	0.908	
Left-Turn Pedestrian Adjustment Factor ( f <sub>LPb</sub> )				1.000			1.000			1.000			1.000			
Right-Turn Ped-Bike Adjustment Factor ( f <sub>RPb</sub> )						1.000			1.000			1.000			1.000	
Work Zone Adjustment Factor ( f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
DDI Factor ( f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
Movement Saturation Flow Rate ( s ), veh/h				1781	821	889	1781	783	922	1781	1541	279	1781	755	970	
Proportion of Vehicles Arriving on Green ( P )				0.14	0.26	0.26	0.09	0.21	0.21	0.12	0.35	0.35	0.13	0.36	0.36	
Incremental Delay Factor ( k )				0.50	0.37		0.07	0.50		0.31	0.50		0.39	0.50		
Signal Timing / Movement Groups				EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R					
Lost Time ( t <sub>L</sub> )				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0					
Green Ratio ( g/C )				0.36	0.26	0.30	0.21	0.47	0.35	0.48	0.36					
Permitted Saturation Flow Rate ( s <sub>p</sub> ), veh/h/ln				656	0	1003	0	508	0	632	0					
Shared Saturation Flow Rate ( s <sub>sh</sub> ), veh/h/ln																
Permitted Effective Green Time ( g <sub>p</sub> ), s				32.0	0.0	30.0	0.0	50.0	0.0	50.0	0.0					
Permitted Service Time ( g <sub>u</sub> ), s				0.0	0.0	4.6	0.0	0.0	0.0	0.0	0.0					
Permitted Queue Service Time ( g <sub>ps</sub> ), s				0.0		4.6		0.0		0.0						
Time to First Blockage ( g <sub>t</sub> ), s				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Queue Service Time Before Blockage ( g <sub>ts</sub> ), s																
Protected Right Saturation Flow ( s <sub>R</sub> ), veh/h/ln																
Protected Right Effective Green Time ( g <sub>R</sub> ), s																
Multimodal				EB			WB			NB			SB			
Pedestrian F <sub>w</sub> / F <sub>v</sub>				1.198	0.000	1.198	0.000	1.198	0.000	1.198	0.000	1.198	0.000			
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.147	0.000	0.152	0.000	0.137	0.000	0.137	0.000	0.135			
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>																
Bicycle c <sub>b</sub> / d <sub>b</sub>				516.90	39.32	419.57	44.65	699.28	30.24	727.23	28.96					
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	1.76	-3.64	1.67	-3.64	1.84	-3.64	1.84	-3.64	2.27			

# HCS7 Signalized Intersection Results Graphical Summary

General Information						Intersection Information									
Agency	TRC Worldwide Engineering, Inc.					Duration, h	0.250								
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other								
Jurisdiction	Clarksville MPO		Time Period	DHV Morning Peak		PHF	0.92								
Urban Street	SR 374 (Richview Dr./W...		Analysis Year	2033		Analysis Period	1> 7:00								
Intersection	Memorial Dr.		File Name	SR 374 w Memorial Dr AM DHV Yr 2033 Existing....											
Project Description	Existing Conditions														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				632	168	182	161	354	417	220	684	124	244	447	574
Signal Information															
Cycle, s	143.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green	17.0	2.0	50.0	13.0	1.0	30.0									
Yellow	4.0	0.0	4.0	4.0	4.0	4.0									
Red	2.0	0.0	2.0	2.0	2.0	2.0									
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)				1452.7	371.5		124.3	1869.8		173.7	1371.1		199.4	2076.4	
Back of Queue ( Q ), veh/ln ( 50 th percentile)				57.2	14.6		4.9	73.6		6.8	54.0		7.8	83.1	
Queue Storage Ratio ( RQ ) ( 50 th percentile)				3.87	0.37		0.12	11.69		0.53	1.37		0.46	2.08	
Control Delay ( d ), s/veh				637.2	65.6		43.8	669.8		71.2	227.3		76.8	398.0	
Level of Service (LOS)				F	E		D	F		E	F		E	F	
Approach Delay, s/veh / LOS				433.5	F		561.7	F		193.9	F		336.0	F	
Intersection Delay, s/veh / LOS				374.0						F					



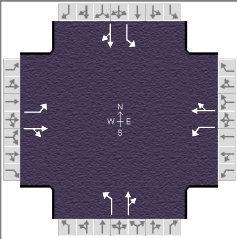
**--- Messages ---**

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

**--- Comments ---**

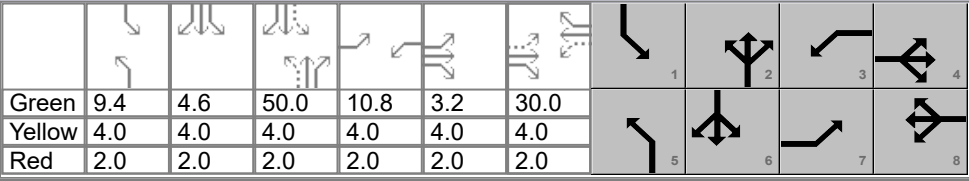
# HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering, Inc.				Duration, h	0.250						
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other					
Jurisdiction	Clarksville MPO		Time Period	DHV Afternoon Peak		PHF	0.92					
Urban Street	SR 374 (Richview Dr./W...		Analysis Year	2033		Analysis Period	1> 7:00					
Intersection	Memorial Dr.		File Name	SR 374 w Memorial Dr PM DHV Yr 2033 Existing....								
Project Description	Existing Conditions											

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	762	245	182	128	274	284	129	853	91	284	906	829

Signal Information																		
Cycle, s	144.0	Reference Phase	2	Green	9.4	4.6	50.0	10.8	3.2	30.0	Yellow	4.0	4.0	4.0	4.0	4.0	4.0	
Offset, s	0	Reference Point	End	Red	2.0	2.0	2.0	2.0	2.0	2.0	Uncoordinated	Yes	Simult. Gap E/W	On	Force Mode	Fixed	Simult. Gap N/S	On

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	762	245	182	128	274	284	129	853	91	284	906	829
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h	None			None			None			None		
Heavy Vehicles (P <sub>HV</sub> ), %	2	2		2	2		2	2		2	0	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Turn Bay Length, ft	375	1000		1000	160		325	1000		430	1000	
Grade (Pg), %	0			0			0			0		
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

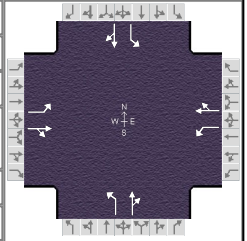
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	20.0	30.0	20.0	30.0	20.0	50.0	20.0	50.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Green ( G <sub>min</sub> ), s	6	6	6	6	6	6	6	6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Off	Ped	Off	Off	Off	Min	Off	Min
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TRC Worldwide Engineering, Inc.			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Dr./W...	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	Memorial Dr.	File Name	SR 374 w Memorial Dr PM DHV Yr 2033 Existing....		
Project Description	Existing Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	762	245	182	128	274	284	129	853	91	284	906	829

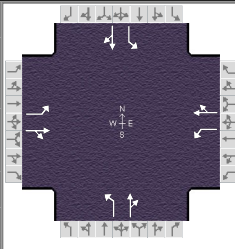
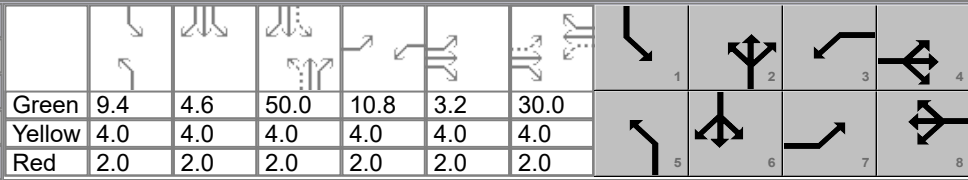
Signal Information											
Cycle, s	144.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	9.4	4.6	50.0	10.8	3.2	30.0	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	4.0	4.0	
				Red	2.0	2.0	2.0	2.0	2.0	2.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	4.0
Phase Duration, s	26.0	45.2	16.8	36.0	15.4	56.0	26.0	66.6
Change Period, ( $Y+R_c$ ), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway ( $MAH$ ), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time ( $g_s$ ), s	22.0	40.2	10.7	32.0	9.2	52.0	22.0	62.6
Green Extension Time ( $g_e$ ), s	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00

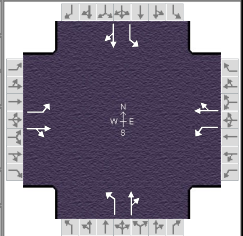





































Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( $v$ ), veh/h	828	464		139	607		140	1026		309	1886	
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1781	1737		1781	1713		1781	1838		1781	1750	
Queue Service Time ( $g_s$ ), s	20.0	38.2		8.7	30.0		7.2	50.0		20.0	60.6	
Cycle Queue Clearance Time ( $g_c$ ), s	20.0	38.2		8.7	30.0		7.2	50.0		20.0	60.6	
Green Ratio ( $g/C$ )	0.36	0.27		0.28	0.21		0.41	0.35		0.50	0.42	
Capacity ( $c$ ), veh/h	297	472		184	357		166	638		297	737	
Volume-to-Capacity Ratio ( $X$ )	2.785	0.982		0.756	1.699		0.846	1.607		1.038	2.559	
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	1905.9	537		100.1	1146.5		83	1829.5		290.8	4242	
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	75.0	21.1		3.9	45.1		3.3	72.0		11.4	169.7	
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	5.08	0.54		0.10	7.17		0.26	1.83		0.68	4.24	
Uniform Delay ( $d_1$ ), s/veh	44.9	52.1		43.2	57.0		35.7	47.0		48.2	41.7	
Incremental Delay ( $d_2$ ), s/veh	812.6	36.6		2.4	326.4		4.5	280.6		62.4	705.7	
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay ( $d$ ), s/veh	857.4	88.7		45.6	383.4		40.2	327.6		110.6	747.4	
Level of Service (LOS)	F	F		D	F		D	F		F	F	
Approach Delay, s/veh / LOS	581.4	F		320.4	F		293.0	F		657.8	F	
Intersection Delay, s/veh / LOS	514.1						F					

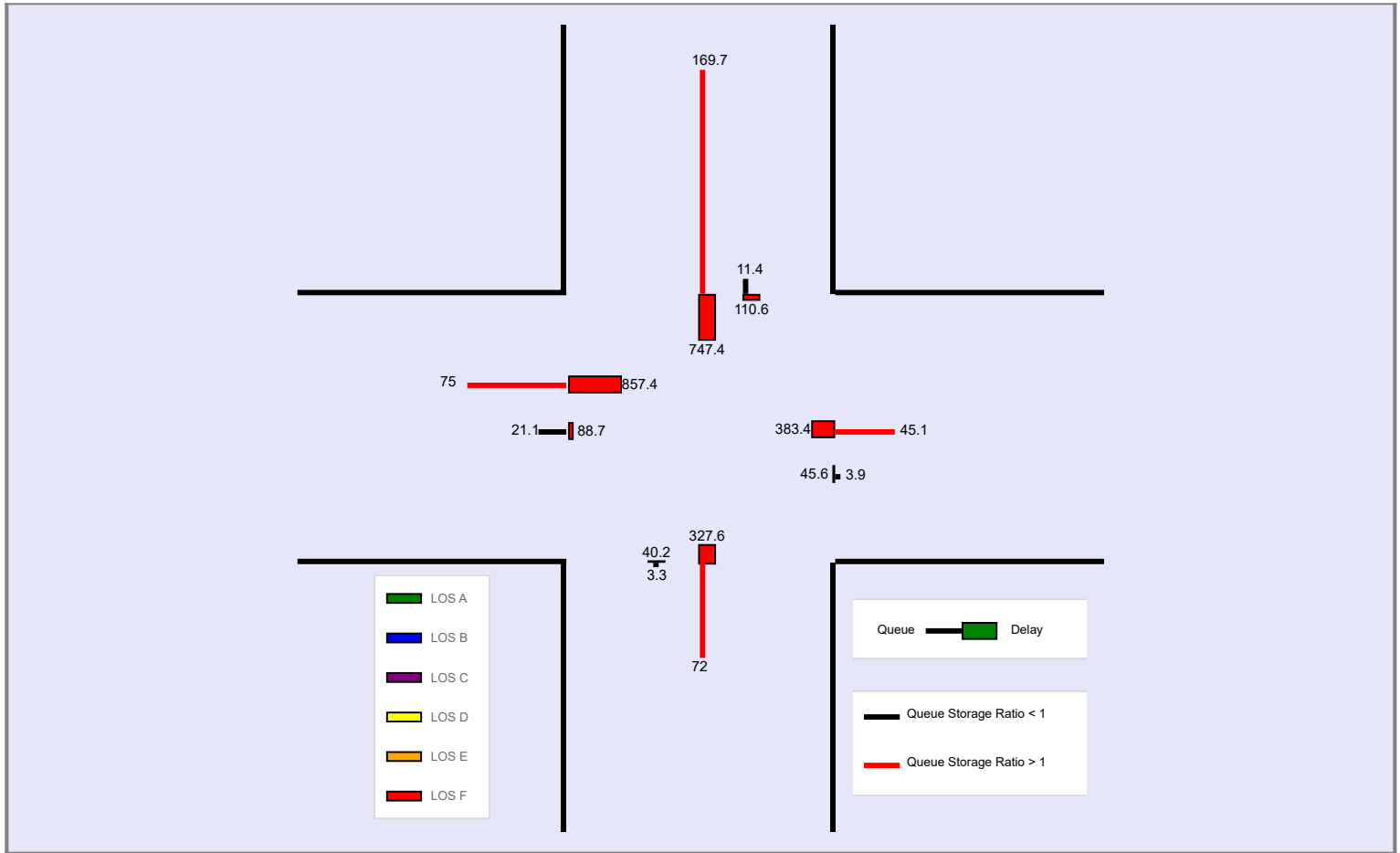
Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.94	B		1.95	B		1.93	B		1.93	B	
Bicycle LOS Score / LOS	2.62	C		1.72	B		2.41	B		4.11	D	

# HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information									
Agency		TRC Worldwide Engineering, Inc.				Duration, h		0.250							
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other					
Jurisdiction		Clarksville MPO		Time Period		DHV Afternoon Peak		PHF		0.92					
Urban Street		SR 374 (Richview Dr./W...		Analysis Year		2033		Analysis Period		1> 7:00					
Intersection		Memorial Dr.		File Name		SR 374 w Memorial Dr PM DHV Yr 2033 Existing....									
Project Description		Existing Conditions													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				762	245	182	128	274	284	129	853	91	284	906	829
Signal Information															
Cycle, s	144.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On	Green	9.4	4.6	50.0	10.8	3.2	30.0	5	6	7	8	
				Yellow	4.0	4.0	4.0	4.0	4.0	4.0					
				Red	2.0	2.0	2.0	2.0	2.0	2.0					
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( f <sub>HVg</sub> )				0.984	0.984	1.000	0.984	0.984	1.000	0.984	0.984	1.000	0.984	1.000	1.000
Parking Activity Adjustment Factor ( f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( f <sub>LU</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Left-Turn Adjustment Factor ( f <sub>LT</sub> )				0.952	0.000		0.952	0.000		0.952	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( f <sub>RT</sub> )					0.929	0.929		0.916	0.916		0.983	0.983		0.921	0.921
Left-Turn Pedestrian Adjustment Factor ( f <sub>LPb</sub> )				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( f <sub>RPb</sub> )						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate ( s ), veh/h				1781	997	740	1781	841	872	1781	1661	177	1781	914	836
Proportion of Vehicles Arriving on Green ( P )				0.14	0.27	0.27	0.08	0.21	0.21	0.06	0.35	0.35	0.14	0.42	0.42
Incremental Delay Factor ( k )				0.50	0.48		0.04	0.50		0.04	0.50		0.50	0.50	
Signal Timing / Movement Groups				EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R				
Lost Time ( t <sub>L</sub> )				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Green Ratio ( g/C )				0.36	0.27	0.28	0.21	0.41	0.35	0.50	0.42				
Permitted Saturation Flow Rate ( s <sub>p</sub> ), veh/h/ln				814	0	928	0	241	0	550	0				
Shared Saturation Flow Rate ( s <sub>sh</sub> ), veh/h/ln															
Permitted Effective Green Time ( g <sub>p</sub> ), s				32.0	0.0	30.0	0.0	50.0	0.0	52.0	0.0				
Permitted Service Time ( g <sub>u</sub> ), s				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Permitted Queue Service Time ( g <sub>ps</sub> ), s				0.0		0.0		0.0		0.0					
Time to First Blockage ( g <sub>t</sub> ), s				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Queue Service Time Before Blockage ( g <sub>ts</sub> ), s															
Protected Right Saturation Flow ( s <sub>R</sub> ), veh/h/ln															
Protected Right Effective Green Time ( g <sub>R</sub> ), s															
Multimodal				EB		WB		NB		SB					
Pedestrian F <sub>w</sub> / F <sub>v</sub>				1.198	0.000	1.198	0.000	1.198	0.000	1.198	0.000				
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.146	0.000	0.153	0.000	0.137	0.000	0.128				
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>															
Bicycle c <sub>b</sub> / d <sub>b</sub>				543.91	38.16	416.67	45.13	694.44	30.68	842.32	24.12				
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	2.13	-3.64	1.23	-3.64	1.92	-3.64	3.62				

# HCS7 Signalized Intersection Results Graphical Summary

General Information						Intersection Information									
Agency	TRC Worldwide Engineering, Inc.					Duration, h	0.250								
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other								
Jurisdiction	Clarksville MPO		Time Period	DHV Afternoon Peak		PHF	0.92								
Urban Street	SR 374 (Richview Dr./W...		Analysis Year	2033		Analysis Period	1> 7:00								
Intersection	Memorial Dr.		File Name	SR 374 w Memorial Dr PM DHV Yr 2033 Existing....											
Project Description	Existing Conditions														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				762	245	182	128	274	284	129	853	91	284	906	829
Signal Information															
Cycle, s	144.0	Reference Phase	2												
Offset, s	0	Reference Point	End	Green	9.4	4.6	50.0	10.8	3.2	30.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	4.0	4.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	2.0					
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)				1905.9	537		100.1	1146.5		83	1829.5		290.8	4242	
Back of Queue ( Q ), veh/ln ( 50 th percentile)				75.0	21.1		3.9	45.1		3.3	72.0		11.4	169.7	
Queue Storage Ratio ( RQ ) ( 50 th percentile)				5.08	0.54		0.10	7.17		0.26	1.83		0.68	4.24	
Control Delay ( d ), s/veh				857.4	88.7		45.6	383.4		40.2	327.6		110.6	747.4	
Level of Service (LOS)				F	F		D	F		D	F		F	F	
Approach Delay, s/veh / LOS				581.4	F		320.4	F		293.0	F		657.8	F	
Intersection Delay, s/veh / LOS				514.1						F					



**--- Messages ---**

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

**--- Comments ---**

# HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering, Inc.				Duration, h	0.250						
Analyst	MLT	Analysis Date	2/17/2020		Area Type	Other						
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak		PHF	0.92						
Urban Street	SR 374 (Richview Dr./W...	Analysis Year	2043		Analysis Period	1> 7:00						
Intersection	Memorial Dr.	File Name	SR 374 w Memorial Dr AM DHV Yr 2043 Existing....									
Project Description	Existing Conditions											

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	793	210	229	202	444	524	277	858	155	307	561	721

Signal Information																	
Cycle, s	144.0	Reference Phase	2	Green	20.0	50.0	15.9	4.1	30.0	0.0	Green	20.0	50.0	15.9	4.1	30.0	0.0
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	0.0	4.0	0.0	Yellow	4.0	4.0	4.0	0.0	4.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.0	2.0	2.0	0.0	2.0	0.0	Red	2.0	2.0	2.0	0.0	2.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On														

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	793	210	229	202	444	524	277	858	155	307	561	721
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h		None			None			None			None	
Heavy Vehicles (P <sub>HV</sub> ), %	2	2		2	2		2	2		2	0	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Turn Bay Length, ft	375	1000		1000	160		325	1000		430	1000	
Grade (Pg), %		0			0			0			0	
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

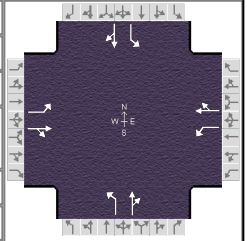
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	20.0	30.0	20.0	30.0	20.0	50.0	20.0	50.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Green ( G <sub>min</sub> ), s	6	6	6	6	6	6	6	6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Off	Ped	Off	Off	Off	Min	Off	Min
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	















# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TRC Worldwide Engineering, Inc.			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Morning Peak	PHF	0.92
Urban Street	SR 374 (Richview Dr./W...	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	Memorial Dr.	File Name	SR 374 w Memorial Dr AM DHV Yr 2043 Existing....		
Project Description	Existing Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	793	210	229	202	444	524	277	858	155	307	561	721

Signal Information												
Cycle, s	144.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	20.0	50.0	15.9	4.1	30.0	0.0		
				Yellow	4.0	4.0	4.0	0.0	4.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	0.0	2.0	0.0		

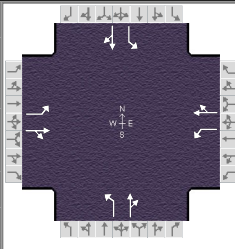
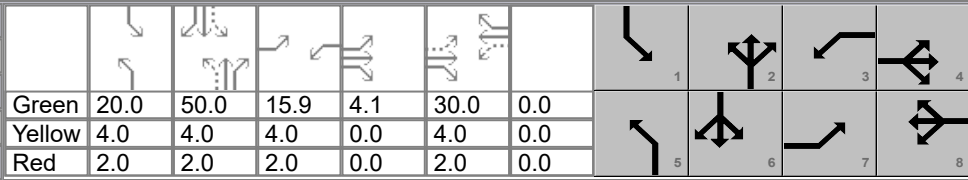
													
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	4.0
Phase Duration, s	26.0	40.1	21.9	36.0	26.0	56.0	26.0	56.0
Change Period, ( $Y+R_c$ ), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway ( $MAH$ ), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time ( $g_s$ ), s	22.0	36.1	15.8	32.0	22.0	52.0	22.0	52.0
Green Extension Time ( $g_e$ ), s	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	1.00	0.33	1.00	1.00	1.00	1.00	1.00

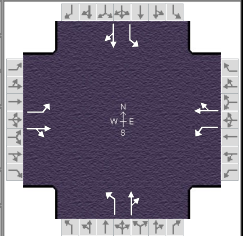












Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( $v$ ), veh/h	862	477		220	1052		301	1101		334	1393	
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1781	1710		1781	1704		1781	1820		1781	1725	
Queue Service Time ( $g_s$ ), s	20.0	34.1		13.8	30.0		20.0	50.0		20.0	50.0	
Cycle Queue Clearance Time ( $g_c$ ), s	20.0	34.1		13.8	30.0		20.0	50.0		20.0	50.0	
Green Ratio ( $g/C$ )	0.35	0.24		0.32	0.21		0.49	0.35		0.49	0.35	
Capacity ( $c$ ), veh/h	297	404		247	355		297	632		297	599	
Volume-to-Capacity Ratio ( $X$ )	2.898	1.180		0.888	2.963		1.012	1.742		1.122	2.326	
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	2032.4	662		188.7	2554.7		276.1	2078.1		347	3026.7	
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	80.0	26.1		7.4	100.6		10.9	81.8		13.7	121.1	
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	5.42	0.66		0.19	15.97		0.85	2.08		0.81	3.03	
Uniform Delay ( $d_1$ ), s/veh	44.5	55.0		41.2	57.0		47.9	47.0		47.9	47.0	
Incremental Delay ( $d_2$ ), s/veh	863.4	103.7		21.1	891.1		55.4	340.5		89.2	601.9	
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay ( $d$ ), s/veh	907.9	158.7		62.4	948.1		103.2	387.5		137.1	648.9	
Level of Service (LOS)	F	F		E	F		F	F		F	F	
Approach Delay, s/veh / LOS	640.9	F		795.2	F		326.5	F		550.0	F	
Intersection Delay, s/veh / LOS	570.9						F					

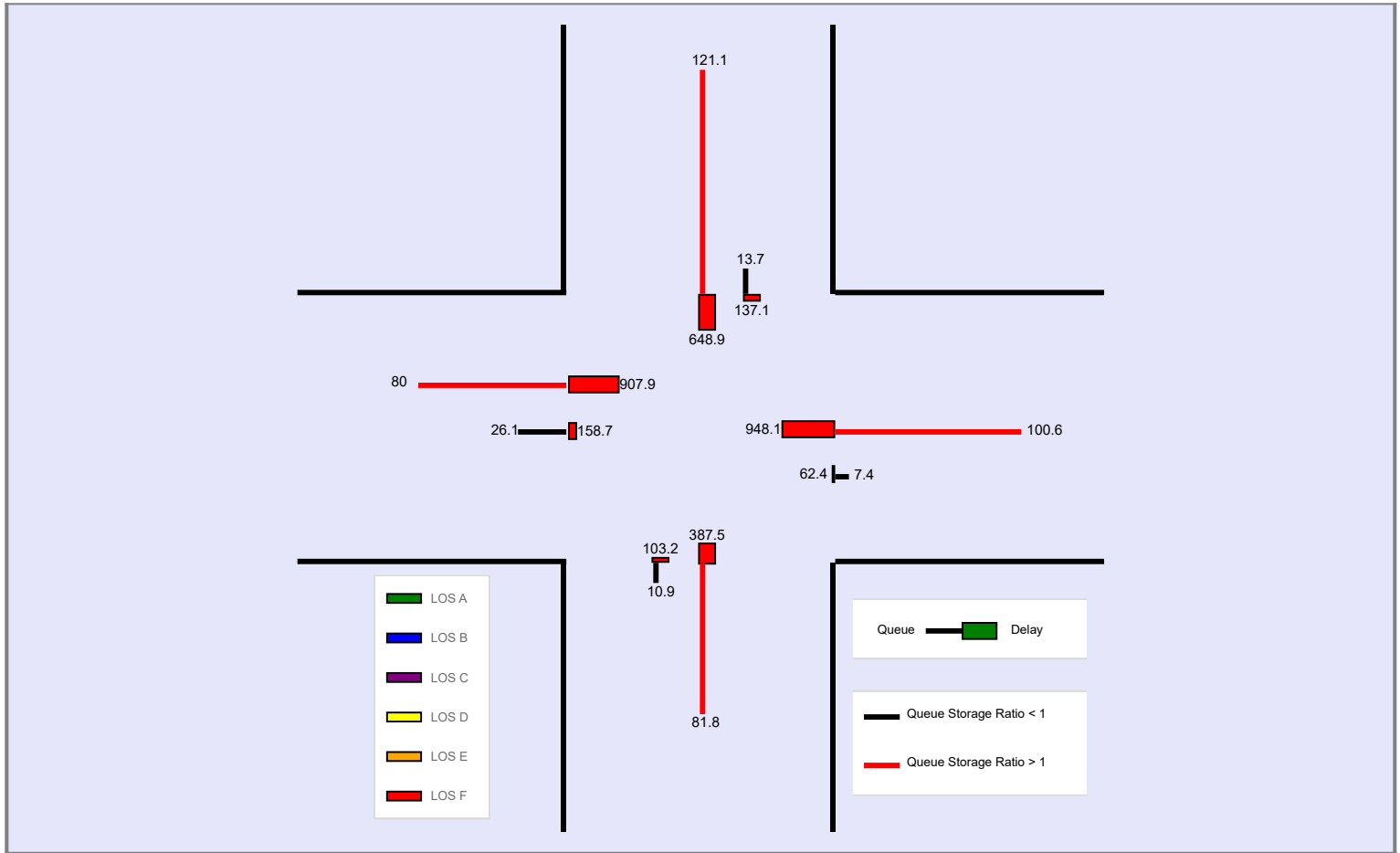
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.95	B	1.95	B	1.93	B	1.93	B
Bicycle LOS Score / LOS	2.70	C	2.59	C	2.80	C	3.34	C

# HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information									
Agency		TRC Worldwide Engineering, Inc.				Duration, h		0.250							
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other					
Jurisdiction		Clarksville MPO		Time Period		DHV Morning Peak		PHF		0.92					
Urban Street		SR 374 (Richview Dr./W...		Analysis Year		2043		Analysis Period		1> 7:00					
Intersection		Memorial Dr.		File Name		SR 374 w Memorial Dr AM DHV Yr 2043 Existing....									
Project Description		Existing Conditions													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				793	210	229	202	444	524	277	858	155	307	561	721
Signal Information															
Cycle, s	144.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	20.0	50.0	15.9	4.1	30.0	0.0					
				Yellow	4.0	4.0	4.0	0.0	4.0	0.0					
				Red	2.0	2.0	2.0	0.0	2.0	0.0					
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor (f <sub>w</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor (f <sub>HVg</sub> )				0.984	0.984	1.000	0.984	0.984	1.000	0.984	0.984	1.000	0.984	1.000	1.000
Parking Activity Adjustment Factor (f <sub>p</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor (f <sub>bb</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor (f <sub>a</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor (f <sub>LU</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Left-Turn Adjustment Factor (f <sub>LT</sub> )				0.952	0.000		0.952	0.000		0.952	0.000		0.952	0.000	
Right-Turn Adjustment Factor (f <sub>RT</sub> )					0.914	0.914		0.911	0.911		0.973	0.973		0.908	0.908
Left-Turn Pedestrian Adjustment Factor (f <sub>LPb</sub> )				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor (f <sub>RPb</sub> )						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor (f <sub>wz</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor (f <sub>DDI</sub> )				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h				1781	818	892	1781	782	923	1781	1542	279	1781	755	970
Proportion of Vehicles Arriving on Green (P)				0.14	0.24	0.24	0.11	0.21	0.21	0.14	0.35	0.35	0.14	0.35	0.35
Incremental Delay Factor (k)				0.50	0.50		0.26	0.50		0.50	0.50		0.50	0.50	
Signal Timing / Movement Groups				EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R				
Lost Time (t <sub>L</sub> )				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Green Ratio (g/C)				0.35	0.24	0.32	0.21	0.49	0.35	0.49	0.35				
Permitted Saturation Flow Rate (s <sub>p</sub> ), veh/h/ln				536	0	917	0	388	0	512	0				
Shared Saturation Flow Rate (s <sub>sh</sub> ), veh/h/ln															
Permitted Effective Green Time (g <sub>p</sub> ), s				30.1	0.0	30.0	0.0	50.0	0.0	50.0	0.0				
Permitted Service Time (g <sub>u</sub> ), s				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Permitted Queue Service Time (g <sub>ps</sub> ), s				0.0		0.0		0.0		0.0					
Time to First Blockage (g <sub>t</sub> ), s				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Queue Service Time Before Blockage (g <sub>ts</sub> ), s															
Protected Right Saturation Flow (s <sub>R</sub> ), veh/h/ln															
Protected Right Effective Green Time (g <sub>R</sub> ), s															
Multimodal				EB			WB			NB			SB		
Pedestrian F <sub>w</sub> / F <sub>v</sub>				1.198	0.000	1.198	0.000	1.198	0.000	1.198	0.000	1.198	0.000	1.198	0.000
Pedestrian F <sub>s</sub> / F <sub>delay</sub>				0.000	0.150	0.000	0.153	0.000	0.137	0.000	0.137	0.000	0.137	0.000	0.137
Pedestrian M <sub>corner</sub> / M <sub>cw</sub>															
Bicycle c <sub>b</sub> / d <sub>b</sub>				473.08	41.97	416.67	45.13	694.44	30.68	694.44	30.68	473.08	41.97	416.67	45.13
Bicycle F <sub>w</sub> / F <sub>v</sub>				-3.64	2.21	-3.64	2.10	-3.64	2.31	-3.64	2.31	-3.64	2.21	-3.64	2.85

# HCS7 Signalized Intersection Results Graphical Summary

General Information						Intersection Information									
Agency	TRC Worldwide Engineering, Inc.					Duration, h	0.250								
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other								
Jurisdiction	Clarksville MPO		Time Period	DHV Morning Peak		PHF	0.92								
Urban Street	SR 374 (Richview Dr./W...		Analysis Year	2043		Analysis Period	1> 7:00								
Intersection	Memorial Dr.		File Name	SR 374 w Memorial Dr AM DHV Yr 2043 Existing....											
Project Description	Existing Conditions														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				793	210	229	202	444	524	277	858	155	307	561	721
Signal Information															
Cycle, s	144.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green	20.0	50.0	15.9	4.1	30.0	0.0									
Yellow	4.0	4.0	4.0	0.0	4.0	0.0									
Red	2.0	2.0	2.0	0.0	2.0	0.0									
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)				2032.4	662		188.7	2554.7		276.1	2078.1		347	3026.7	
Back of Queue ( Q ), veh/ln ( 50 th percentile)				80.0	26.1		7.4	100.6		10.9	81.8		13.7	121.1	
Queue Storage Ratio ( RQ ) ( 50 th percentile)				5.42	0.66		0.19	15.97		0.85	2.08		0.81	3.03	
Control Delay ( d ), s/veh				907.9	158.7		62.4	948.1		103.2	387.5		137.1	648.9	
Level of Service (LOS)				F	F		E	F		F	F		F	F	
Approach Delay, s/veh / LOS				640.9	F		795.2	F		326.5	F		550.0	F	
Intersection Delay, s/veh / LOS				570.9						F					



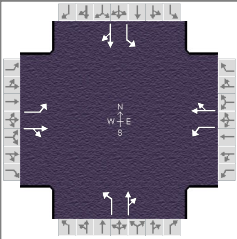
**--- Messages ---**

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

**--- Comments ---**

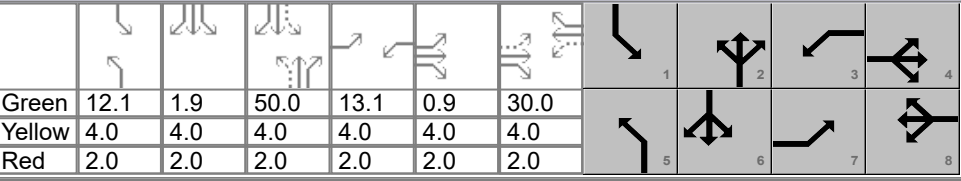
# HCS7 Signalized Intersection Input Data

General Information					Intersection Information							
Agency	TRC Worldwide Engineering, Inc.				Duration, h	0.250						
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other					
Jurisdiction	Clarksville MPO		Time Period	DHV Afternoon Peak		PHF	0.92					
Urban Street	SR 374 (Richview Dr./W...		Analysis Year	2043		Analysis Period	1> 7:00					
Intersection	Memorial Dr.		File Name	SR 374 w Memorial Dr PM DHV Yr 2043 Existing....								
Project Description	Existing Conditions											

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	957	308	164	160	343	357	162	1071	115	357	1136	1041

Signal Information													
Cycle, s	144.0	Reference Phase	2	Green	12.1	1.9	50.0	13.1	0.9	30.0			
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	4.0	4.0	4.0			
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.0	2.0	2.0	2.0	2.0	2.0			
Force Mode	Fixed	Simult. Gap N/S	On										

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	957	308	164	160	343	357	162	1071	115	357	1136	1041
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h		None			None			None			None	
Heavy Vehicles (P <sub>HV</sub> ), %	2	2		2	2		2	2		2	0	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Turn Bay Length, ft	375	1000		1000	160		325	1000		430	1000	
Grade (Pg), %		0			0			0			0	
Speed Limit, mi/h	40	40	40	40	40	40	40	40	40	40	40	40

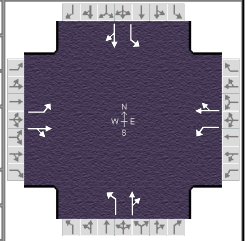
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	20.0	30.0	20.0	30.0	20.0	50.0	20.0	50.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Green ( G <sub>min</sub> ), s	6	6	6	6	6	6	6	6
Start-Up Lost Time ( lt), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Off	Ped	Off	Off	Off	Min	Off	Min
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	





















































# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TRC Worldwide Engineering, Inc.			Duration, h	0.250
Analyst	MLT	Analysis Date	2/17/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	DHV Afternoon Peak	PHF	0.92
Urban Street	SR 374 (Richview Dr./W...	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	Memorial Dr.	File Name	SR 374 w Memorial Dr PM DHV Yr 2043 Existing....		
Project Description	Existing Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	957	308	164	160	343	357	162	1071	115	357	1136	1041

Signal Information												
Cycle, s	144.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	12.1	1.9	50.0	13.1	0.9	30.0		
				Yellow	4.0	4.0	4.0	4.0	4.0	4.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	2.0		

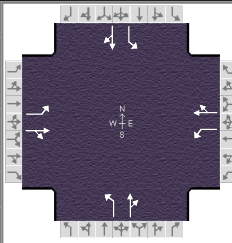
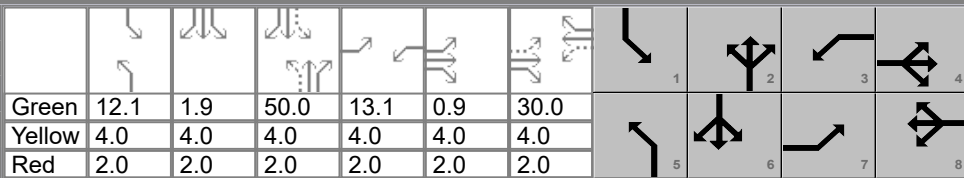
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	4.0
Phase Duration, s	26.0	42.9	19.1	36.0	18.1	56.0	26.0	63.9
Change Period, ( Y+R c ), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway ( MAH ), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time ( g s ), s	22.0	38.9	12.9	32.0	12.0	52.0	22.0	59.9
Green Extension Time ( g e ), s	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	1.00	0.01	1.00	0.00	1.00	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate ( v ), veh/h	1040	513		174	761		176	1289		388	2366	
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1781	1760		1781	1713		1781	1838		1781	1749	
Queue Service Time ( g s ), s	20.0	36.9		10.9	30.0		10.0	50.0		20.0	57.9	
Cycle Queue Clearance Time ( g c ), s	20.0	36.9		10.9	30.0		10.0	50.0		20.0	57.9	
Green Ratio ( g/C )	0.36	0.26		0.30	0.21		0.43	0.35		0.50	0.40	
Capacity ( c ), veh/h	297	451		212	357		200	638		297	703	
Volume-to-Capacity Ratio ( X )	3.498	1.136		0.822	2.132		0.879	2.020		1.305	3.367	
Back of Queue ( Q ), ft/ln ( 50 th percentile)	2576.9	679.1		133.4	1630.4		114.6	2656.4		494.4	5821.2	
Back of Queue ( Q ), veh/ln ( 50 th percentile)	101.5	26.7		5.3	64.2		4.5	104.6		19.5	232.8	
Queue Storage Ratio ( RQ ) ( 50 th percentile)	6.87	0.68		0.13	10.19		0.35	2.66		1.15	5.82	
Uniform Delay ( d 1 ), s/veh	44.9	53.5		42.3	57.0		40.3	47.0		48.2	43.1	
Incremental Delay ( d 2 ), s/veh	1132.4	85.3		8.4	518.7		13.2	464.4		159.4	1068.6	
Initial Queue Delay ( d 3 ), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay ( d ), s/veh	1177.2	138.8		50.7	575.7		53.4	511.4		207.7	1111.7	
Level of Service (LOS)	F	F		D	F		D	F		F	F	
Approach Delay, s/veh / LOS	834.2	F		478.0	F		456.3	F		984.3	F	
Intersection Delay, s/veh / LOS	763.7						F					

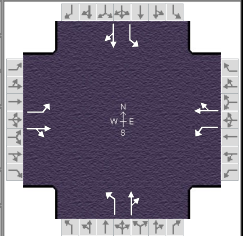
Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.95	B		1.95	B		1.93	B		1.93	B	

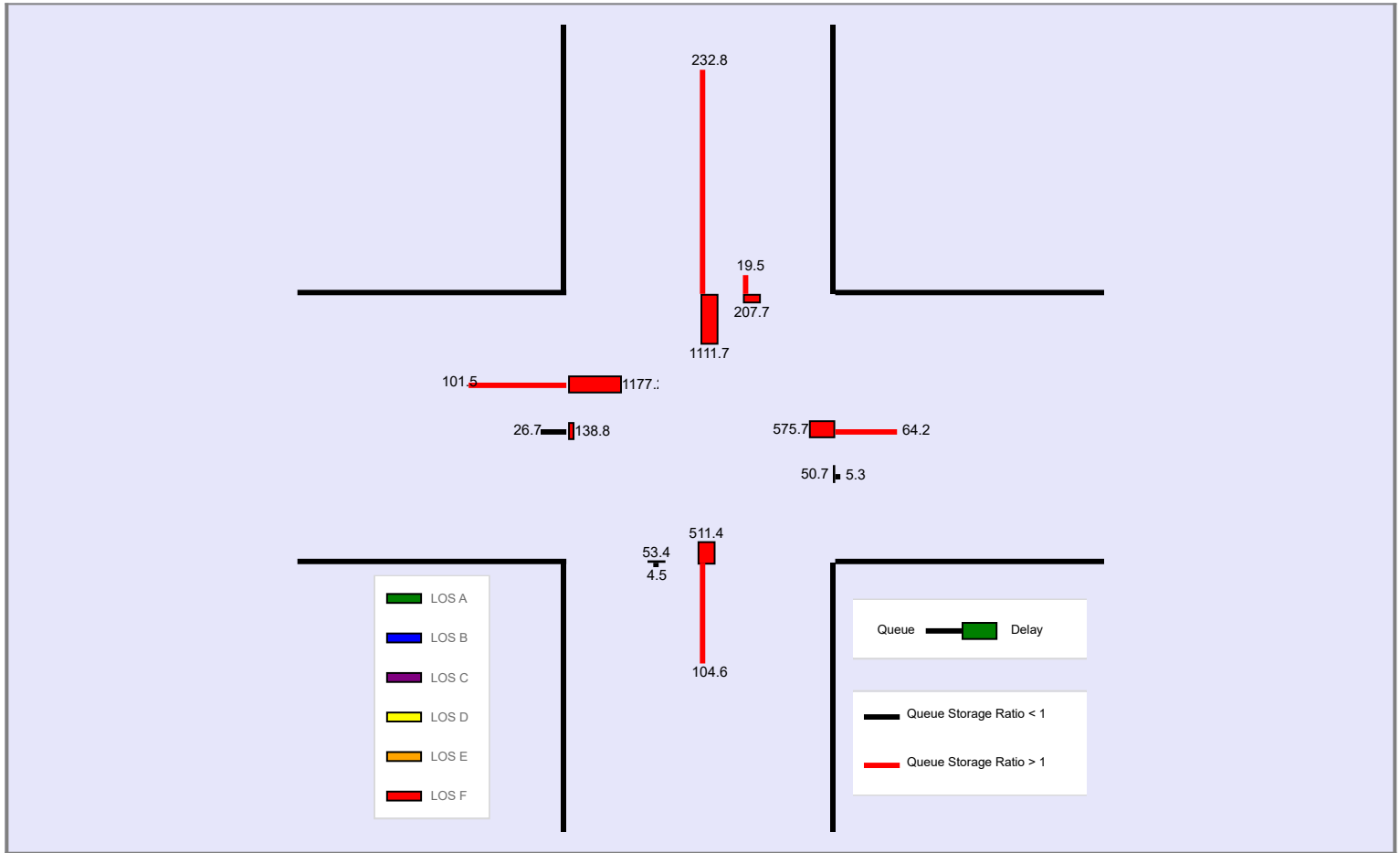
Bicycle LOS Score / LOS	3.05	C	2.03	B	2.91	C	5.03	E
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# HCS7 Signalized Intersection Intermediate Values

General Information						Intersection Information									
Agency		TRC Worldwide Engineering, Inc.				Duration, h		0.250							
Analyst		MLT		Analysis Date		2/17/2020		Area Type		Other					
Jurisdiction		Clarksville MPO		Time Period		DHV Afternoon Peak		PHF		0.92					
Urban Street		SR 374 (Richview Dr./W...		Analysis Year		2043		Analysis Period		1> 7:00					
Intersection		Memorial Dr.		File Name		SR 374 w Memorial Dr PM DHV Yr 2043 Existing....									
Project Description		Existing Conditions													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h				957	308	164	160	343	357	162	1071	115	357	1136	1041
Signal Information															
Cycle, s	144.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	12.1	1.9	50.0	13.1	0.9	30.0					
				Yellow	4.0	4.0	4.0	4.0	4.0	4.0					
				Red	2.0	2.0	2.0	2.0	2.0	2.0					
Saturation Flow / Delay				L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor (f_w)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor (f_HVg)				0.984	0.984	1.000	0.984	0.984	1.000	0.984	0.984	1.000	0.984	1.000	1.000
Parking Activity Adjustment Factor (f_p)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor (f_bb)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor (f_a)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor (f_LU)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Left-Turn Adjustment Factor (f_LT)				0.952	0.000		0.952	0.000		0.952	0.000		0.952	0.000	
Right-Turn Adjustment Factor (f_RT)					0.941	0.941		0.916	0.916		0.983	0.983		0.921	0.921
Left-Turn Pedestrian Adjustment Factor (f_Lpb)				1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor (f_Rpb)						1.000			1.000			1.000			1.000
Work Zone Adjustment Factor (f_wz)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor (f_DDI)				1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h				1781	1149	612	1781	839	874	1781	1660	178	1781	913	837
Proportion of Vehicles Arriving on Green (P)				0.14	0.26	0.26	0.09	0.21	0.21	0.08	0.35	0.35	0.14	0.40	0.40
Incremental Delay Factor (k)				0.50	0.50		0.12	0.50		0.12	0.50		0.50	0.50	
Signal Timing / Movement Groups				EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R				
Lost Time (t_L)				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				6.0
Green Ratio (g/C)				0.36	0.26	0.30	0.21	0.43	0.35	0.50	0.40				
Permitted Saturation Flow Rate (s_p), veh/h/ln				705	0	887	0	150	0	428	0				0
Shared Saturation Flow Rate (s_sh), veh/h/ln															
Permitted Effective Green Time (g_p), s				32.0	0.0	30.0	0.0	50.0	0.0	52.0	0.0				0.0
Permitted Service Time (g_u), s				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.0
Permitted Queue Service Time (g_ps), s				0.0		0.0		0.0		0.0					0.0
Time to First Blockage (g_t), s				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.0
Queue Service Time Before Blockage (g_ts), s															
Protected Right Saturation Flow (s_R), veh/h/ln															
Protected Right Effective Green Time (g_R), s															
Multimodal				EB			WB			NB			SB		
Pedestrian F_w / F_v				1.198	0.000	1.198	0.000	1.198	0.000	1.198	0.000	1.198	0.000	1.198	0.000
Pedestrian F_s / F_delay				0.000	0.148	0.000	0.153	0.000	0.137	0.000	0.137	0.000	0.130	0.000	0.130
Pedestrian M_corner / M_cw															
Bicycle c_b / d_b				512.94	39.80	416.67	45.13	694.44	30.68	803.54	25.77				
Bicycle F_w / F_v				-3.64	2.56	-3.64	1.54	-3.64	2.42	-3.64	4.54				

# HCS7 Signalized Intersection Results Graphical Summary

General Information						Intersection Information										
Agency	TRC Worldwide Engineering, Inc.					Duration, h	0.250									
Analyst	MLT		Analysis Date	2/17/2020		Area Type	Other									
Jurisdiction	Clarksville MPO		Time Period	DHV Afternoon Peak		PHF	0.92									
Urban Street	SR 374 (Richview Dr./W...		Analysis Year	2043		Analysis Period	1> 7:00									
Intersection	Memorial Dr.		File Name	SR 374 w Memorial Dr PM DHV Yr 2043 Existing....												
Project Description	Existing Conditions															
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand ( v ), veh/h				957	308	164	160	343	357	162	1071	115	357	1136	1041	
Signal Information																
Cycle, s	144.0	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	12.1	1.9	50.0	13.1	0.9	30.0						
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	4.0	4.0						
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	2.0						
Movement Group Results				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Back of Queue ( Q ), ft/ln ( 50 th percentile)				2576.9	679.1		133.4	1630.4		114.6	2656.4		494.4	5821.2		
Back of Queue ( Q ), veh/ln ( 50 th percentile)				101.5	26.7		5.3	64.2		4.5	104.6		19.5	232.8		
Queue Storage Ratio ( RQ ) ( 50 th percentile)				6.87	0.68		0.13	10.19		0.35	2.66		1.15	5.82		
Control Delay ( d ), s/veh				1177.2	138.8		50.7	575.7		53.4	511.4		207.7	1111.7		
Level of Service (LOS)				F	F		D	F		D	F		F	F		
Approach Delay, s/veh / LOS				834.2		F	478.0		F	456.3		F	984.3		F	
Intersection Delay, s/veh / LOS				763.7						F						



**--- Messages ---**

WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

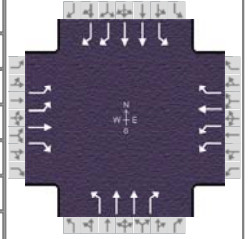
WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

**--- Comments ---**

# HCS7 Signalized Intersection Input Data

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	AM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr AM DHV yr 2023 Lead LTs...		
Project Description	2 Southbound RT Lead Lag				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	471	125	136	120	264	311	164	510	92	182	333	428

## Signal Information

Cycle, s	64.6	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	10.0	12.9	6.8	0.6	14.3	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	4.0	0.0		
				Red	1.0	1.0	1.0	0.0	1.0	0.0		

## Traffic Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	471	125	136	120	264	311	164	510	92	182	333	428
Initial Queue ( $Q_0$ ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate ( $s_0$ ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking ( $N_m$ ), man/h		None			None			None			None	
Heavy Vehicles ( $P_{HV}$ ), %	0	0	0	0	0	0	0	0	0	0	0	0
Ped / Bike / RTOR, /h	0	0	120	0	0	120	0	0	92	0	0	120
Buses ( $N_b$ ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type ( $AT$ )	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering ( $I$ )	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width ( $W$ ), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Turn Bay Length, ft	0	0	0	0	0	0	0	0	0	0	0	0
Grade ( $P_g$ ), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	35	35	35	35	35	35

## Phase Information

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green ( $G_{max}$ ) or Phase Split, s	30.0	35.0		35.0	20.0	30.0	20.0	35.0
Yellow Change Interval ( $Y$ ), s	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Red Clearance Interval ( $R_c$ ), s	1.0	1.0		1.0	1.0	1.0	1.0	1.0
Minimum Green ( $G_{min}$ ), s	6	6		6	6	6	6	6
Start-Up Lost Time ( $l_t$ ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green ( $e$ ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage ( $PT$ ), s	2.0	2.0		2.0	2.0	2.0	2.0	2.0
Recall Mode	Off	Min		Min	Off	Off	Off	Off
Dual Entry	No	Yes		Yes	No	Yes	No	Yes
Walk ( $Walk$ ), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time ( $PC$ ), s		0.0		0.0		0.0		0.0

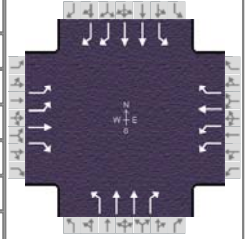
## Multimodal Information

	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	AM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr AM DHV yr 2023 Lead LTs...		
Project Description	2 Southbound RT Lead Lag				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	471	125	136	120	264	311	164	510	92	182	333	428

## Signal Information

Cycle, s	64.6	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	10.0	12.9	6.8	0.6	14.3	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	4.0	0.0		
				Red	1.0	1.0	1.0	0.0	1.0	0.0		

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	1.0	3.0		5.3	1.1	3.0	1.1	3.0
Phase Duration, s	15.0	32.9		17.9	11.8	19.3	12.4	19.9
Change Period, ( Y+R <sub>c</sub> ), s	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway ( MAH ), s	3.1	3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time ( g <sub>s</sub> ), s	8.8	4.8		11.2	6.8	11.1	7.3	7.5
Green Extension Time ( g <sub>e</sub> ), s	1.2	1.6		1.6	0.2	3.1	0.3	3.3
Phase Call Probability	1.00	1.00		1.00	0.96	1.00	0.97	1.00
Max Out Probability	0.00	0.00		0.00	0.00	0.01	0.00	0.00

## Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	512	136	17	130	287	208	178	554	0	198	362	335
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1757	1900	1610	1273	1900	1610	1810	1809	1610	1810	1809	1425
Queue Service Time ( $g_s$ ), s	6.8	2.8	0.4	2.8	9.2	6.6	4.8	9.1	0.0	5.3	5.5	5.3
Cycle Queue Clearance Time ( $g_c$ ), s	6.8	2.8	0.4	2.8	9.2	6.6	4.8	9.1	0.0	5.3	5.5	5.3
Green Ratio ( $g/C$ )	0.39	0.43	0.43	0.20	0.20	0.31	0.33	0.22	0.22	0.34	0.23	0.39
Capacity ( $c$ ), veh/h	897	822	696	731	379	506	421	802	357	388	836	1103
Volume-to-Capacity Ratio ( $X$ )	0.571	0.165	0.025	0.179	0.756	0.411	0.423	0.691	0.000	0.509	0.433	0.304
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	59.9	26.1	3.1	19.5	98.5	55.6	45.2	90.4	0	50.1	54.4	37.6
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	2.4	1.0	0.1	0.8	3.9	2.2	1.8	3.6	0.0	2.0	2.2	1.5
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	15.6	11.2	10.6	21.9	24.4	17.5	16.7	23.2	0.0	16.9	21.3	13.8
Incremental Delay ( $d_2$ ), s/veh	0.2	0.0	0.0	0.0	1.2	0.2	0.3	0.4	0.0	0.4	0.1	0.1
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	15.8	11.3	10.6	21.9	25.6	17.7	17.0	23.6	0.0	17.3	21.4	13.9
Level of Service (LOS)	B	B	B	C	C	B	B	C		B	C	B
Approach Delay, s/veh / LOS	14.7	B		22.2	C		22.0	C		17.7	B	
Intersection Delay, s/veh / LOS	19.1						B					

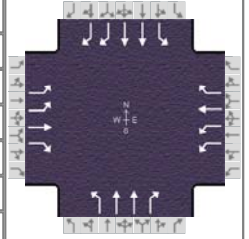
## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.54	C		2.74	C		2.45	B		2.60	C	
Bicycle LOS Score / LOS	1.59	B		1.52	B		1.09	A		1.23	A	

## HCS7 Signalized Intersection Intermediate Values

### General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	AM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr AM DHV yr 2023 Lead LTs...		
Project Description	2 Southbound RT Lead Lag				



### Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	471	125	136	120	264	311	164	510	92	182	333	428

### Signal Information

Cycle, s	64.6	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	10.0	12.9	6.8	0.6	14.3	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	4.0	0.0		
				Red	1.0	1.0	1.0	0.0	1.0	0.0		

### Saturation Flow / Delay

	L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( $f_w$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( $f_{HVG}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Parking Activity Adjustment Factor ( $f_p$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( $f_{bb}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( $f_a$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( $f_{LU}$ )	0.971	1.000	1.000	0.971	1.000	1.000	1.000	0.952	1.000	1.000	0.952	0.885
Left-Turn Adjustment Factor ( $f_{LT}$ )	0.952	0.000		0.670	0.000		0.952	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( $f_{RT}$ )		0.000	0.847		0.000	0.847		0.000	0.847		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( $f_{LPB}$ )	1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( $f_{RPB}$ )			1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( $f_{WZ}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( $f_{DDI}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate ( $s$ ), veh/h	3514	1900	1610	2547	1900	1610	1810	3618	1610	1810	3618	2850
Proportion of Vehicles Arriving on Green ( $P$ )	0.16	0.43	0.43	0.20	0.20	0.20	0.10	0.22	0.00	0.11	0.23	0.23
Incremental Delay Factor ( $k$ )	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04		0.04	0.04	0.04

### Signal Timing / Movement Groups

	EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R
Lost Time ( $t_L$ )	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Green Ratio ( $g/C$ )	0.39	0.43		0.20	0.33	0.22	0.34	0.23
Permitted Saturation Flow Rate ( $s_p$ ), veh/h/ln	1110	0		1273	1036	0	868	0
Shared Saturation Flow Rate ( $s_{sh}$ ), veh/h/ln								
Permitted Effective Green Time ( $g_p$ ), s	14.9	0.0		12.9	14.4	0.0	14.4	0.0
Permitted Service Time ( $g_u$ ), s	3.7	0.0		13.1	7.5	0.0	5.3	0.0
Permitted Queue Service Time ( $g_{ps}$ ), s	3.4			2.8	1.4		2.7	
Time to First Blockage ( $g_t$ ), s	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Queue Service Time Before Blockage ( $g_{ts}$ ), s								
Protected Right Saturation Flow ( $s_R$ ), veh/h/ln		0		1610		0		1425
Protected Right Effective Green Time ( $g_R$ ), s		0.0		7.4		0.0		10.1

### Multimodal

	EB		WB		NB		SB	
Pedestrian $F_w / F_v$	1.710	0.131	1.852	0.171	1.557	0.171	1.710	0.171
Pedestrian $F_s / F_{delay}$	0.000	0.094	0.000	0.122	0.000	0.119	0.000	0.118
Pedestrian $M_{corner} / M_{cw}$								
Bicycle $c_b / d_b$	864.42	10.42	398.73	20.71	442.98	19.58	461.97	19.11
Bicycle $F_w / F_v$	-3.64	1.10	-3.64	1.03	-3.64	0.60	-3.64	0.74

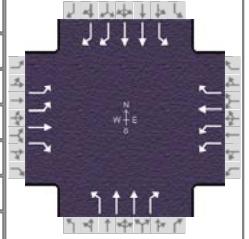
# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering
Analyst	MLT
Jurisdiction	Clarksville MPO
Urban Street	SR 374
Intersection	Memorial Drive
Project Description	2 Southbound RT Lead Lag

## Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.92
Analysis Period	1> 7:00
File Name	SR 374 w Memorial Dr AM DHV yr 2023 Lead LTs...



## Demand Information

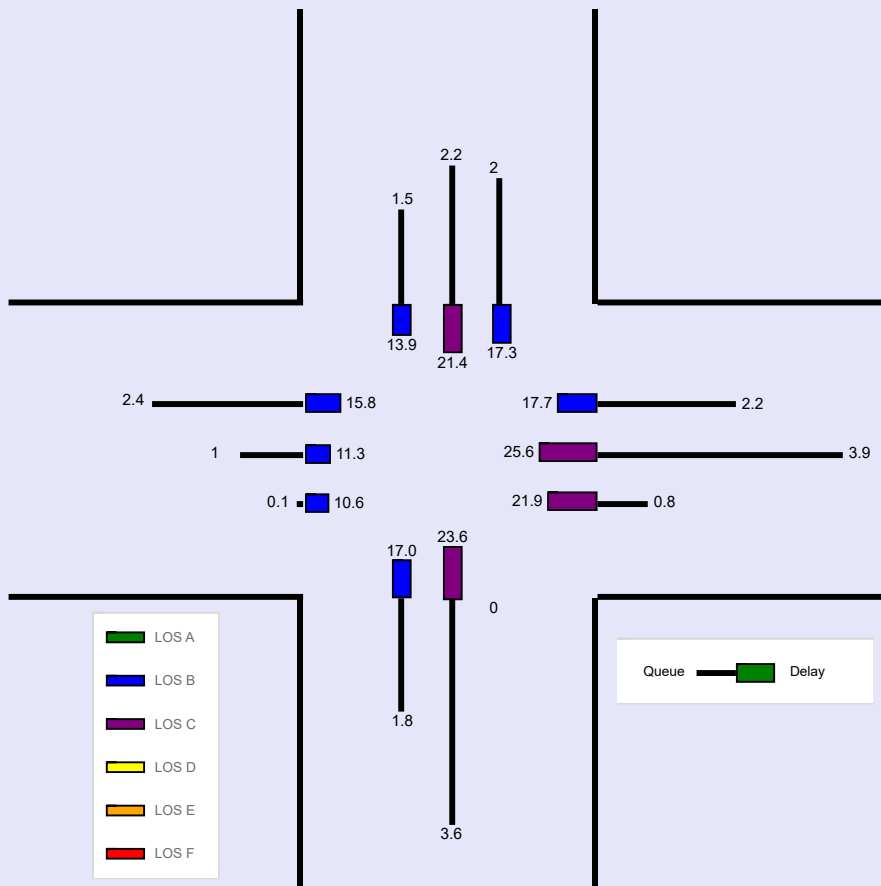
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	471	125	136	120	264	311	164	510	92	182	333	428

## Signal Information

Cycle, s	64.6	Reference Phase	2								
Offset, s	0	Reference Point	End	Green	10.0	12.9	6.8	0.6	14.3	0.0	
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	0.0	4.0	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0	1.0	0.0	1.0	0.0	

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	59.9	26.1	3.1	19.5	98.5	55.6	45.2	90.4	0	50.1	54.4	37.6
Back of Queue ( Q ), veh/ln ( 50 th percentile)	2.4	1.0	0.1	0.8	3.9	2.2	1.8	3.6	0.0	2.0	2.2	1.5
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control Delay ( d ), s/veh	15.8	11.3	10.6	21.9	25.6	17.7	17.0	23.6	0.0	17.3	21.4	13.9
Level of Service (LOS)	B	B	B	C	C	B	B	C		B	C	B
Approach Delay, s/veh / LOS	14.7	B		22.2	C		22.0	C		17.7	B	
Intersection Delay, s/veh / LOS	19.1						B					



**--- Messages ---**

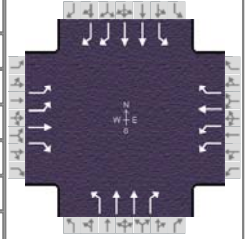
No errors or warnings exist.

**--- Comments ---**

# HCS7 Signalized Intersection Input Data

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	PM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr PM DHV yr 2023 Lead LTs...		
Project Description	2 Southbound RT Lead Lag				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	568	183	97	95	204	212	96	636	68	212	675	618

## Signal Information

Cycle, s	75.1	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	13.7	11.7	8.6	21.1	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	1.0	1.0	1.0	1.0	0.0	0.0		

## Traffic Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	568	183	97	95	204	212	96	636	68	212	675	618
Initial Queue ( Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate ( s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking ( N <sub>m</sub> ), man/h		None		0	L			None			None	
Heavy Vehicles ( P <sub>HV</sub> ), %	0	0	0	0	0	0	0	0	0	0	0	0
Ped / Bike / RTOR, /h	0	0	97	0	0	120	0	0	68	0	0	120
Buses ( N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type ( AT )	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering ( I )	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width ( W ), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Turn Bay Length, ft	0	0	0	0	0	0	0	0	0	0	0	0
Grade ( P <sub>g</sub> ), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	35	35	35	35	35	35

## Phase Information

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green ( G <sub>max</sub> ) or Phase Split, s	30.0	35.0		35.0		35.0	20.0	35.0
Yellow Change Interval ( Y ), s	4.0	4.0		4.0		4.0	4.0	4.0
Red Clearance Interval ( R <sub>c</sub> ), s	1.0	1.0		1.0		1.0	1.0	1.0
Minimum Green ( G <sub>min</sub> ), s	6	6		6		6	6	6
Start-Up Lost Time ( l <sub>t</sub> ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green ( e ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage ( P <sub>T</sub> ), s	2.0	2.0		2.0		2.0	2.0	2.0
Recall Mode	Off	Min		Min		Off	Off	Off
Dual Entry	No	Yes		Yes		Yes	No	Yes
Walk ( Walk ), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time ( P <sub>C</sub> ), s		0.0		0.0		0.0		0.0

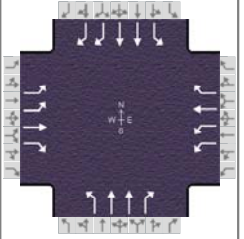
## Multimodal Information

	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	PM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr PM DHV yr 2023 Lead LTs...		
Project Description	2 Southbound RT Lead Lag				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	568	183	97	95	204	212	96	636	68	212	675	618

## Signal Information

Cycle, s	75.1	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	13.7	11.7	8.6	21.1	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	1.0	1.0	1.0	1.0	0.0	0.0		

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8	7	4
Case Number	1.0	3.0		5.3		5.3	1.0	3.0
Phase Duration, s	18.7	35.4		16.7		26.1	13.6	39.8
Change Period, ( $Y+R_c$ ), s	5.0	5.0		5.0		5.0	5.0	5.0
Max Allow Headway ( $MAH$ ), s	3.1	3.2		3.2		3.2	3.1	3.2
Queue Clearance Time ( $g_s$ ), s	12.2	7.2		10.4		14.8	8.3	12.3
Green Extension Time ( $g_e$ ), s	1.5	1.2		1.2		5.9	0.3	6.5
Phase Call Probability	1.00	1.00		1.00		1.00	0.99	1.00
Max Out Probability	0.00	0.00		0.00		0.10	0.00	0.07

## Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	617	199	0	103	222	100	104	691	0	230	734	541
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1757	1900	1610	1202	1900	1610	735	1809	1610	1810	1809	1425
Queue Service Time ( $g_s$ ), s	10.2	5.2	0.0	2.9	8.4	3.6	9.0	12.8	0.0	6.3	10.3	6.3
Cycle Queue Clearance Time ( $g_c$ ), s	10.2	5.2	0.0	2.9	8.4	3.6	9.0	12.8	0.0	6.3	10.3	6.3
Green Ratio ( $g/C$ )	0.36	0.40	0.40	0.16	0.16	0.27	0.28	0.28	0.28	0.42	0.46	0.65
Capacity ( $c$ ), veh/h	936	768	651	565	295	435	302	1018	453	388	1674	1839
Volume-to-Capacity Ratio ( $X$ )	0.660	0.259	0.000	0.183	0.751	0.230	0.345	0.679	0.000	0.594	0.438	0.294
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	96.2	52.3	0	19.7	94.3	32.6	36.8	128.3	0	60.3	93.9	36.1
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	3.8	2.1	0.0	0.8	3.8	1.3	1.5	5.1	0.0	2.4	3.8	1.4
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	19.4	14.9	0.0	28.0	30.4	21.4	22.6	24.0	0.0	16.5	13.6	5.8
Incremental Delay ( $d_2$ ), s/veh	0.3	0.1	0.0	0.1	1.5	0.1	0.3	0.3	0.0	0.5	0.1	0.0
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	19.7	15.0	0.0	28.1	31.8	21.5	22.9	24.3	0.0	17.0	13.7	5.9
Level of Service (LOS)	B	B		C	C	C	C	C		B	B	A
Approach Delay, s/veh / LOS	18.6	B		28.5	C		24.1	C		11.4	B	
Intersection Delay, s/veh / LOS	18.0						B					

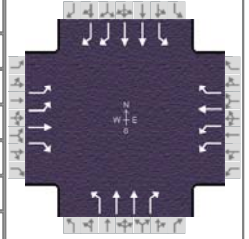
## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.51	C		2.75	C		2.45	B		2.54	C	
Bicycle LOS Score / LOS	1.83	B		1.19	A		1.14	A		1.73	B	

# HCS7 Signalized Intersection Intermediate Values

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	PM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr PM DHV yr 2023 Lead LTs...		
Project Description	2 Southbound RT Lead Lag				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	568	183	97	95	204	212	96	636	68	212	675	618

## Signal Information

Cycle, s	75.1	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

## Saturation Flow / Delay

	L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( $f_w$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( $f_{HVg}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Parking Activity Adjustment Factor ( $f_p$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( $f_{bb}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( $f_a$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( $f_{LU}$ )	0.971	1.000	1.000	0.971	1.000	1.000	1.000	0.952	1.000	1.000	0.952	0.885
Left-Turn Adjustment Factor ( $f_{LT}$ )	0.952	0.000		0.633	0.000		0.387	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( $f_{RT}$ )		0.000	0.847		0.000	0.847		0.000	0.847		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( $f_{LPB}$ )	1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( $f_{RPB}$ )			1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( $f_{WZ}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( $f_{DDI}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h	3514	1900	1610	2405	1900	1610	735	3618	1610	1810	3618	2850
Proportion of Vehicles Arriving on Green (P)	0.18	0.40	0.00	0.16	0.16	0.16	0.28	0.28	0.00	0.11	0.46	0.46
Incremental Delay Factor (k)	0.04	0.04		0.04	0.04	0.04	0.04	0.04		0.04	0.04	0.04

## Signal Timing / Movement Groups

	EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R
Lost Time ( $t_L$ )	5.0	5.0		5.0		5.0	5.0	5.0
Green Ratio ( $g/C$ )	0.36	0.40		0.16		0.28	0.42	0.46
Permitted Saturation Flow Rate ( $s_p$ ), veh/h/ln	1178	0		1202		735	764	0
Shared Saturation Flow Rate ( $s_{sh}$ ), veh/h/ln								
Permitted Effective Green Time ( $g_p$ ), s	13.7	0.0		11.7		21.2	23.2	0.0
Permitted Service Time ( $g_u$ ), s	3.3	0.0		11.8		21.2	8.3	0.0
Permitted Queue Service Time ( $g_{ps}$ ), s	3.3			2.9		9.0	6.4	
Time to First Blockage ( $g_r$ ), s	0.0	0.0		0.0		0.0	0.0	0.0
Queue Service Time Before Blockage ( $g_{ts}$ ), s								
Protected Right Saturation Flow ( $s_R$ ), veh/h/ln		0		1610		0		1425
Protected Right Effective Green Time ( $g_R$ ), s		0.0		8.6		0.0		13.7

## Multimodal

	EB		WB		NB		SB	
Pedestrian $F_w / F_v$	1.710	0.097	1.852	0.171	1.557	0.171	1.710	0.138
Pedestrian $F_s / F_{delay}$	0.000	0.104	0.000	0.132	0.000	0.119	0.000	0.096
Pedestrian $M_{corner} / M_{cw}$								
Bicycle $c_b / d_b$	808.47	13.33	310.62	26.80	562.70	19.40	925.26	10.85
Bicycle $F_w / F_v$	-3.64	1.35	-3.64	0.70	-3.64	0.66	-3.64	1.24

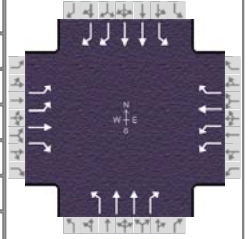
# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering
Analyst	MLT
Jurisdiction	Clarksville MPO
Urban Street	SR 374
Intersection	Memorial Drive
Project Description	2 Southbound RT Lead Lag

## Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.92
Analysis Period	1> 7:00
File Name	SR 374 w Memorial Dr PM DHV yr 2023 Lead LTs...



## Demand Information

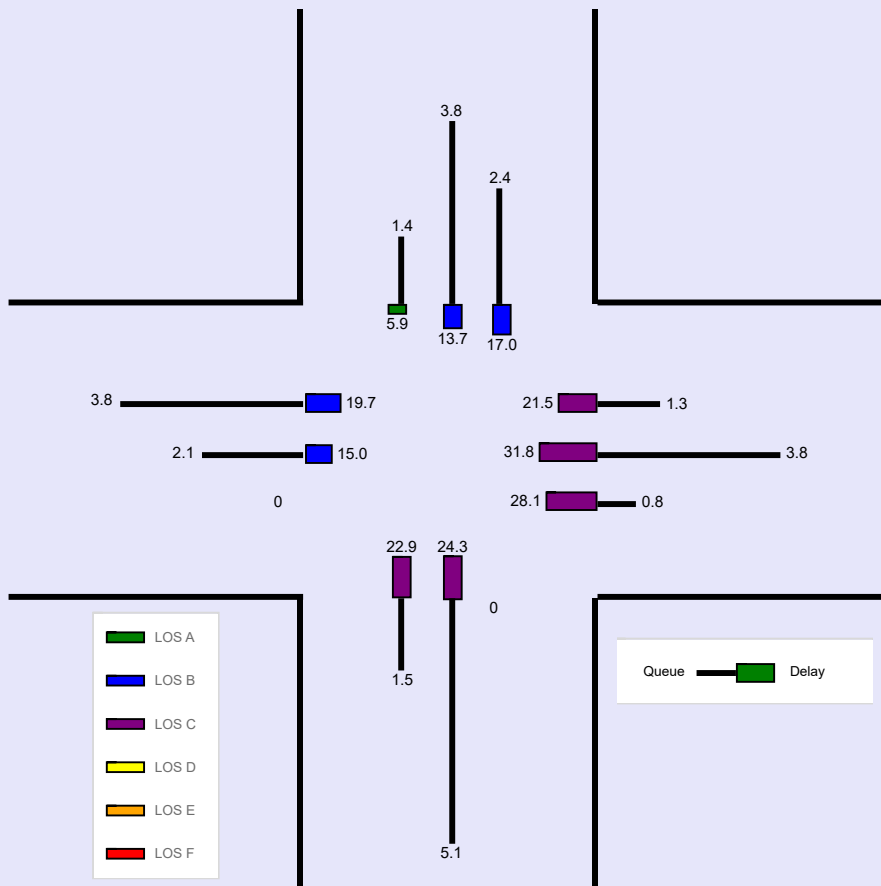
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	568	183	97	95	204	212	96	636	68	212	675	618

## Signal Information

Cycle, s	75.1	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	96.2	52.3	0	19.7	94.3	32.6	36.8	128.3	0	60.3	93.9	36.1
Back of Queue ( Q ), veh/ln ( 50 th percentile)	3.8	2.1	0.0	0.8	3.8	1.3	1.5	5.1	0.0	2.4	3.8	1.4
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control Delay ( d ), s/veh	19.7	15.0	0.0	28.1	31.8	21.5	22.9	24.3	0.0	17.0	13.7	5.9
Level of Service (LOS)	B	B		C	C	C	C	C		B	B	A
Approach Delay, s/veh / LOS	18.6		B	28.5		C	24.1		C	11.4		B
Intersection Delay, s/veh / LOS	18.0						B					



**--- Messages ---**

No errors or warnings exist.

**--- Comments ---**

**--- Messages ---**

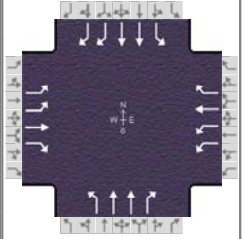
WARNING: Since queue spillover from turn lanes and spillback into upstream intersections is not accounted for in the HCM procedures, use of a simulation tool may be advised in situations where the Queue Storage Ratio exceeds 1.0.

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

**--- Comments ---**

# HCS7 Signalized Intersection Input Data

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	AM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr AM DHV yr 2033 Lead LTs...		
Project Description	2 Southbound RT Lead Lag				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	632	168	182	161	354	417	220	684	124	244	447	574

Signal Information											
Cycle, s	97.1	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	17.1	22.8	11.6	1.0	24.5	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	4.0	0.0	
				Red	1.0	1.0	1.0	0.0	1.0	0.0	

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	632	168	182	161	354	417	220	684	124	244	447	574
Initial Queue ( Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate ( s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking ( N <sub>m</sub> ), man/h		None			None			None			None	
Heavy Vehicles ( P <sub>HV</sub> ), %	0	0	0	0	0	0	0	0	0	0	0	0
Ped / Bike / RTOR, /h	0	0	120	0	0	120	0	0	120	0	0	120
Buses ( N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type ( AT )	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering ( I )	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width ( W ), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Turn Bay Length, ft	0	0	0	0	0	0	0	0	0	0	0	0
Grade ( P <sub>g</sub> ), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	35	35	35	35	35	35

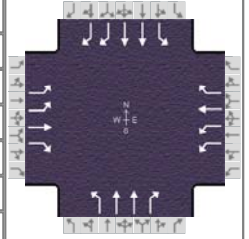
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green ( G <sub>max</sub> ) or Phase Split, s	30.0	35.0		35.0	20.0	30.0	20.0	35.0
Yellow Change Interval ( Y ), s	4.0	4.0		4.0	4.0	4.0	4.0	4.0
Red Clearance Interval ( R <sub>c</sub> ), s	1.0	1.0		1.0	1.0	1.0	1.0	1.0
Minimum Green ( G <sub>min</sub> ), s	6	6		6	6	6	6	6
Start-Up Lost Time ( l <sub>t</sub> ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green ( e ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage ( PT ), s	2.0	2.0		2.0	2.0	2.0	2.0	2.0
Recall Mode	Off	Min		Min	Off	Off	Off	Off
Dual Entry	No	Yes		Yes	No	Yes	No	Yes
Walk ( Walk ), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time ( PC ), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	AM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr AM DHV yr 2033 Lead LTs...		
Project Description	2 Southbound RT Lead Lag				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	632	168	182	161	354	417	220	684	124	244	447	574

## Signal Information

Cycle, s	97.1	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	17.1	22.8	11.6	1.0	24.5	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	4.0	0.0		
				Red	1.0	1.0	1.0	0.0	1.0	0.0		

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	1.0	3.0		5.3	1.1	3.0	1.1	3.0
Phase Duration, s	22.1	49.9		27.8	16.6	29.5	17.7	30.5
Change Period, ( $Y+R_c$ ), s	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway ( $MAH$ ), s	3.1	3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time ( $g_s$ ), s	15.4	7.6		20.9	11.3	20.8	12.3	13.4
Green Extension Time ( $g_e$ ), s	1.6	2.5		1.8	0.3	3.5	0.3	4.8
Phase Call Probability	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.00	0.00		0.04	0.01	0.31	0.02	0.03

## Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	687	183	67	175	385	323	239	743	4	265	486	493
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1757	1900	1610	1220	1900	1610	1810	1809	1610	1810	1809	1425
Queue Service Time ( $g_s$ ), s	13.4	5.6	2.3	5.8	18.9	15.5	9.3	18.8	0.2	10.3	11.1	11.4
Cycle Queue Clearance Time ( $g_c$ ), s	13.4	5.6	2.3	5.8	18.9	15.5	9.3	18.8	0.2	10.3	11.1	11.4
Green Ratio ( $g/C$ )	0.43	0.46	0.46	0.24	0.24	0.37	0.37	0.25	0.25	0.38	0.26	0.44
Capacity ( $c$ ), veh/h	850	880	746	722	447	590	410	912	406	353	951	1252
Volume-to-Capacity Ratio ( $X$ )	0.808	0.208	0.090	0.242	0.860	0.547	0.584	0.815	0.011	0.752	0.511	0.394
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	133.4	58	20.1	41.5	226.1	142.8	96.7	210.6	1.9	111.1	118.8	90.1
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	5.3	2.3	0.8	1.7	9.0	5.7	3.9	8.4	0.1	4.4	4.8	3.6
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	22.5	15.5	14.7	30.7	35.7	24.5	23.1	34.3	27.3	24.4	30.6	18.5
Incremental Delay ( $d_2$ ), s/veh	1.1	0.0	0.0	0.1	4.6	0.3	0.5	3.2	0.0	2.4	0.2	0.1
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	23.5	15.6	14.7	30.7	40.3	24.8	23.6	37.5	27.3	26.8	30.7	18.6
Level of Service (LOS)	C	B	B	C	D	C	C	D	C	C	C	B
Approach Delay, s/veh / LOS	21.4	C		32.7	C		34.1	C		25.1	C	
Intersection Delay, s/veh / LOS	28.1						C					

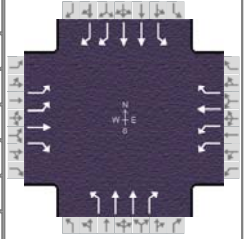
## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.59	C		2.76	C		2.46	B		2.61	C	
Bicycle LOS Score / LOS	2.03	B		1.94	B		1.30	A		1.51	B	

# HCS7 Signalized Intersection Intermediate Values

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	AM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr AM DHV yr 2033 Lead LTs...		
Project Description	2 Southbound RT Lead Lag				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	632	168	182	161	354	417	220	684	124	244	447	574

## Signal Information

Cycle, s	97.1	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	17.1	22.8	11.6	1.0	24.5	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	4.0	0.0		
				Red	1.0	1.0	1.0	0.0	1.0	0.0		

## Saturation Flow / Delay

	L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( $f_w$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( $f_{HVg}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Parking Activity Adjustment Factor ( $f_p$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( $f_{bb}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( $f_a$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( $f_{LU}$ )	0.971	1.000	1.000	0.971	1.000	1.000	1.000	0.952	1.000	1.000	0.952	0.885
Left-Turn Adjustment Factor ( $f_{LT}$ )	0.952	0.000		0.642	0.000		0.952	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( $f_{RT}$ )		0.000	0.847		0.000	0.847		0.000	0.847		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( $f_{LPB}$ )	1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( $f_{RPB}$ )			1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( $f_{WZ}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( $f_{DDI}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h	3514	1900	1610	2441	1900	1610	1810	3618	1610	1810	3618	2850
Proportion of Vehicles Arriving on Green (P)	0.18	0.46	0.46	0.24	0.24	0.24	0.12	0.25	0.25	0.13	0.26	0.26
Incremental Delay Factor (k)	0.06	0.04	0.04	0.04	0.10	0.04	0.04	0.19	0.04	0.08	0.04	0.04

## Signal Timing / Movement Groups

	EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R
Lost Time ( $t_L$ )	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Green Ratio (g/C)	0.43	0.46		0.24	0.37	0.25	0.38	0.26
Permitted Saturation Flow Rate ( $s_p$ ), veh/h/ln	1014	0		1220	924	0	728	0
Shared Saturation Flow Rate ( $s_{sh}$ ), veh/h/ln								
Permitted Effective Green Time ( $g_p$ ), s	24.9	0.0		22.9	24.6	0.0	24.6	0.0
Permitted Service Time ( $g_u$ ), s	4.0	0.0		23.1	12.5	0.0	5.7	0.0
Permitted Queue Service Time ( $g_{ps}$ ), s	4.0			5.8	4.2		5.7	
Time to First Blockage ( $g_t$ ), s	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Queue Service Time Before Blockage ( $g_{ts}$ ), s								
Protected Right Saturation Flow ( $s_R$ ), veh/h/ln		0		1610		0		1425
Protected Right Effective Green Time ( $g_R$ ), s		0.0		12.7		0.0		17.2

## Multimodal

	EB		WB		NB		SB	
Pedestrian $F_w / F_v$	1.710	0.171	1.852	0.171	1.557	0.171	1.710	0.171
Pedestrian $F_s / F_{delay}$	0.000	0.106	0.000	0.134	0.000	0.132	0.000	0.131
Pedestrian $M_{corner} / M_{cw}$								
Bicycle $c_b / d_b$	925.64	14.01	470.35	28.41	504.21	27.16	525.72	26.39
Bicycle $F_w / F_v$	-3.64	1.55	-3.64	1.46	-3.64	0.81	-3.64	1.03

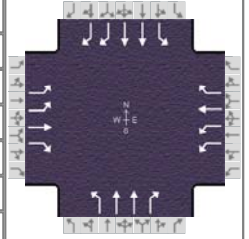
# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering
Analyst	MLT
Jurisdiction	Clarksville MPO
Urban Street	SR 374
Intersection	Memorial Drive
Project Description	2 Southbound RT Lead Lag

## Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.92
Analysis Period	1> 7:00
File Name	SR 374 w Memorial Dr AM DHV yr 2033 Lead LTs...



## Demand Information

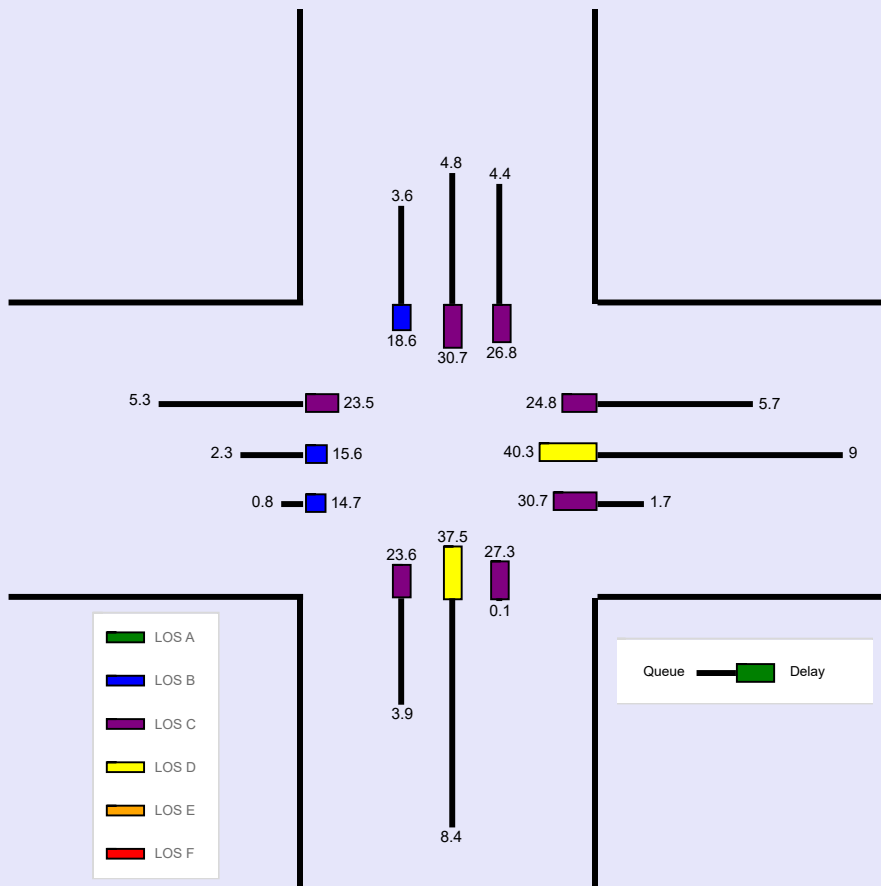
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	632	168	182	161	354	417	220	684	124	244	447	574

## Signal Information

Cycle, s	97.1	Reference Phase	2								
Offset, s	0	Reference Point	End	Green	17.1	22.8	11.6	1.0	24.5	0.0	
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	0.0	4.0	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0	1.0	0.0	1.0	0.0	

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( Q ), ft/ln ( 50 th percentile)	133.4	58	20.1	41.5	226.1	142.8	96.7	210.6	1.9	111.1	118.8	90.1
Back of Queue ( Q ), veh/ln ( 50 th percentile)	5.3	2.3	0.8	1.7	9.0	5.7	3.9	8.4	0.1	4.4	4.8	3.6
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control Delay ( d ), s/veh	23.5	15.6	14.7	30.7	40.3	24.8	23.6	37.5	27.3	26.8	30.7	18.6
Level of Service (LOS)	C	B	B	C	D	C	C	D	C	C	C	B
Approach Delay, s/veh / LOS	21.4	C		32.7	C		34.1	C		25.1	C	
Intersection Delay, s/veh / LOS	28.1						C					



**--- Messages ---**

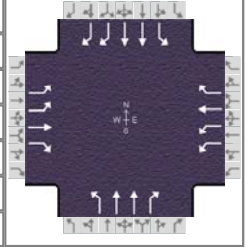
No errors or warnings exist.

**--- Comments ---**

# HCS7 Signalized Intersection Input Data

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	PM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr PM DHV yr 2033 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead WB				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	762	245	130	128	274	284	129	853	91	284	906	829

## Signal Information

Cycle, s	111.6	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	23.9	20.4	15.9	31.4	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	1.0	1.0	1.0	1.0	0.0	0.0		

## Traffic Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	762	245	130	128	274	284	129	853	91	284	906	829
Initial Queue (Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N <sub>m</sub> ), man/h		None		0	L			None			None	
Heavy Vehicles (P <sub>HV</sub> ), %	0	0	0	0	0	0	0	0	0	0	0	0
Ped / Bike / RTOR, /h	0	0	120	0	0	120	0	0	91	0	0	120
Buses (N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Turn Bay Length, ft	0	0	0	0	0	0	0	0	0	0	0	0
Grade (P <sub>g</sub> ), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	35	35	35	35	35	35

## Phase Information

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G <sub>max</sub> ) or Phase Split, s	30.0	35.0		35.0		35.0	20.0	35.0
Yellow Change Interval (Y), s	4.0	4.0		4.0		4.0	4.0	4.0
Red Clearance Interval (R <sub>c</sub> ), s	1.0	1.0		1.0		1.0	1.0	1.0
Minimum Green (G <sub>min</sub> ), s	6	6		6		6	6	6
Start-Up Lost Time (I <sub>t</sub> ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.0	2.0		2.0		2.0	2.0	2.0
Recall Mode	Off	Min		Min		Off	Off	Off
Dual Entry	No	Yes		Yes		Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

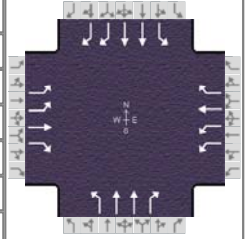
## Multimodal Information

	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	PM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr PM DHV yr 2033 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead WB				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	762	245	130	128	274	284	129	853	91	284	906	829

## Signal Information

Cycle, s	111.6	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	23.9	20.4	15.9	31.4	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	1.0	1.0	1.0	1.0	0.0	0.0		

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8	7	4
Case Number	1.0	3.0		5.3		5.3	1.0	3.0
Phase Duration, s	28.9	54.3		25.4		36.4	20.9	57.3
Change Period, ( $Y+R_c$ ), s	5.0	5.0		5.0		5.0	5.0	5.0
Max Allow Headway ( $MAH$ ), s	3.1	3.2		3.2		3.3	3.1	3.3
Queue Clearance Time ( $g_s$ ), s	22.2	12.2		19.0		29.8	15.5	24.3
Green Extension Time ( $g_e$ ), s	1.6	1.9		1.2		1.5	0.3	6.8
Phase Call Probability	1.00	1.00		1.00		1.00	1.00	1.00
Max Out Probability	0.13	0.00		0.01		0.88	0.33	0.61

## Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	828	266	11	139	298	178	140	927	0	309	985	771
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1757	1900	1610	1131	1900	1610	581	1809	1610	1810	1809	1425
Queue Service Time ( $g_s$ ), s	20.2	10.2	0.4	6.0	17.0	9.4	26.0	27.8	0.0	13.5	22.3	13.2
Cycle Queue Clearance Time ( $g_c$ ), s	20.2	10.2	0.4	6.0	17.0	9.4	27.1	27.8	0.0	13.5	22.3	13.2
Green Ratio ( $g/C$ )	0.42	0.44	0.44	0.18	0.18	0.33	0.28	0.28	0.28	0.44	0.47	0.68
Capacity ( $c$ ), veh/h	949	840	712	542	348	525	222	1018	453	343	1696	1948
Volume-to-Capacity Ratio ( $X$ )	0.873	0.317	0.015	0.257	0.857	0.340	0.632	0.911	0.000	0.901	0.581	0.396
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	223.8	111.1	3.9	41.6	203.4	90.2	95.6	335.1	0	185.5	229.4	89.5
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	9.0	4.4	0.2	1.7	8.1	3.6	3.8	13.4	0.0	7.4	9.2	3.6
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	27.2	20.3	17.6	39.9	44.4	28.7	39.2	38.9	0.0	28.0	21.7	7.7
Incremental Delay ( $d_2$ ), s/veh	5.9	0.1	0.0	0.1	2.5	0.1	3.2	9.7	0.0	18.8	0.3	0.0
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	33.2	20.4	17.6	40.0	46.9	28.8	42.5	48.7	0.0	46.8	22.1	7.8
Level of Service (LOS)	C	C	B	D	D	C	D	D		D	C	A
Approach Delay, s/veh / LOS	29.9	C		40.1	D		47.9	D		20.4	C	
Intersection Delay, s/veh / LOS	31.1						C					

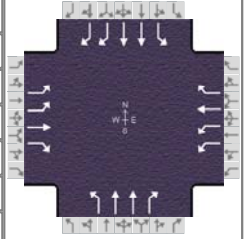
## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.55	C		2.77	C		2.46	B		2.59	C	
Bicycle LOS Score / LOS	2.31	B		1.50	B		1.37	A		2.19	B	

# HCS7 Signalized Intersection Intermediate Values

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	PM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr PM DHV yr 2033 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead WB				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	762	245	130	128	274	284	129	853	91	284	906	829

## Signal Information

Cycle, s	111.6	Reference Phase	2									
Offset, s	0	Reference Point	End	Green	23.9	20.4	15.9	31.4	0.0	0.0		
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0	1.0	1.0	0.0	0.0		

## Saturation Flow / Delay

	L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( $f_w$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( $f_{HVG}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Parking Activity Adjustment Factor ( $f_p$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( $f_{bb}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( $f_a$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( $f_{LU}$ )	0.971	1.000	1.000	0.971	1.000	1.000	1.000	0.952	1.000	1.000	0.952	0.885
Left-Turn Adjustment Factor ( $f_{LT}$ )	0.952	0.000		0.595	0.000		0.306	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( $f_{RT}$ )		0.000	0.847		0.000	0.847		0.000	0.847		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( $f_{LPB}$ )	1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( $f_{RPB}$ )			1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( $f_{WZ}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( $f_{DDI}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate ( $s$ ), veh/h	3514	1900	1610	2261	1900	1610	581	3618	1610	1810	3618	2850
Proportion of Vehicles Arriving on Green ( $P$ )	0.21	0.44	0.44	0.18	0.18	0.18	0.28	0.28	0.00	0.14	0.47	0.47
Incremental Delay Factor ( $k$ )	0.25	0.04	0.04	0.04	0.04	0.04	0.12	0.34		0.28	0.11	0.04

## Signal Timing / Movement Groups

	EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R
Lost Time ( $t_L$ )	5.0	5.0		5.0		5.0	5.0	5.0
Green Ratio ( $g/C$ )	0.42	0.44		0.18		0.28	0.44	0.47
Permitted Saturation Flow Rate ( $s_p$ ), veh/h/ln	1099	0		1131		581	613	0
Shared Saturation Flow Rate ( $s_{sh}$ ), veh/h/ln								
Permitted Effective Green Time ( $g_p$ ), s	22.5	0.0		20.5		31.6	33.6	0.0
Permitted Service Time ( $g_u$ ), s	3.4	0.0		20.7		30.5	3.6	0.0
Permitted Queue Service Time ( $g_{ps}$ ), s	3.4			6.0		26.0	3.6	
Time to First Blockage ( $g_r$ ), s	0.0	0.0		0.0		0.0	0.0	0.0
Queue Service Time Before Blockage ( $g_{ts}$ ), s								
Protected Right Saturation Flow ( $s_R$ ), veh/h/ln		0		1610		0		1425
Protected Right Effective Green Time ( $g_R$ ), s		0.0		16.0		0.0		24.1

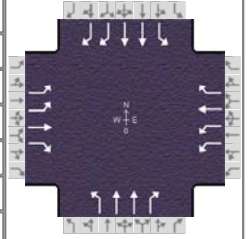
## Multimodal

	EB		WB		NB		SB	
Pedestrian $F_w / F_v$	1.710	0.129	1.852	0.171	1.557	0.171	1.710	0.171
Pedestrian $F_s / F_{delay}$	0.000	0.115	0.000	0.145	0.000	0.135	0.000	0.111
Pedestrian $M_{corner} / M_{cw}$								
Bicycle $c_b / d_b$	883.70	17.39	365.46	37.29	562.72	28.83	937.13	15.77
Bicycle $F_w / F_v$	-3.64	1.82	-3.64	1.02	-3.64	0.88	-3.64	1.70

# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	PM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2033	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr PM DHV yr 2033 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead WB				



## Demand Information

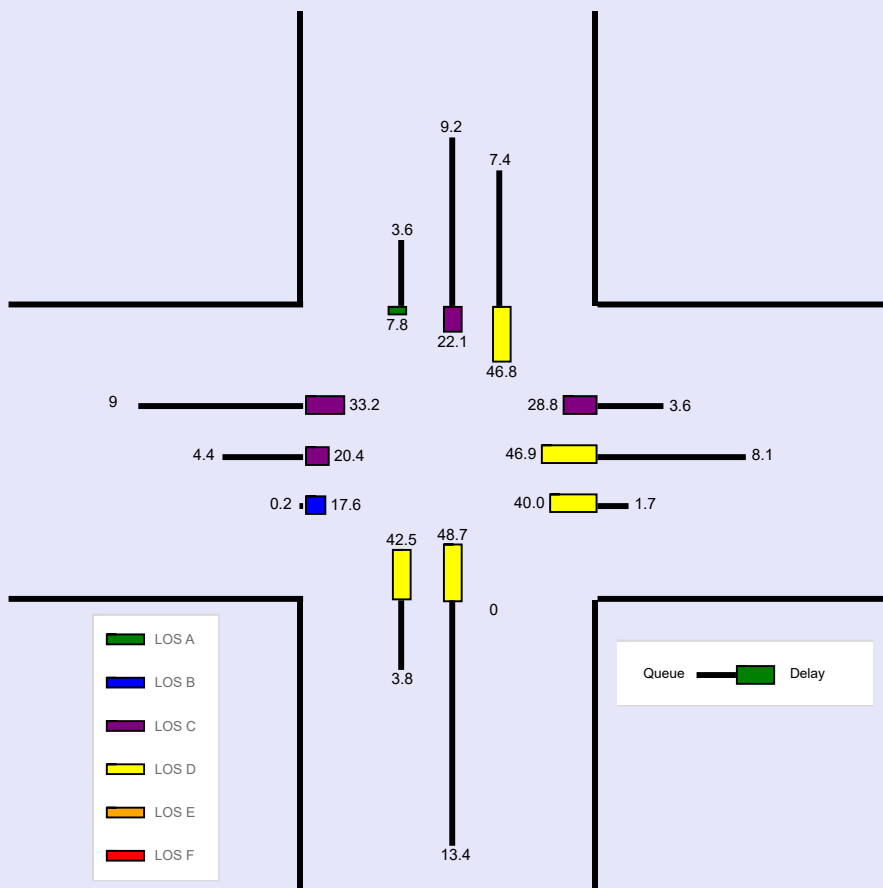
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	762	245	130	128	274	284	129	853	91	284	906	829

## Signal Information

Cycle, s	111.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

## Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	223.8	111.1	3.9	41.6	203.4	90.2	95.6	335.1	0	185.5	229.4	89.5
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	9.0	4.4	0.2	1.7	8.1	3.6	3.8	13.4	0.0	7.4	9.2	3.6
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control Delay ( $d$ ), s/veh	33.2	20.4	17.6	40.0	46.9	28.8	42.5	48.7	0.0	46.8	22.1	7.8
Level of Service (LOS)	C	C	B	D	D	C	D	D		D	C	A
Approach Delay, s/veh / LOS	29.9	C		40.1	D		47.9	D		20.4	C	
Intersection Delay, s/veh / LOS	31.1						C					



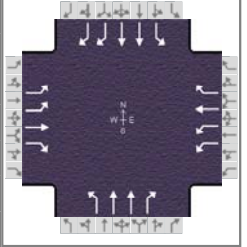
**--- Messages ---**

No errors or warnings exist.

**--- Comments ---**

# HCS7 Signalized Intersection Input Data

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	AM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr AM DHV yr 2043 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead SB				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	793	210	229	202	444	524	277	858	155	307	561	721

Signal Information											
Cycle, s	157.4	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	793	210	229	202	444	524	277	858	155	307	561	721
Initial Queue ( Q <sub>b</sub> ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate ( s <sub>o</sub> ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking ( N <sub>m</sub> ), man/h		None		0	L			None			None	
Heavy Vehicles ( P <sub>HV</sub> ), %	0	0	0	0	0	0	0	0	0	0	0	0
Ped / Bike / RTOR, /h	0	0	120	0	0	120	0	0	120	0	0	120
Buses ( N <sub>b</sub> ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type ( AT )	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering ( I )	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width ( W ), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Turn Bay Length, ft	0	0	0	0	0	0	0	0	0	0	0	0
Grade ( P <sub>g</sub> ), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	35	35	35	35	35	35

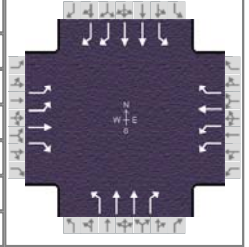
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green ( G <sub>max</sub> ) or Phase Split, s	45.0	35.0		30.0		50.0	20.0	50.0
Yellow Change Interval ( Y ), s	4.0	4.0		4.0		4.0	4.0	4.0
Red Clearance Interval ( R <sub>c</sub> ), s	1.0	1.0		1.0		1.0	1.0	1.0
Minimum Green ( G <sub>min</sub> ), s	6	6		6		6	6	6
Start-Up Lost Time ( l <sub>t</sub> ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green ( e ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage ( PT ), s	2.0	2.0		2.0		2.0	2.0	2.0
Recall Mode	Off	Min		Min		Off	Off	Off
Dual Entry	No	Yes		Yes		Yes	No	Yes
Walk ( Walk ), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time ( PC ), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	AM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2043	Analysis Period	1 > 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr AM DHV yr 2043 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead SB				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	793	210	229	202	444	524	277	858	155	307	561	721

## Signal Information

Cycle, s	157.4	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	37.4	30.0	20.0	50.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	1.0	1.0	1.0	1.0	0.0	0.0		

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8	7	4
Case Number	1.0	3.0		5.3		5.3	1.0	3.0
Phase Duration, s	42.4	77.4		35.0		55.0	25.0	80.0
Change Period, ( Y+R <sub>c</sub> ), s	5.0	5.0		5.0		5.0	5.0	5.0
Max Allow Headway ( MAH ), s	3.1	3.2		3.2		3.3	3.1	3.3
Queue Clearance Time ( g <sub>s</sub> ), s	35.6	13.6		32.0		52.0	22.0	18.7
Green Extension Time ( g <sub>e</sub> ), s	1.8	3.5		0.0		0.0	0.0	9.9
Phase Call Probability	1.00	1.00		1.00		1.00	1.00	1.00
Max Out Probability	0.07	0.02		1.00		1.00	1.00	0.10

## Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	862	228	118	220	483	439	301	933	38	334	610	653
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1757	1900	1610	1171	1900	1610	824	1809	1610	1810	1809	1425
Queue Service Time ( g <sub>s</sub> ), s	33.6	11.6	6.8	13.2	30.0	30.0	49.9	37.3	2.6	20.0	16.7	13.4
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	33.6	11.6	6.8	13.2	30.0	30.0	50.0	37.3	2.6	20.0	16.7	13.4
Green Ratio ( g/C )	0.44	0.46	0.46	0.19	0.19	0.32	0.32	0.32	0.32	0.46	0.48	0.71
Capacity ( c ), veh/h	926	874	740	538	362	512	307	1149	512	325	1724	2035
Volume-to-Capacity Ratio ( X )	0.931	0.261	0.160	0.408	1.332	0.858	0.980	0.811	0.074	1.027	0.354	0.321
Back of Queue ( Q ), ft/ln ( 50 th percentile)	452.4	133.2	65.7	98.1	781.8	449.3	402.6	436.4	26.1	349.4	181.5	99.5
Back of Queue ( Q ), veh/ln ( 50 th percentile)	18.1	5.3	2.6	3.9	31.3	18.0	16.1	17.5	1.0	14.0	7.3	4.0
Queue Storage Ratio ( RQ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( d <sub>1</sub> ), s/veh	47.4	26.1	24.8	56.9	63.7	50.3	57.0	49.3	37.5	39.9	25.9	8.3
Incremental Delay ( d <sub>2</sub> ), s/veh	11.6	0.1	0.0	0.2	167.3	13.1	45.5	4.2	0.0	57.0	0.0	0.0
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( d ), s/veh	59.0	26.1	24.8	57.1	230.9	63.4	102.5	53.5	37.5	96.9	26.0	8.4
Level of Service ( LOS )	E	C	C	E	F	E	F	D	D	F	C	A
Approach Delay, s/veh / LOS	49.5		D	133.0		F	64.6		E	33.6		C
Intersection Delay, s/veh / LOS	66.6						E					

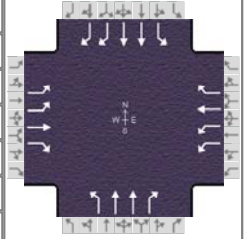
## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.61		C	2.78		C	2.47		B	2.60		C
Bicycle LOS Score / LOS	2.48		B	2.37		B	1.54		B	1.80		B

# HCS7 Signalized Intersection Intermediate Values

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	AM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2043	Analysis Period	1 > 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr AM DHV yr 2043 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead SB				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	793	210	229	202	444	524	277	858	155	307	561	721

## Signal Information

Cycle, s	157.4	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	37.4	30.0	20.0	50.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	1.0	1.0	1.0	1.0	0.0	0.0		

## Saturation Flow / Delay

	L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( $f_w$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( $f_{HVg}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Parking Activity Adjustment Factor ( $f_p$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( $f_{bb}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( $f_a$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( $f_{LU}$ )	0.971	1.000	1.000	0.971	1.000	1.000	1.000	0.952	1.000	1.000	0.952	0.885
Left-Turn Adjustment Factor ( $f_{LT}$ )	0.952	0.000		0.616	0.000		0.434	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( $f_{RT}$ )		0.000	0.847		0.000	0.847		0.000	0.847		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( $f_{LPB}$ )	1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( $f_{RPB}$ )			1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( $f_{WZ}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( $f_{DDI}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate ( $s$ ), veh/h	3514	1900	1610	2341	1900	1610	824	3618	1610	1810	3618	2850
Proportion of Vehicles Arriving on Green ( $P$ )	0.24	0.46	0.46	0.19	0.19	0.19	0.32	0.32	0.32	0.13	0.48	0.48
Incremental Delay Factor ( $k$ )	0.30	0.04	0.04	0.04	0.50	0.37	0.48	0.33	0.04	0.50	0.04	0.04

## Signal Timing / Movement Groups

	EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R
Lost Time ( $t_L$ )	5.0	5.0		5.0		5.0	5.0	5.0
Green Ratio ( $g/C$ )	0.44	0.46		0.19		0.32	0.46	0.48
Permitted Saturation Flow Rate ( $s_p$ ), veh/h/ln	927	0		1171		824	610	0
Shared Saturation Flow Rate ( $s_{sh}$ ), veh/h/ln								
Permitted Effective Green Time ( $g_p$ ), s	32.0	0.0		30.0		50.0	52.0	0.0
Permitted Service Time ( $g_u$ ), s	0.0	0.0		30.0		49.9	12.7	0.0
Permitted Queue Service Time ( $g_{ps}$ ), s	0.0			13.2		49.9	12.7	
Time to First Blockage ( $g_t$ ), s	0.0	0.0		0.0		0.0	0.0	0.0
Queue Service Time Before Blockage ( $g_{ts}$ ), s								
Protected Right Saturation Flow ( $s_R$ ), veh/h/ln		0		1610		0		1425
Protected Right Effective Green Time ( $g_R$ ), s		0.0		20.0		0.0		37.3

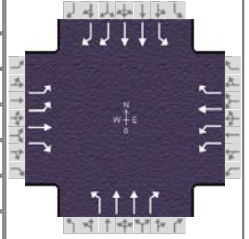
## Multimodal

	EB			WB			NB			SB		
Pedestrian $F_w / F_v$	1.710	0.171		1.852	0.171		1.557	0.171		1.710	0.171	
Pedestrian $F_s / F_{delay}$	0.000	0.126		0.000	0.158		0.000	0.144		0.000	0.123	
Pedestrian $M_{corner} / M_{cw}$												
Bicycle $c_b / d_b$	919.68	22.96		381.31	51.54		635.44	36.62		953.19	21.55	
Bicycle $F_w / F_v$	-3.64	1.99		-3.64	1.88		-3.64	1.05		-3.64	1.32	

# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	AM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr AM DHV yr 2043 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead SB				



## Demand Information

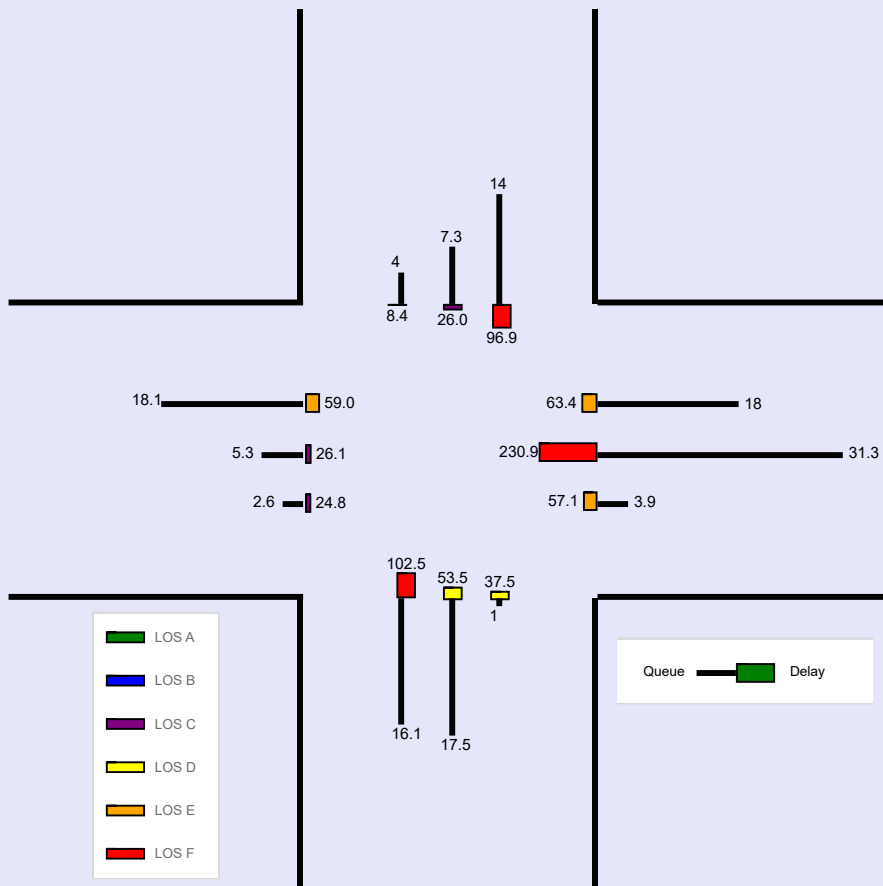
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	793	210	229	202	444	524	277	858	155	307	561	721

## Signal Information

Cycle, s	157.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

## Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	452.4	133.2	65.7	98.1	781.8	449.3	402.6	436.4	26.1	349.4	181.5	99.5
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	18.1	5.3	2.6	3.9	31.3	18.0	16.1	17.5	1.0	14.0	7.3	4.0
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control Delay ( $d$ ), s/veh	59.0	26.1	24.8	57.1	230.9	63.4	102.5	53.5	37.5	96.9	26.0	8.4
Level of Service (LOS)	E	C	C	E	F	E	F	D	D	F	C	A
Approach Delay, s/veh / LOS	49.5	D		133.0	F		64.6	E		33.6	C	
Intersection Delay, s/veh / LOS	66.6						E					



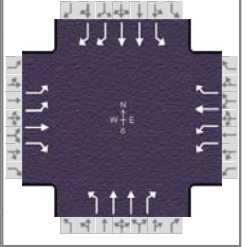
**--- Messages ---**

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

**--- Comments ---**

# HCS7 Signalized Intersection Input Data

General Information				Intersection Information	
Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	PM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr PM DHV yr 2043 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead SB				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	957	308	164	160	343	357	162	1071	115	357	1136	1041

Signal Information											
Cycle, s	152.2	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	957	308	164	160	343	357	162	1071	115	357	1136	1041
Initial Queue ( $Q_0$ ), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate ( $s_0$ ), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking ( $N_m$ ), man/h		None		0	L			None			None	
Heavy Vehicles ( $P_{HV}$ ), %	0	0	0	0	0	0	0	0	0	0	0	0
Ped / Bike / RTOR, /h	0	0	120	0	0	120	0	0	91	0	0	120
Buses ( $N_b$ ), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type ( $AT$ )	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering ( $I$ )	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width ( $W$ ), ft	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Turn Bay Length, ft	0	0	0	0	0	0	0	0	0	0	0	0
Grade ( $P_g$ ), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	35	35	35	35	35	35

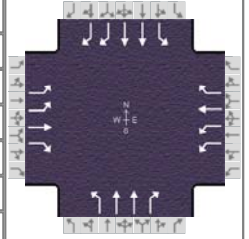
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green ( $G_{max}$ ) or Phase Split, s	30.0	35.0		35.0		50.0	20.0	50.0
Yellow Change Interval ( $Y$ ), s	4.0	4.0		4.0		4.0	4.0	4.0
Red Clearance Interval ( $R_c$ ), s	1.0	1.0		1.0		1.0	1.0	1.0
Minimum Green ( $G_{min}$ ), s	6	6		6		6	6	6
Start-Up Lost Time ( $l_t$ ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green ( $e$ ), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage ( $PT$ ), s	2.0	2.0		2.0		2.0	2.0	2.0
Recall Mode	Off	Min		Min		Off	Off	Off
Dual Entry	No	Yes		Yes		Yes	No	Yes
Walk ( $Walk$ ), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time ( $PC$ ), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0	No	25	0	No	25	0	No	25	0	No	25
Walkway / Crosswalk Width / Length, ft	9.0	12	0	9.0	12	0	9.0	12	0	9.0	12	0
Street Width / Island / Curb	0	0	No	0	0	No	0	0	No	0	0	No
Width Outside / Bike Lane / Shoulder, ft	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0	12	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

# HCS7 Signalized Intersection Results Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	PM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2043	Analysis Period	1 > 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr PM DHV yr 2043 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead SB				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	957	308	164	160	343	357	162	1071	115	357	1136	1041

## Signal Information

Cycle, s	152.2	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	30.0	32.2	20.0	50.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	1.0	1.0	1.0	1.0	0.0	0.0		

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8	7	4
Case Number	1.0	3.0		5.3		5.3	1.0	3.0
Phase Duration, s	35.0	72.2		37.2		55.0	25.0	80.0
Change Period, ( $Y+R_c$ ), s	5.0	5.0		5.0		5.0	5.0	5.0
Max Allow Headway ( $MAH$ ), s	3.1	3.2		3.2		3.4	3.1	3.4
Queue Clearance Time ( $g_s$ ), s	32.0	20.2		31.3		52.0	22.0	42.0
Green Extension Time ( $g_e$ ), s	0.0	2.5		0.9		0.0	0.0	6.6
Phase Call Probability	1.00	1.00		1.00		1.00	1.00	1.00
Max Out Probability	1.00	0.04		0.88		1.00	1.00	0.87

## Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R			
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14			
Adjusted Flow Rate ( $v$ ), veh/h	1040	335	48	174	373	258	176	1164	26	388	1235	1001			
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1757	1900	1610	1062	1900	1610	458	1809	1610	1810	1809	1425			
Queue Service Time ( $g_s$ ), s	30.0	18.2	2.6	10.7	29.3	19.0	35.0	48.5	1.7	20.0	40.0	25.5			
Cycle Queue Clearance Time ( $g_c$ ), s	30.0	18.2	2.6	10.7	29.3	19.0	50.0	48.5	1.7	20.0	40.0	25.5			
Green Ratio ( $g/C$ )	0.42	0.44	0.44	0.21	0.21	0.34	0.33	0.33	0.33	0.47	0.49	0.69			
Capacity ( $c$ ), veh/h	826	839	711	543	402	552	153	1189	529	290	1783	1967			
Volume-to-Capacity Ratio ( $X$ )	1.259	0.399	0.067	0.320	0.928	0.467	1.153	0.979	0.049	1.338	0.692	0.509			
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	687.5	209.2	25.3	71.9	417.9	190	276.6	629.1	16.8	629.2	435.7	193.1			
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	27.5	8.4	1.0	2.9	16.7	7.6	11.1	25.2	0.7	25.2	17.4	7.7			
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Uniform Delay ( $d_1$ ), s/veh	44.4	28.8	24.5	51.6	58.9	39.1	64.0	50.6	34.9	49.8	29.7	11.3			
Incremental Delay ( $d_2$ ), s/veh	126.5	0.1	0.0	0.1	24.2	0.2	120.0	21.1	0.0	173.5	1.0	0.1			
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Control Delay ( $d$ ), s/veh	170.9	28.9	24.5	51.7	83.1	39.3	184.0	71.7	34.9	223.4	30.7	11.4			
Level of Service (LOS)	F	C	C	D	F	D	F	E	C	F	C	B			
Approach Delay, s/veh / LOS	132.6	F		62.3		E		85.4		F		51.8		D	
Intersection Delay, s/veh / LOS	79.0						E								

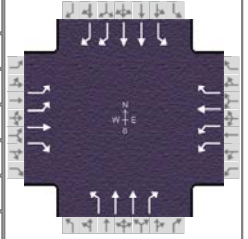
## Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.57	C		2.78	C		2.47	B		2.60	C	
Bicycle LOS Score / LOS	2.84	C		1.81	B		1.61	B		2.65	C	

# HCS7 Signalized Intersection Intermediate Values

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	PM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr PM DHV yr 2043 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead SB				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	957	308	164	160	343	357	162	1071	115	357	1136	1041

## Signal Information

Cycle, s	152.2	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	30.0	32.2	20.0	50.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0		
				Red	1.0	1.0	1.0	1.0	0.0	0.0		

## Saturation Flow / Delay

	L	T	R	L	T	R	L	T	R	L	T	R
Lane Width Adjustment Factor ( $f_w$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles and Grade Factor ( $f_{HVg}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Parking Activity Adjustment Factor ( $f_p$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Bus Blockage Adjustment Factor ( $f_{bb}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Area Type Adjustment Factor ( $f_a$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Lane Utilization Adjustment Factor ( $f_{LU}$ )	0.971	1.000	1.000	0.971	1.000	1.000	1.000	0.952	1.000	1.000	0.952	0.885
Left-Turn Adjustment Factor ( $f_{LT}$ )	0.952	0.000		0.559	0.000		0.241	0.000		0.952	0.000	
Right-Turn Adjustment Factor ( $f_{RT}$ )		0.000	0.847		0.000	0.847		0.000	0.847		0.000	0.847
Left-Turn Pedestrian Adjustment Factor ( $f_{LPB}$ )	1.000			1.000			1.000			1.000		
Right-Turn Ped-Bike Adjustment Factor ( $f_{RPB}$ )			1.000			1.000			1.000			1.000
Work Zone Adjustment Factor ( $f_{WZ}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DDI Factor ( $f_{DDI}$ )	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Movement Saturation Flow Rate (s), veh/h	3514	1900	1610	2124	1900	1610	458	3618	1610	1810	3618	2850
Proportion of Vehicles Arriving on Green (P)	0.20	0.44	0.44	0.21	0.21	0.21	0.33	0.33	0.33	0.13	0.49	0.49
Incremental Delay Factor (k)	0.50	0.04	0.04	0.04	0.36	0.04	0.50	0.48	0.04	0.50	0.22	0.05

## Signal Timing / Movement Groups

	EBL	EBT/R	WBL	WBT/R	NBL	NBT/R	SBL	SBT/R
Lost Time ( $t_L$ )	5.0	5.0		5.0		5.0	5.0	5.0
Green Ratio (g/C)	0.42	0.44		0.21		0.33	0.47	0.49
Permitted Saturation Flow Rate ( $s_p$ ), veh/h/ln	1026	0		1062		458	490	0
Shared Saturation Flow Rate ( $s_{sh}$ ), veh/h/ln								
Permitted Effective Green Time ( $g_p$ ), s	34.2	0.0		32.2		50.0	52.0	0.0
Permitted Service Time ( $g_u$ ), s	2.8	0.0		32.1		35.0	1.5	0.0
Permitted Queue Service Time ( $g_{ps}$ ), s	2.8			10.7		35.0	1.5	
Time to First Blockage ( $g_r$ ), s	0.0	0.0		0.0		0.0	0.0	0.0
Queue Service Time Before Blockage ( $g_{ts}$ ), s								
Protected Right Saturation Flow ( $s_R$ ), veh/h/ln		0		1610		0		1425
Protected Right Effective Green Time ( $g_R$ ), s		0.0		20.0		0.0		30.0

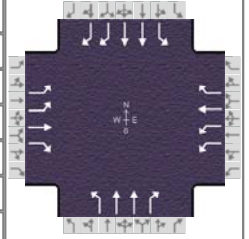
## Multimodal

	EB		WB		NB		SB	
Pedestrian $F_w / F_v$	1.710	0.129	1.852	0.171	1.557	0.171	1.710	0.171
Pedestrian $F_s / F_{delay}$	0.000	0.127	0.000	0.155	0.000	0.142	0.000	0.119
Pedestrian $M_{corner} / M_{cw}$								
Bicycle $c_b / d_b$	882.72	23.74	422.68	47.32	657.22	34.29	985.81	19.56
Bicycle $F_w / F_v$	-3.64	2.35	-3.64	1.33	-3.64	1.13	-3.64	2.16

# HCS7 Signalized Intersection Results Graphical Summary

## General Information

Agency	TRC Worldwide Engineering			Duration, h	0.250
Analyst	MLT	Analysis Date	4/22/2020	Area Type	Other
Jurisdiction	Clarksville MPO	Time Period	PM Peak	PHF	0.92
Urban Street	SR 374	Analysis Year	2043	Analysis Period	1> 7:00
Intersection	Memorial Drive	File Name	SR 374 w Memorial Dr PM DHV yr 2043 Lead LTs...		
Project Description	2 Southbound RT Lead EB Lead SB				



## Demand Information

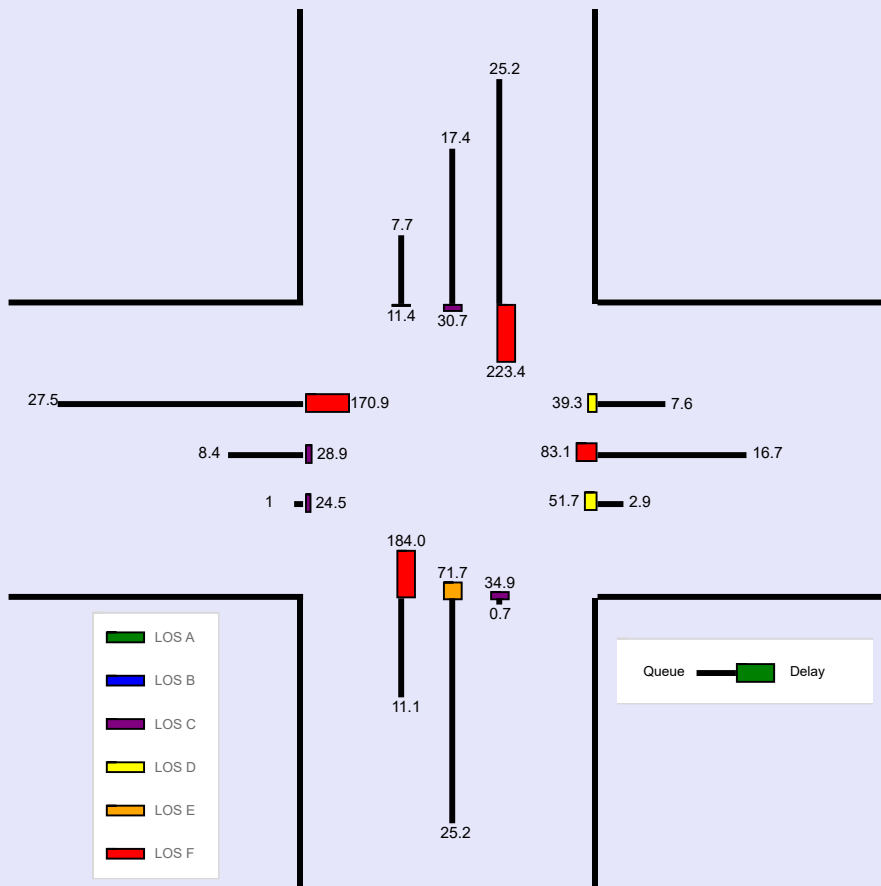
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	957	308	164	160	343	357	162	1071	115	357	1136	1041

## Signal Information

Cycle, s	152.2	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

## Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue ( $Q$ ), ft/ln ( 50 th percentile)	687.5	209.2	25.3	71.9	417.9	190	276.6	629.1	16.8	629.2	435.7	193.1
Back of Queue ( $Q$ ), veh/ln ( 50 th percentile)	27.5	8.4	1.0	2.9	16.7	7.6	11.1	25.2	0.7	25.2	17.4	7.7
Queue Storage Ratio ( $RQ$ ) ( 50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Control Delay ( $d$ ), s/veh	170.9	28.9	24.5	51.7	83.1	39.3	184.0	71.7	34.9	223.4	30.7	11.4
Level of Service (LOS)	F	C	C	D	F	D	F	E	C	F	C	B
Approach Delay, s/veh / LOS	132.6	F		62.3	E		85.4	F		51.8	D	
Intersection Delay, s/veh / LOS	79.0						E					



**--- Messages ---**

WARNING: If demand exceeds capacity, a multiple-period analysis should be conducted.

**--- Comments ---**

## 14.9 WebEx Teleconference

## WebEx Teleconference

A WebEx conference was held at 10:00 AM CST Thursday May 28, 2020 to discuss the preliminary conceptual plans for the widening of S.R. 374 in Clarksville, TN from Madison Street to Dunbar Cave Road. Those who attended the meeting were as follows.

- Steve Allen, Strategic Transportation Investments Division
- Jim Waters, Strategic Transportation Investments Division
- Shaun Armstrong, Strategic Transportation Investments Division
- Emily Burgess, Strategic Transportation Investments Division
- Chris Cowan, City of Clarksville
- Stan Williams, City of Clarksville
- Sharon Schutz, TDOT Region 3 Project Development
- Jon Zirkle, TDOT Region 3 Project Development
- Melissa Portell, TDOT Region 3 Survey
- Amy Hume, TDOT Environmental
- Sharon Sanders, TDOT Environmental
- Ted Kniazewycz, TDOT Structures
- George Hardy, TDOT Region 3 Traffic
- Mike Tugwell, TRC Worldwide Engineering, Inc.
- Jon Meadows, TRC Worldwide Engineering, Inc.
- Anthony Smith, TRC Worldwide Engineering, Inc.
- Brady Griggs, TRC Worldwide Engineering, Inc.

The following bullet points may require further discussion:

- The preliminary functionals prepared by TRC Worldwide Engineering showed twelve (12) foot shoulders for the typical section to maintain continuity with the adjacent project to the north. Based upon the discussion at this meeting it was determined to reduce the shoulder widths to ten (10) feet, which is the current standard for RD11-TS-6B and provides sufficient width for the proposed bicycle lanes.
- The preliminary functionals currently include a raised curb island at the Madison Street intersection that will prevent left turn movements onto S.R. 374 from the shopping center located on the northwest corner, thus providing positive access management near the intersection. This was discussed at the meeting but no definitive determination was made if this should instead be changed to pavement marking to allow left turn movements.

- Sidewalks may have to be widened adjacent to the high school and middle school to accommodate the 'Safe Route to Schools' requirements. Current sidewalk width is five (5) feet. **Response:** Sidewalk to be widened to six (6) feet in the school area.
- A retaining wall should be used at the pond across from the High School to reduce impacts.
- Future study may be required to determine optimum layout for school entrances. Crossing guards are present during school hours at three (3) locations in the school zone.
- TDOT Structures has determined that the existing bridge should be widened to accommodate the new typical section. Symmetrical widening of the bridge is preferred. Bridge should use the full typical section width.
- Review if a double left turn lane is warranted for the eastbound to northbound movement at the Madison Street Intersection. There are two (2) receiving lanes currently proposed. **Response:** There are only 212 vehicles turning left onto S.R. 374 in the 2043 peak hour. It would require lane shifting and additional ROW to line up a double left.
- Will Clarksville Gas and Water be receptive to moving the back entrance to S.R. 374 further north if feasible?
- Does existing right turn lane at the Clarksville High School and Richview Middle School need to be replaced? The functionals currently do not include right turn lanes into school entrances. **Response:** Right turn lanes are to be added at both the high school and middle school entrances.
- Review if traffic warrants a double left turn lane for the northbound to westbound movement at the Memorial Drive intersection. **Response:** There are only 277 vehicles turning left onto Memorial Drive in the peak hour. There are 1,041 vehicles turning right onto Memorial Drive in the peak hour.