



HCS™
Roundabouts Module

USER GUIDE

Contents

Introduction	1
License Agreement	1
Acknowledgements	4
Trademarks and Copyrights.....	4
Getting Started	5
Getting Started	5
General Controls	6
Menu Items	6
Roundabouts	8
HCM Chapter 22	8
HCM Chapter 33	8
Operational Data	9
Roundabouts Report.....	10
Roundabout Segments	11
HCM Chapter 30	11
Operational Data	11
Roundabout Segments Report	12
How To	13
Create a New File	13
Open an Existing File.....	16
Save a File	20
Close a File	21
Exit the Program	22
Edit the Default Settings	23
Change the View.....	25
Change the Lane Configuration	27
Add or Delete Roundabout Intersections.....	33
View Results of the Analysis.....	35
Print a Report.....	43
Glossary of Terms	47
Index	57

Introduction

License Agreement

HIGHWAY CAPACITY SOFTWARE™, TRANSYT-7F™, AND HIGHWAY SAFETY SOFTWARE™

HCS2022™ END USER LICENSE AGREEMENT

Copyright © 2021 University of Florida. All rights reserved.

This is an agreement between you and the University of Florida Board of Trustees for the benefit of the McTrans Center.

BY USING THE PROGRAMS WITHIN THE ELECTRONIC TRANSMITTED PACKAGE OR DIRECT DOWNLOAD (“SOFTWARE”), YOU AGREE TO BE BOUND BY THE TERMS OF THIS LICENSE AGREEMENT. DO NOT USE THE SOFTWARE WITHOUT FIRST READING AND UNDERSTANDING THE TERMS OF THIS LICENSE AGREEMENT.

If you do not agree with the terms of this license, discontinue use, delete and/or return the unused Software immediately to the distributor from which it was obtained.

1. **LICENSE:** In consideration of the required license fee, the University of Florida McTrans Center (hereinafter called “McTrans”) hereby grants you (hereinafter called “End User”) a nonexclusive license to use the enclosed HIGHWAY CAPACITY SOFTWARE, TRANSYT-7F, and HIGHWAY SAFETY SOFTWARE in HCS2022 (hereinafter called “Software”) as described in the applicable portion of section 3 for a period in which the End User pays the subscription fee established by McTrans.

2. **OWNERSHIP:** This license is not a sale of the Software; it is a license to use the Software under the terms of this License Agreement.

3. **USE:** The Software is licensed to End Users for a particular use, depending on the particular license that is designated on order and described in this Section 3.

a. **Single Office License.** The End User may use the Software on any number of computers within End User’s immediate office, which is defined as a single organizational unit, having a unique function, comprising one or more contiguous rooms in a single location. All persons using the Software are also End Users. End Users may also use the Software on portable computers while on official travel and on home computers, as long as ALL such use is on behalf of the office for which this Software License was purchased. This Software License does not authorize the use of the Software at any offices that are related to that single organizational unit but are not located at the same geographic location, even if the Software is stored on a portable computer. If you have any questions as to the validity of your End User License, contact McTrans.

b. Academic License. The End User may use the Software only within a laboratory within End User's immediate school, which is defined as a single school unit, having a unique function, comprising one or more contiguous rooms in a single location, up to the permitted (purchased) number of copies, provided the use is supervised in a classroom setting for teaching or research purposes, and appropriate protection is in place against students copying the Software and taking it out of the lab. The responsibility for ensuring this protection of the Software rests with the End User. Multiple laboratories require multiple licenses. The Software may not be installed or used on any computer outside of the licensed laboratory under the Academic License, including (but not limited to) any office, home, networked or portable computer. If you have any questions as to the type or validity of your End User License, contact McTrans.

WARNING! If this license is a Single Office License for use in traffic and transportation applications, the Software may not be used for classroom or workshop instruction, demonstrations, conferences or other similar purposes without the express, written consent of McTrans. (Contact McTrans for an Academic License.) If this license is an Academic License for use in training or educational applications, the Software may not be used for traffic and transportation applications or other similar purposes without the express, written consent of McTrans. (Contact McTrans for an Applications License.)

4. NETWORK INCOMPATIBILITIES: McTrans is not able to provide technical support for issues resulting from network incompatibilities.

5. GENERAL: The Software is not designed for network use, and such use is not supported. No network use is permitted, including but not limited to, using the Software either directly or through commands, data or instructions from or to a computer not already licensed and part of the internal network, for Internet or web hosting services or by any user not licensed to use this copy of the Software through a valid license from McTrans.

6. COPY RESTRICTIONS: Unauthorized copying, distribution, or dissemination of the Software is expressly prohibited. End User may be held legally responsible for any copyright infringement that is caused, encouraged, or enabled by failure to abide by the terms of this license. Subject to these restrictions, End User may make copies of the Software for backup purposes and for use of the Software on any computers located within its office complex, as described in paragraph 3. Under no circumstances may the Software or associated printed documentation be copied for sale, distribution, or dissemination, except as provided in paragraph 3, without the express, written consent of McTrans. End User may reproduce the associated documentation as necessary to use within the geographic location for which the license is granted. End User may not modify, adapt, translate, reverse engineer, decompile, disassemble, or create derivative work from the Software or any associated written materials without the prior written consent of McTrans. ANY SUCH ACTIVITY OR PRODUCT BECOMES THE PROPERTY OF McTRANS.

7. TRANSFER RESTRICTIONS: The Software is licensed only to the End User, and this License Agreement may not be assigned or transferred to anyone without the prior written consent of McTrans. Any authorized transferee of this License Agreement shall be bound by the terms of this License Agreement. End User may not transfer, assign, rent, lease, sell, or otherwise dispose of the Software except as expressly provided in this License Agreement.

8. REGISTRATION AND SUPPORT: This license is automatically registered to the person or entity that purchased it. If the End User wishes to change the registration, he or she must fill out and return the registration card contained in this package. McTrans may, from time to time, revise or update the Software to correct bugs or add minor improvements. McTrans will supply, at its discretion, minor updates to the End User without additional charge and will provide reasonable telephone or email support to the End User during the normal business hours of McTrans for the period for which End User pays the subscription fee established by McTrans. McTrans reserves the right to determine the extent of the support. McTrans reserves the right to make substantial revisions and enhancements to the Software and to market such substantially revised versions as separate products. End User shall not be entitled to receive such separate products without additional charge. Upon release of any such revised version of the Software, the obligation to provide the above described technical support services to End User shall

cease, unless End User chooses to pay to license the enhanced version of the Software, whether or not the End User has previously requested or received support on the prior version.

9. LIMITED WARRANTY AND LIMITATIONS OF REMEDIES: McTrans warrants the magnetic or optical medium on which the Software is furnished to be free from defects in material and workmanship under normal use for a period of thirty (30) days from the date of delivery to the End User as evidenced by a copy of invoice. The entire liability and End User's exclusive remedy shall be the replacement of any diskette found to be defective. Defective diskettes should be returned with a copy of the End User's invoice to the distributor from which the Software was obtained. End User agrees that it is the responsibility of End User to understand fully the limitations of and assumptions underlying the Software and not to make use of the Software without the assistance of personnel with appropriate expertise. End User accepts all responsibility for review, application, and use of the program output and accepts all responsibility for assurance that the output meets provisions of any applicable design code, standard, or any project specification.

EXCEPT AS PROVIDED ABOVE, THE PRODUCT IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. McTRANS DOES NOT WARRANT THAT THE FUNCTIONS CONTAINED IN THE SOFTWARE WILL MEET END USER'S REQUIREMENTS OR THAT THE OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED OR ERROR-FREE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PRODUCT IS WITH THE END USER. IN NO EVENT WILL McTRANS BE LIABLE TO END USER FOR ANY DAMAGES, INCLUDING ANY LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF OR INABILITY TO USE THE SOFTWARE EVEN IF McTRANS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY OTHER PARTY. THE ABOVE WARRANTY GIVES END USER SPECIFIC LEGAL RIGHTS AND END USER MAY ALSO HAVE OTHER RIGHTS IN THE UNITED STATES WHICH VARY FROM STATE TO STATE. USE OF THE SOFTWARE WHERE THE END USER BELIEVES OR HAS REASON TO BELIEVE THAT DAMAGE MAY OCCUR IS A VIOLATION OF ANY AND ALL WARRANTIES. McTRANS HAS NO KNOWLEDGE OF THE HARDWARE OR SOFTWARE CONFIGURATIONS OF THE END USER AND ASSUMES NO LIABILITY FOR THEIR DAMAGE.

10. TERMINATION: This license is effective from the date End User receives the Software until this License Agreement is terminated. End User may terminate it by returning or destroying all copies of the Software and associated documentation in End User's possession or control. If any terms of this license are breached by End User, the license shall terminate immediately.

11. GOVERNING LAW: This License Agreement shall be governed by the laws of the State of Florida, U.S.A. Venue for all disputes related to this License Agreement shall be in the United States District Court of the Northern District of Florida, Gainesville Division, or in the Circuit Court of the Eighth Judicial Circuit for Alachua County Florida.

12. U.S. GOVERNMENT RESTRICTED RIGHTS: The Software and associated documentation are provided with RESTRICTED RIGHTS. Use, duplication, or disclosure by the U.S. Government is subject to restrictions as set forth in subdivision (c)(1)(ii) of The Rights in Technical Data and Computer Software clause at 52.227-7013 or subparagraphs (c)(1) and (2) of the Commercial Computer Software - Restricted Rights at 48CFR52.227-19. The contractor is McTrans, University of Florida, PO Box 116585, Gainesville, FL 32611-6585.

13. EXPORT REGULATION: The Software may be subject to U.S. export control laws, including the U.S. Export Control Reform Act and its associated regulations. End User will not directly or indirectly, export, re-export, or release the Software to, or make the Software accessible from, any country, jurisdiction or person to which export, re-export, or release is prohibited by applicable law. End User will comply with all applicable laws and complete all required undertakings (including obtaining any necessary export license

or other governmental approval) prior to exporting, re-exporting, releasing, or otherwise making the Software available outside the U.S.

14. INTEGRATION: This License Agreement is the complete and exclusive statement of the agreement between End User and McTrans and supersedes any proposal or prior agreement, oral or written, and any other communications between End User and McTrans relating to the subject matter of this License Agreement. This License Agreement may only be modified by a written agreement made subsequent to the date hereof and signed by both parties.

15. SEVERABILITY: If any portion of this License Agreement shall be declared void or a nullity by a court of competent jurisdiction then the remainder shall survive and remain in full force. Should you have any questions concerning this license, you may contact the McTrans Center, University of Florida, PO Box 116585, Gainesville, FL 32611-6585, U.S.A., [1] (352) 392-0378.

Acknowledgements

McTrans Center, University of Florida Transportation Institute
PO Box 116585, Gainesville FL 32611-6585
Telephone: 1-800-226-1013 Fax: 352-392-6629
Web: mctrans.ce.ufl.edu Email: mctrans@ce.ufl.edu

We acknowledge the Transportation Research Board (TRB), the USDOT's Federal Highway Administration (FHWA), the American Traffic Safety Services Association (ATSSA), the Institute of Transportation Engineers (ITE), and the American Association of State Highway and Transportation Officials (AASHTO) for all text, figures, and references included in HCS and express our sincere appreciation for permission to include this information.

Trademarks and Copyrights

- Microsoft(R), MS-DOS(R), and Windows(TM) are registered trademarks of Microsoft Corporation.
- McTrans(TM), HCS(TM) and TRANSYT-7F(TM) are registered trademarks of the University of Florida.
- HCS, HCS2022, HCS7, HCS 2010, HCS+, HSS, TRANSYT-7F, and T7F are copyright University of Florida.
- TSIS, CORSIM, NETSIM, FRESIM, TRAFED, TRAFVU, and TShell are copyright University of Florida, with portions copyright ITT Industries, Inc., Systems Division.

Getting Started

Getting Started

To begin, click on File then New (or the "New File" icon).

Normal Windows keyboard and mouse functions are available. The PgUp and PgDn keys will scroll the entry screen up and down respectively. Tabbing, clicking to a new field, or pressing the Enter key will trigger a recalculation and update the Report pane.

Roundabout Analysis

Roundabout intersection analyses will estimate Capacity and Level of Service (LOS) for a given set of traffic and geometric conditions. This type of analysis is oriented toward the evaluation of an existing or planned facility. The methodology and procedures of application use the HCM Chapter 22 procedures.

General Controls

Menu Items

New – Creates a new Roundabouts file (*.xro) and starts a new analysis project; shortcut is Ctrl+N

Open – Opens an existing Roundabouts file (*.xro, *.xra); shortcut is Ctrl+O

Example Folder – Opens folder with all HCS examples in File Explorer

Save – Saves an open Roundabouts file (*.xro) using the current file name; shortcut is Ctrl+S

Save As... – Saves an open Roundabouts file (*.xro) using a specified file name; shortcut is F12

Close – Closes an existing Roundabouts file (*.xro); shortcut is Ctrl+W

Units

USC Units – Changes the units of the current file to U.S. Customary

Metric Units – Changes the units of the current file to Metric

Print – Brings up printer selection and prints a Roundabouts report to the printer or specified file type; shortcut is Ctrl+P

Print Preview – Displays preview of current report before printing; shortcut is Ctrl+F2

View

Page View – Changes the view to display inputs and reports by pages; shortcut is F9

Full View

Report -> Right – Changes the view to display both the input screen and report simultaneously; the report is displayed on the right portion of the screen; shortcut is F10

Report -> Bottom – Changes the view to display both the input screen and report simultaneously; the report is displayed on the bottom portion of the screen; shortcut is F11

Report

Roundabout Formatted Report – Displays formatted report of the currently selected intersection including the most important values; shortcut is F4

Roundabout Text Report – Displays text report with all input, intermediary, and final results of the currently selected intersection; shortcut is F6

Segment Formatted Report – Displays formatted report of the currently selected segment including the most important values; shortcut is F7

Segment Text Report – Displays text report with all input, intermediary, and final results of the currently selected segment; shortcut is F8

Full Segments Report – Displays formatted report for all segments including the most important values; shortcut is F3

Default Settings – Opens a dialog box for the user to input defaults for Analyst, Agency, and Jurisdiction, which will be applied to all new files; also allows selection of USC or SI units, which will be applied to all new files; shortcut is Alt+F

Help

Contents – Provides access to glossary, acknowledgements, copyrights, and information on the HCM procedures; shortcut is Ctrl+F1

Index – Allows user to search for keywords within the glossary

Search – Allows user to search for any word within the Contents

User Guide – Opens a comprehensive user guide in PDF format; shortcut is Ctrl+G

HCM6 Reference Guide – Opens the McTrans website in the default web browser to access the Highway Capacity Manual Reference Guide PDF

HCS Updates – Sends the HCS version number anonymously without any personally identifiable information to McTrans to check for a newer version

HCM/HCS Training – Opens the McTrans Training Page in the default web browser to view the latest training opportunities

HCQS Web Page – Opens the TRB Highway Capacity and Quality of Service Committee page in the default web browser

Support

Frequently Asked Questions – Opens the McTrans support page for HCS in the default web browser

HCS on the Web – Opens the McTrans HCS Overview page in the default web browser

McTrans on the Web – Opens the McTrans home page in the default web browser

E-mail McTrans – Composes a new e-mail addressed to McTrans in the default e-mail client with registration number, serial key, module, and version number already populated in the Subject field

About HCS – Opens an about window with software version information, EULA, general acknowledgements, contact information, and other relevant links

CORSIM

View Animation – Sends data to the TSIS-CORSIM program for simulation and/or animation purposes, TRAFVU can be opened within TSIS-CORSIM to allow user to view animation; shortcut is Ctrl+Shift+A

Generate TRF File – Saves an open Roundabouts file (*.xro) as a CORSIM file (*.trf), which is a file that contains the input data used to define a CORSIM network and to drive the CORSIM simulation for a single simulation case; shortcut is Ctrl+Shift+T

Exit – Exits the *HCS* Roundabouts module; shortcut is Alt+F4

Roundabouts

HCM Chapter 22

Roundabouts are intersections with a generally circular shape, characterized by yield on entry and circulation around a central island (counterclockwise in the United States). Roundabouts have been used successfully throughout the world and are being used increasingly in the United States, especially since 1990. **Chapter 22, Roundabouts**, presents concepts and procedures for analyzing these types of intersections.

LIMITATIONS OF THE METHODOLOGY

The procedures presented in this chapter cover many of the typical situations that a user may encounter in practice. However, there are sometimes applications for which alternative tools can produce a more accurate analysis. The following limitations, stated earlier in this chapter, may be addressed by using available simulation tools. The conditions beyond the scope of this chapter that are treated explicitly by alternative tools include

- Pedestrian signals or hybrid beacons at roundabout crosswalks,
- Metering signals on one or more approaches,
- Adjacent signals or roundabouts,
- Priority reversal under extremely high flows,
- High pedestrian or bicycle activity levels,
- More than two entry lanes on an approach, or
Flared entry lanes.

HCM Chapter 33

Chapter 33 is the supplemental chapter for Chapter 22, Roundabouts, which is found in Volume 3 of the *Highway Capacity Manual* (HCM). This chapter presents detailed information about the following aspects of the Chapter 22 motorized vehicle methodology:

- Information about the large variability in U.S. driver behavior at roundabouts,
- Guidance on making an appropriate selection of a lane utilization factor, and
- Guidance on calibrating the capacity model to reflect local conditions.

This chapter also provides example problems that demonstrate the application of the Chapter 22 methodology to single-lane and multilane roundabouts.

Operational Data

This Highway Capacity Software (*HCS*) faithfully implements the methodology prescribed in the Highway Capacity Manual (HCM) for analyzing Roundabouts.

First, the user enters the Project Properties into the respective fields: Analyst, Agency, Date, Time Analyzed, Jurisdiction, Analysis Year, and Project Description. Then, the user enters the Intersection Data into the respective fields: Intersection Name, East/West Street Name, North/South Street Name, Analysis Time Period, and Peak Hour Factor. The Analysis Time Period is normally 15 minutes ($T=0.25$ hr) to represent the length of time the peak flow is constant.

Lane Designations

The geometry of each approach is described by coding the number of lanes and the movements allowed in each lane, including whether movements are exclusive or shared. These are coded with the use of the Roundabouts lane graphic. Each approach allows for two lanes to be coded and one bypass lane, if necessary. Lanes for an approach will be disabled depending on what is already coded. Defining the number of lanes and usage is necessary to allow further analysis.

The Conflicting Lanes on Entry is specified for each approach as the number of lanes that pass directly in front of the subject entry. It can be coded by either clicking on the arrows within the roundabout or by changing the number in the textboxes below the graphic. The number of conflicting lanes on entry for an approach can be either 1 or 2.

If a right-turn bypass lane is necessary for an approach, the user can choose to code either a Yielding or a Non-Yield Right-Turn Bypass Lane. The yellow arrow represents a yielding right-turn bypass lane and the green arrow represents a non-yielding right-turn bypass lane. If a yielding right-turn bypass lane is coded for an approach, the corresponding textbox for Conflicting Lanes on Bypass Exit will enable, allowing the user to specify the number of lanes as 1 or 2.

Traffic Volumes

The Volume for each movement of the intersection is coded in vehicles per hour. An hourly volume is required for any movement to be included in the analysis. The Percent Heavy Vehicles (%HV) and Passenger Car Equivalent is entered for each movement. The Percent of Entry Vehicles Using Left Lane is also entered for each approach if there are two lanes coded for the approach and both lanes have the same movement. This field provides for the traffic split for the two lanes. For example, if there is a LT and TR coded for one approach, the Percent of Entry Vehicles Using Left Lane field will enable for the approach to allow the user to specify how the thru volume is distributed among the two lanes.

Pedestrian Volumes

The Number of Pedestrians Crossing Entry for each entry of the intersection is coded in pedestrians per hour.

Critical Headway and Follow-up Headway

The default values for Critical Headway and Follow-Up Headway depends on the roundabout geometry. To calibrate the capacity equations, these values can be adjusted from the default values.

Results

Level of Service (LOS) criteria for Roundabouts in control delay (s/veh):

Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio ^a	
	$v/c \leq 1.0$	$v/c > 1.0$
0–10	A	F
>10–15	B	F
>15–25	C	F
>25–35	D	F
>35–50	E	F
>50	F	F

Note: ^a For approaches and intersectionwide assessment, LOS is defined solely by control delay.

Control Delay is computed for each critical lane, approach and the intersection as a whole. Critical lanes where the volume-to-capacity ratio is more than 1.0, LOS F is assigned regardless of control delay.

Roundabout Report

The report can be displayed in either Page or Full View. If displayed in Page View, the results will automatically update when the user switches to the Report page. From the Report page, the user can then switch between the formatted report and the text report using the button found at the bottom of the page. The formatted report shows the most important results in a presentable format, while the text report shows a detailed step-by-step analysis in plain text.

If displayed in Full View, the report can be displayed along with the input screen. The user has the choice of displaying the report to the right of the input screen or below the input screen. The report is dynamic and reacts to changes in the input screen. Like the Report page in Page View, the user can switch between the formatted report and the text report using the button found at the bottom of the report.

All or a portion of the reports can be copied to the Windows clipboard for insertion into other files by right-clicking into the Report pane and selecting Copy. The user can also change the display of the report through File Menu or with the use of shortcuts. See *General Controls*.

Roundabout Segments

HCM Chapter 30

Roundabout Segment methodology is a subsection in **Chapter 30, Urban Streets Segments**. It provides an overview of the methodology for evaluating the performance of the motorized vehicle mode on an urban street segment bounded by one or more roundabouts. The procedure is based on national research that measured the travel time performance of nine corridors containing three or more roundabouts in series. The procedure is designed to be integrated into the general computation process for urban street segments described in Chapter 18. Only the relevant deviations from the general procedure are provided in this subsection.

LIMITATIONS OF THE METHODOLOGY

The methodologies in this subsection are based on regression analyses of field-measured data. The limits of these field data are provided in Exhibit 30-40. The analyst is cautioned regarding the validity of the results when an input or intermediate calculated value is outside the range of the research data. In addition, the methodology does not account for capacity constraint caused by oversaturated conditions or the possible effects of an upstream signal on a downstream roundabout.

Operational Data

This Highway Capacity Software (*HCS*) faithfully implements the methodology prescribed in the Highway Capacity Manual (HCM) for analyzing Roundabout Segments.

The user enters all the information necessary in a normal Roundabouts dataset. When a second Roundabout is added, the program will recognize the dataset as a Roundabout Segments dataset and all the necessary fields for the Roundabout Segments procedure will appear.

Intersection/Segment Selection

In a Roundabout Segments dataset, at least two intersections need to be coded. In the upper right-hand corner of the screen, the user has the option to add and delete intersections in the dataset with the use of '+' and '-' buttons, respectively. Segments will be added based on the number of intersections added. The user also has the ability to change the display of the input screen and reports by switching between intersections and segments with the use of drop-down menus.

Roundabout Properties

In addition to the general Roundabout properties, Roundabout Segments also requires input of Width of Circulating Lanes and Inscribed Circle Diameter, both of which are in units of feet (or meters in metric units), and Speed Limit, which is in units of mi/h (or km/h in metric units). The information displayed on

the input screen and current report is dependent on which Roundabout Intersection is selected. Roundabout Intersection selection can be found in the upper right-hand corner of the screen.

Segment Properties

When more than one Roundabout is coded in a dataset, the program will recognize the analysis as a Roundabout Segments analysis. A Segment Properties intersection will appear on the input screen after the Roundabout Properties section. The Name of the segment can be input but is not necessary. Segment Length is a required input. For both the Forward and Reverse directions, required inputs include BFFS Calibration Factor, Restrictive Median, Right-Hand Curb, Right-Hand Access Points, and On-Street Parking, and Mid-Segment Demand Flow Rate.

Roundabout Segments Report

The report can be displayed in either Page or Full View. If displayed in Page View, the results will automatically be updated when the user switches to the Report page. In Full View, the report can be displayed along with the input screen. The user has the choice of displaying the report to the right of the input screen or below the input screen. The report is dynamic and reacts to changes in the input screen. The user can switch between the formatted report and the text report using the buttons found at the bottom of the report or using the buttons found in the menu items.

For the formatted report, there are two types of reports that can be displayed: the Segment or the Roundabout report. If the user chooses to display the Roundabout report, the intersection displayed for the report will depend on which intersection is currently displayed for the input screen. A dropdown menu in the upper right-hand corner of the screen allows the user to switch between intersections. If there are multiple segments and the user chooses to display the Segment report, the segment displayed for the report will depend on which segment is currently displayed for the input screen. Similarly, a dropdown menu in the upper right-hand corner of the screen allows the user to switch between segments.

For the text report, there are two types of reports that can be displayed: the Segment or the Roundabout report. If the user chooses to display the Roundabout report, the intersection displayed for the report will depend on which intersection is currently displayed for the input screen. A dropdown menu in the upper right-hand corner of the screen allows the user to switch between intersections. If there are multiple segments and the user chooses to display the Segment report, the segment displayed for the report will depend on which segment is currently displayed for the input screen. Similarly, a dropdown menu in the upper right-hand corner of the screen allows the user to switch between segments.

All or a portion of the reports can be copied to the Windows clipboard for insertion into other files by right-clicking into the Report pane and selecting Copy. The user can also change the display of the report through File Menu or with the use of shortcuts. See *General Controls*.

How To

Create a New File

1. From the Start screen, there are three options for creating a new file:



Note: A new file can be created if an existing file is already open; you do not need to start from the Start screen.

- a. Selecting *File > New* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “New”

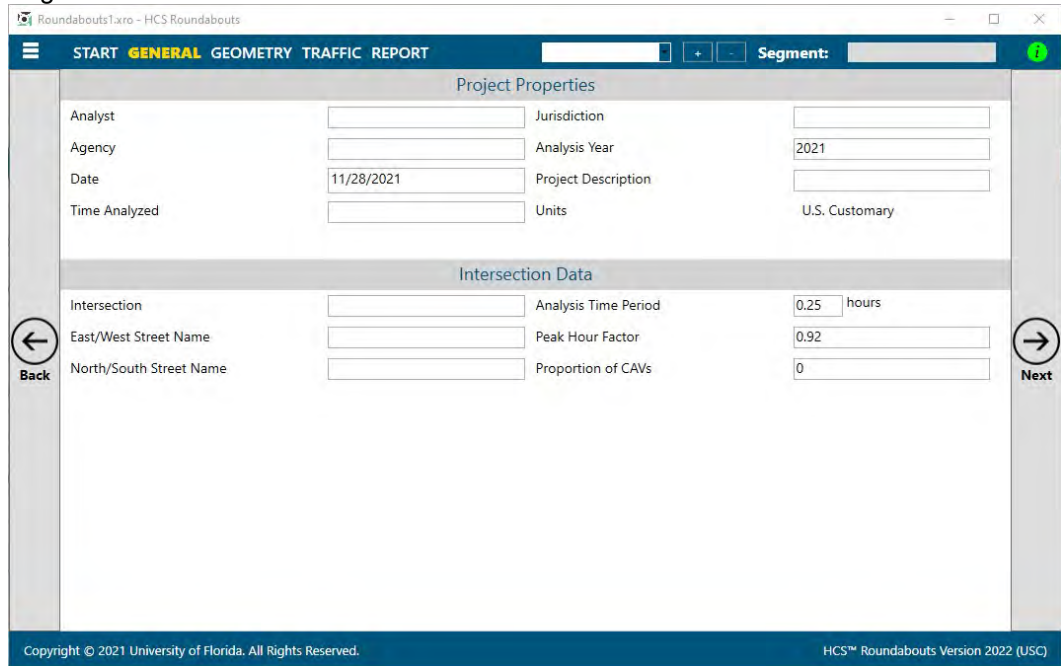


- b. Selecting “New File...” from the Start screen; this can be found below in the red box



- c. Using keyboard shortcut “Ctrl+N”
2. Once a new file is created, you will be brought to the General page if in Page View or the input screen split with the report either on the right or the bottom of the screen if in Full View

a. Page View



Roundabouts1.xro - HCS Roundabouts

START **GENERAL** GEOMETRY TRAFFIC REPORT Segment: []

Project Properties

Analyst: [] Jurisdiction: []
 Agency: [] Analysis Year: 2021
 Date: 11/28/2021 Project Description: []
 Time Analyzed: [] Units: U.S. Customary

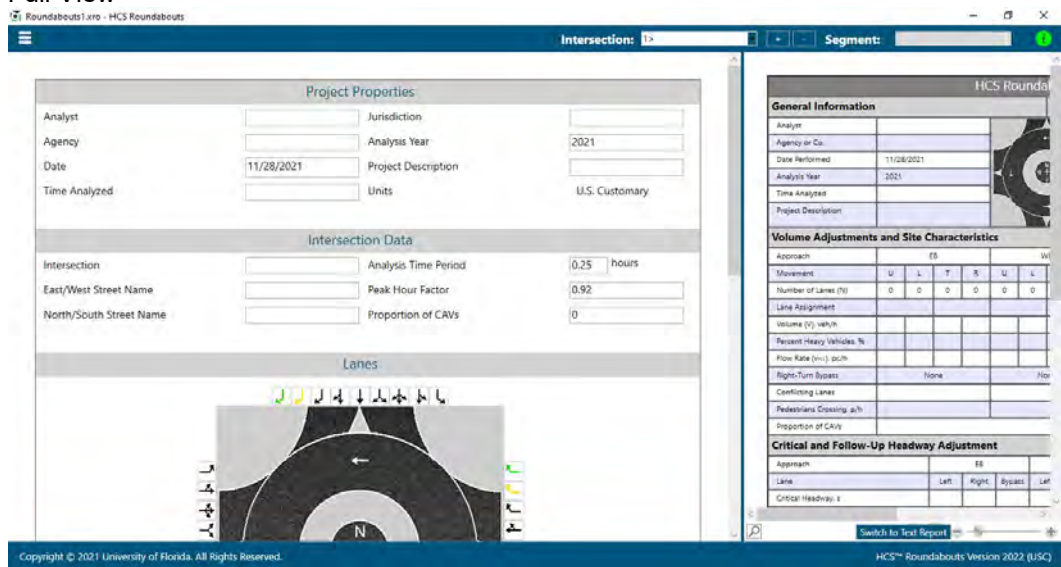
Intersection Data

Intersection: [] Analysis Time Period: 0.25 hours
 East/West Street Name: [] Peak Hour Factor: 0.92
 North/South Street Name: [] Proportion of CAVs: 0

Back Next

Copyright © 2021 University of Florida. All Rights Reserved. HCS™ Roundabouts Version 2022 (USC)

b. Full View



Roundabouts1.xro - HCS Roundabouts Intersection: [] Segment: []

Project Properties

Analyst: [] Jurisdiction: []
 Agency: [] Analysis Year: 2021
 Date: 11/28/2021 Project Description: []
 Time Analyzed: [] Units: U.S. Customary

Intersection Data

Intersection: [] Analysis Time Period: 0.25 hours
 East/West Street Name: [] Peak Hour Factor: 0.92
 North/South Street Name: [] Proportion of CAVs: 0

Lanes

Diagram showing lane configuration for a roundabout intersection.

General Information

Analyst	[]
Agency or Co.	[]
Date Performed	11/28/2021
Analysis Year	2021
Time Analyzed	[]
Project Description	[]

Volume Adjustments and Site Characteristics

Approach	ES	WS
Movement	U L T R	U L
Number of Lanes (N)	0 0 0 0	0 0
Line Assignment	[] [] [] []	[] []
Volume (v) veh/h	[] [] [] []	[] []
Percent Heavy Vehicles %	[] [] [] []	[] []
Flow Rate (m/s) pc/h	[] [] [] []	[] []
Right-Turn Bypass	None	Yes
Conflicting Lanes	[] [] [] []	[] []
Pedestrian Crossing, a/h	[] [] [] []	[] []
Proportion of CAVs	[] [] [] []	[] []

Critical and Follow-Up Headway Adjustment

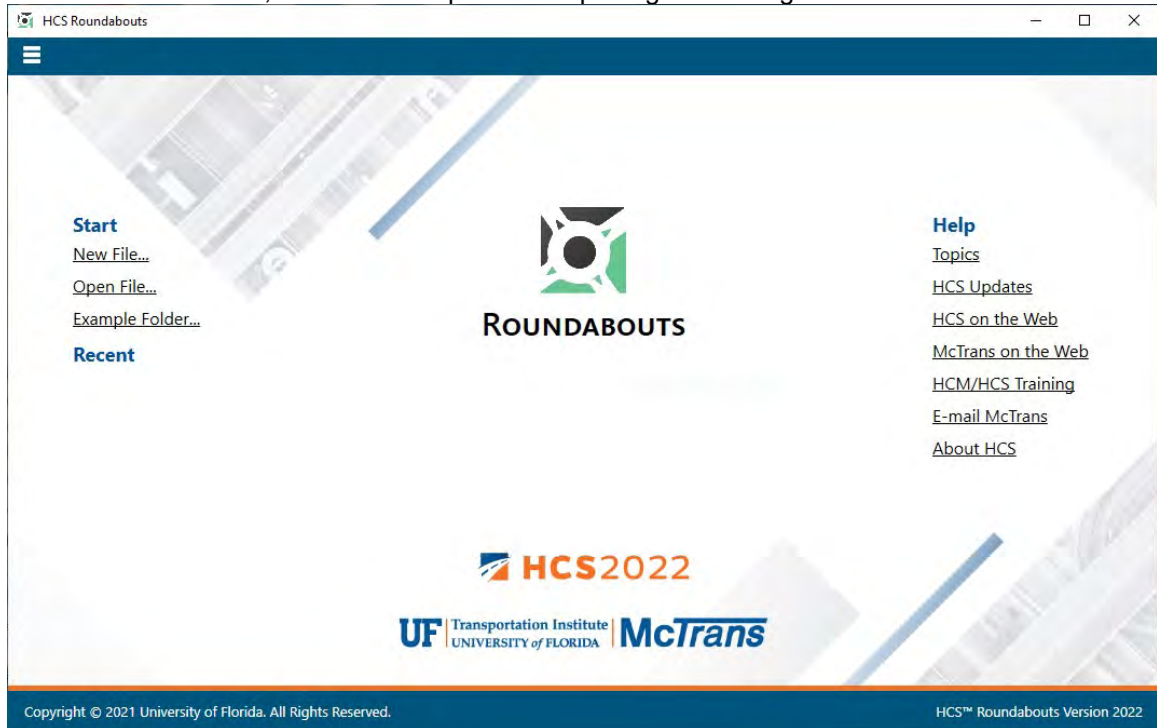
Approach	ES
Line	Left Right Bypass Left
Critical Headway, s	[] [] [] []

Switch to Text Report

Copyright © 2021 University of Florida. All Rights Reserved. HCS™ Roundabouts Version 2022 (USC)

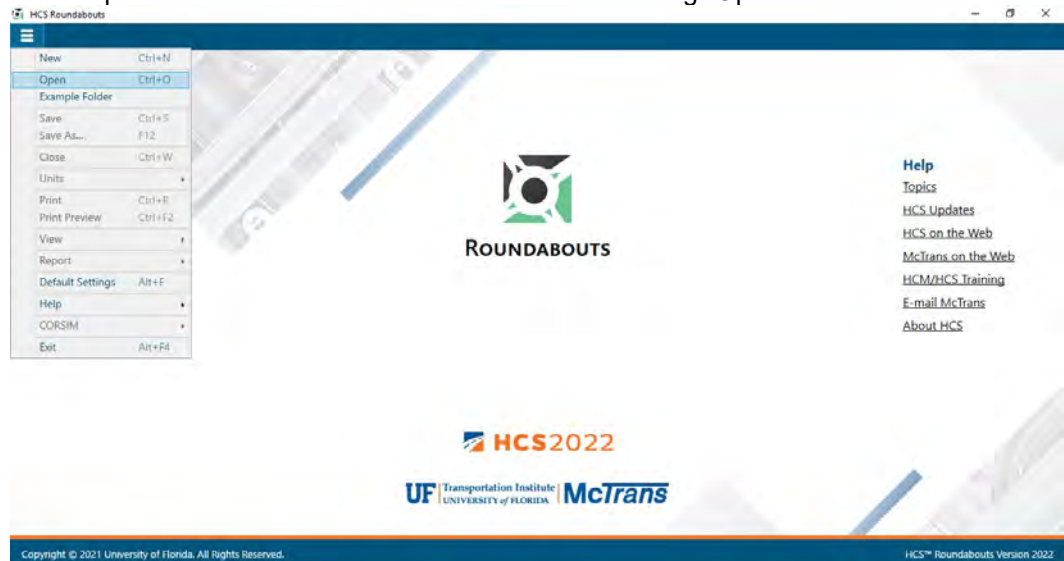
Open an Existing File

1. From the Start screen, there are six options for opening an existing file:



Note: A file can be opened even if another file is currently open; you do not need to start from the Start screen.

- a. Selecting *File > Open* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “Open”



- b. Selecting “Open File...” from the Start screen; this can be found below in the red box



- c. Using the keyboard shortcut “Ctrl+O”
- d. Selecting a file under the Recent files list from the Start screen; this can be found below in the red box



- e. Selecting *File > Example Folder* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “Example Folder”. Opening the example folder will open the path of the HCS example files in File Explorer. The desired example file can be double-clicked or right-clicked and selecting ‘Open’, which will open the example file in the Roundabouts program.



- f. Selecting “Example Folder...” from the Start screen; this can be found below in the red box. Opening the example folder will open the path of the HCS example files in File Explorer. The desired example file can be double-clicked or right-clicked and selecting ‘Open’, which will open the example file in the Roundabouts program.



2. Once an existing file is opened, you will be brought to the General page if in Page View or the input screen split with the report either on the right or the bottom of the screen if in Full View

a. Page View

b. Full View

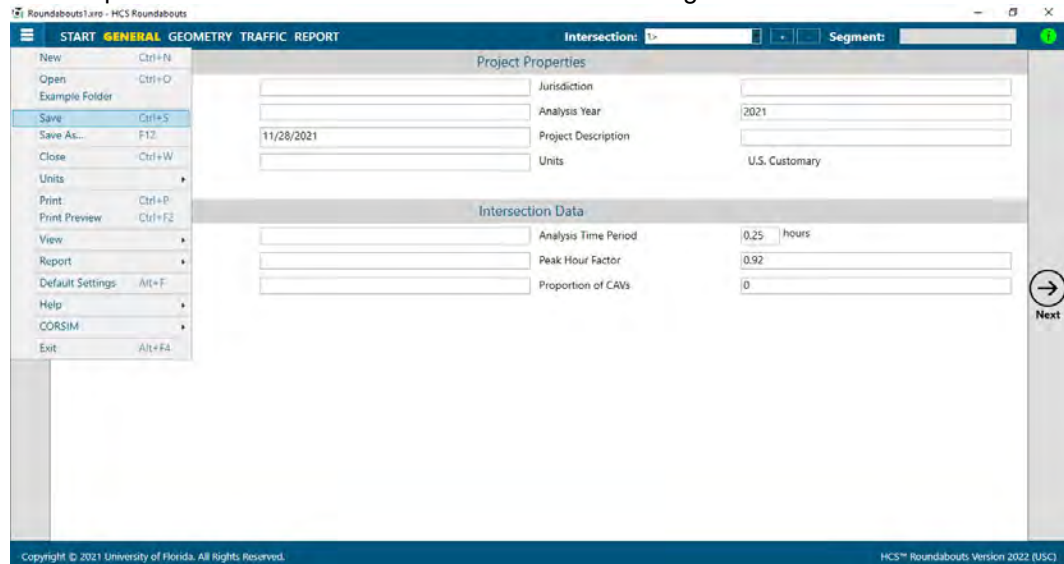
Analyst	
Agency or Co.	
Date Performed	2/20/2017
Analysis Year	2017
Time Analyzed	
Project Description	Chapter 33: Example Problem 1

Approach	EB				WB			
Movement	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0
Lane Assignment	LTR							
Volume (V), veh/h	50	190	280	85	20	110		
Percent Heavy Vehicles, %	2	2	2	2	2	2		
Flow Rate (v/s), pc/h	54	208	304	92	22	119		
Right-Turn Bypass	None				Yield			
Conflicting Lanes	1				1			
Pedestrian Crossing, s/h	0				0			
Proportion of CAVs								

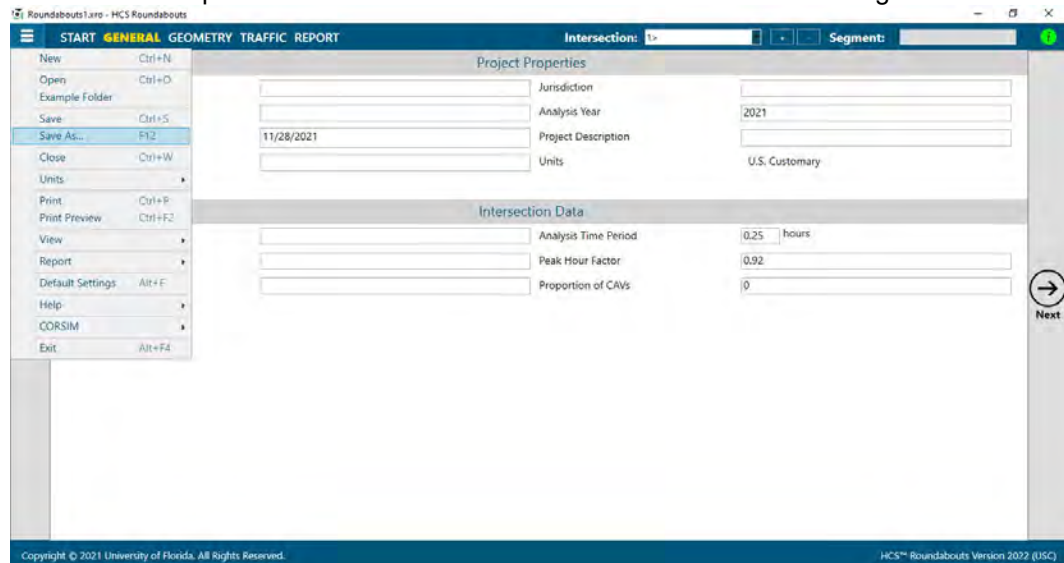
Approach	EB			
Lane	Left	Right	Bypass	Left
Critical Headway, s				4.9755

Save a File

1. There are five options for saving an open file:
 - a. Selecting *File* > *Save* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “Save”

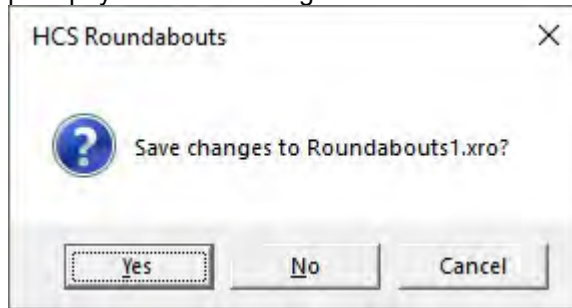


- b. Selecting *File* > *Save As...* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “Save As...”



- c. Using the keyboard shortcut “Ctrl+S” for Save
- d. Using the keyboard shortcut “F12” for Save As

- e. Exiting the program or closing the file without saving changes beforehand; this will prompt you to save changes to the file before anything is closed

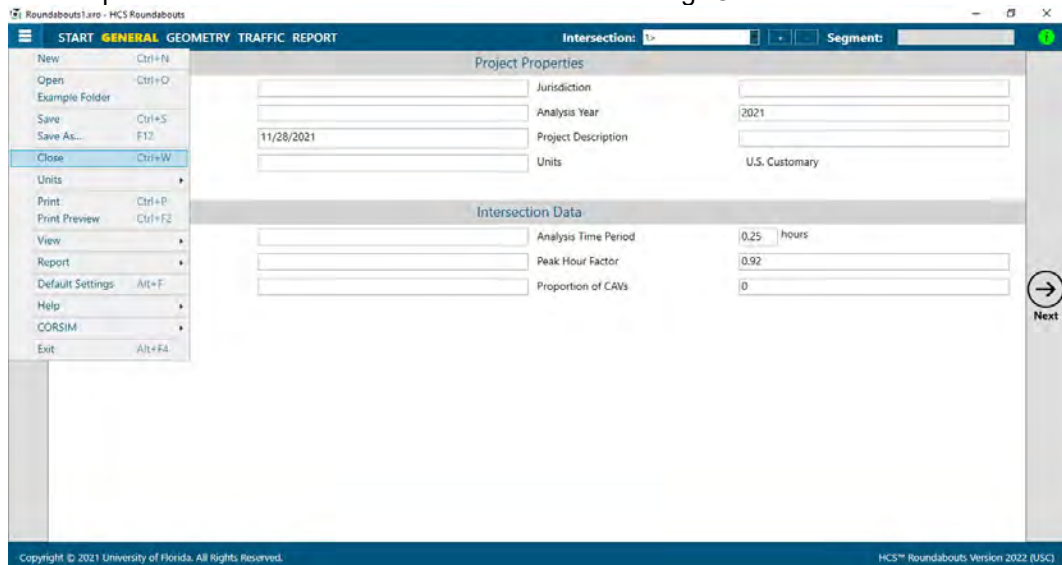


- i. Selecting "Yes" will save the file if it is an existing file. If the file has not been previously saved, the Save As dialog box will pop up allowing you to change the file name and save it.
- ii. Selecting "No" will exit the program or close the file without saving the file
- iii. Selecting "Cancel" will prevent the file from closing

Note: Using Save with an existing file will save a file without prompting you to specify a file name. Using Save with a new file will bring up the Save As dialog box for you to specify a file name for saving. Using Save As will always bring up the Save As dialog box for you to specify a file name for saving.

Close a File

- 1. There are three options for closing an open file:
 - a. Selecting *File > Close* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting "Close"



- b. Using the keyboard shortcut "Ctrl+W"
- c. Exiting the program itself; please see *How To: Exit the Program*

Exit the Program

1. From the Start screen, there are three options for exiting the program:



Note: The program can be exited even if a file is still open; you do not need to start from the Start screen.

- a. Selecting *File > Exit* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “Exit”



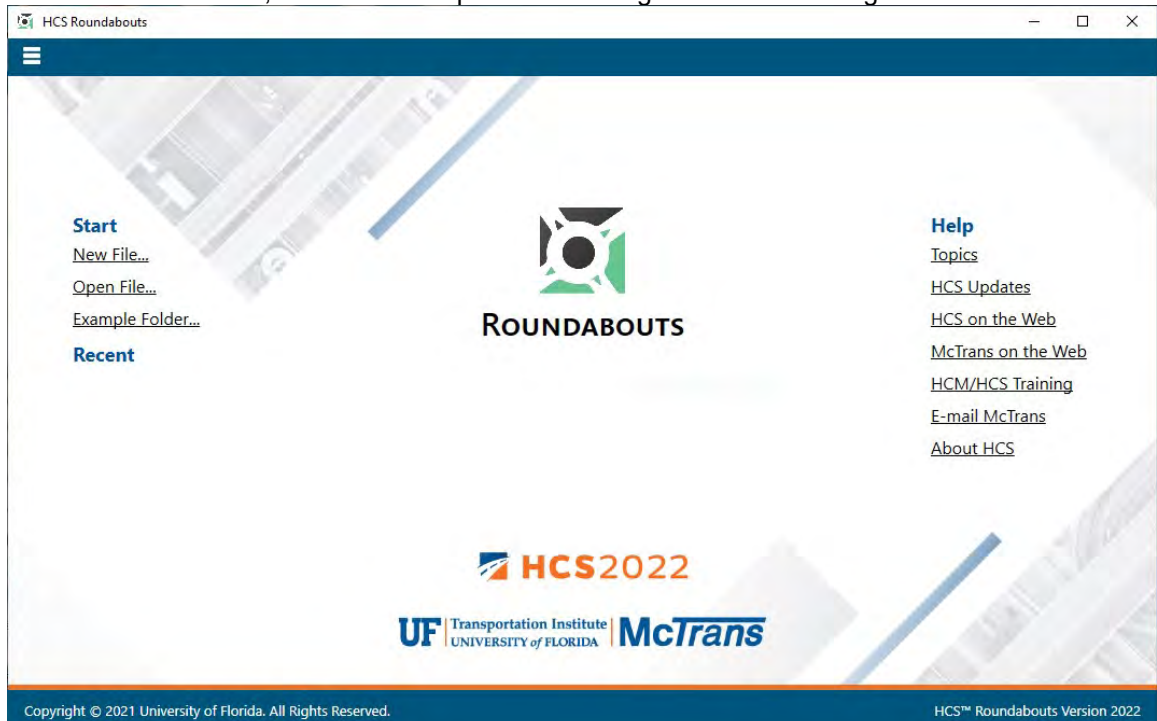
- b. Using the keyboard shortcut “Alt+F4”

- c. Selecting “X” in the top right-hand corner of the screen; this can be found below in the red box



Edit the Default Settings

1. From the Start screen, there are two options for editing the Default Settings:



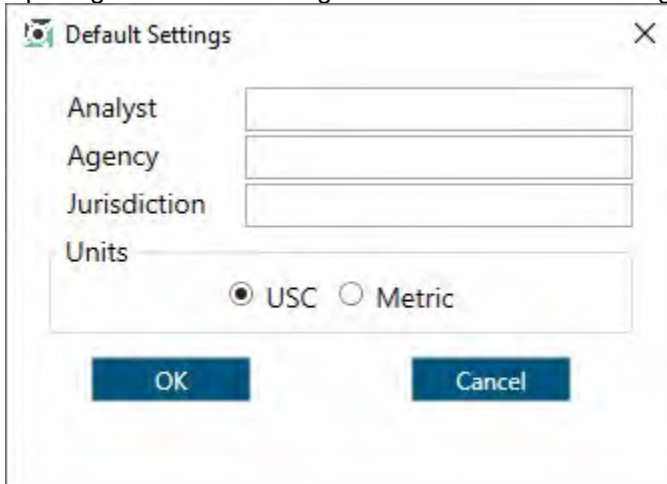
Note: The Default Settings can be changed even if an existing file is already open; you do not need to start from the Start screen.

- a. Selecting *File > Default Settings* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “Default Settings”



- b. Using the keyboard shortcut “Alt+F”

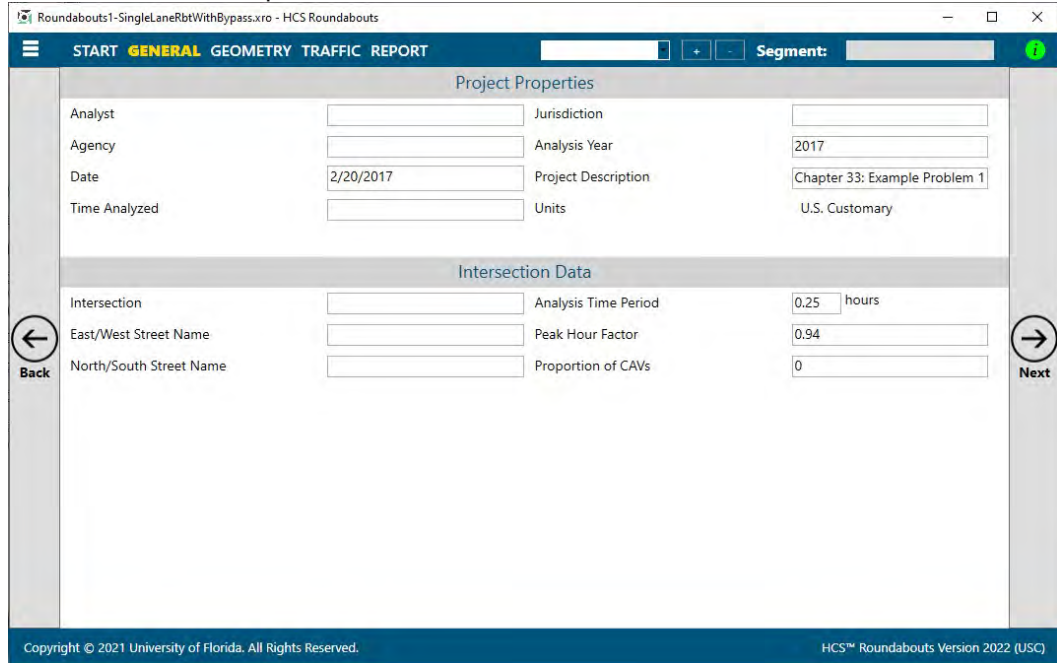
2. Opening the Default Settings will cause a Default Settings window to pop up:



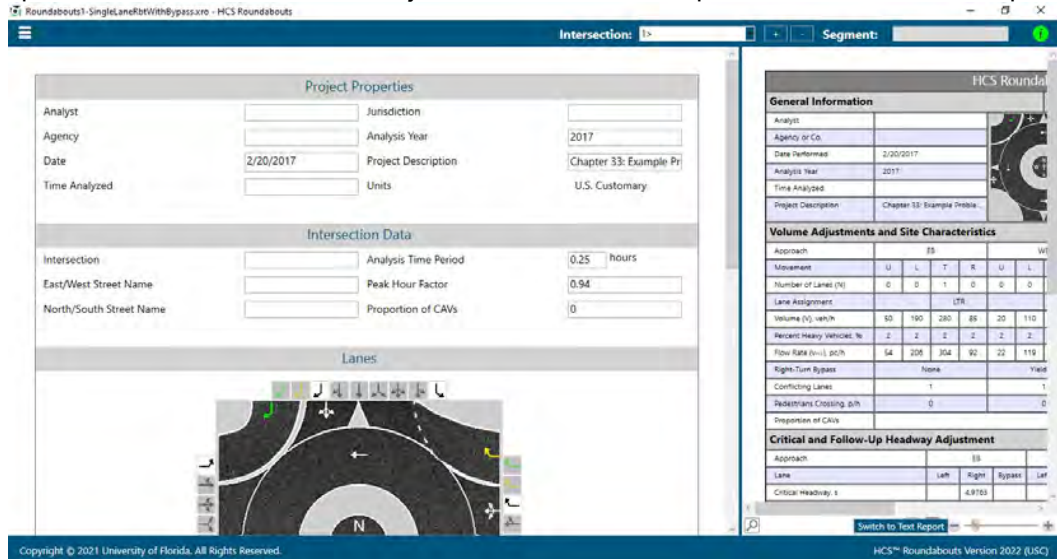
3. You can specify Analyst, Agency, and Jurisdiction by clicking on the corresponding text boxes and typing the desired text.
4. Under ‘Units’, you are given the option of running the analysis in either *U.S. Customary (USC)* or *SI (Metric)* units.
5. Clicking “OK” will save the changes made and close the Default Settings window; clicking “Cancel” will close the Default Setting window without saving and changes.
6. When a new file is created, the Analyst, Agency, and Jurisdiction fields will automatically be populated with the text specified in the Default Settings.
7. When starting a new file, the input and results will display according to the units specified in the Default Settings.

Change the View

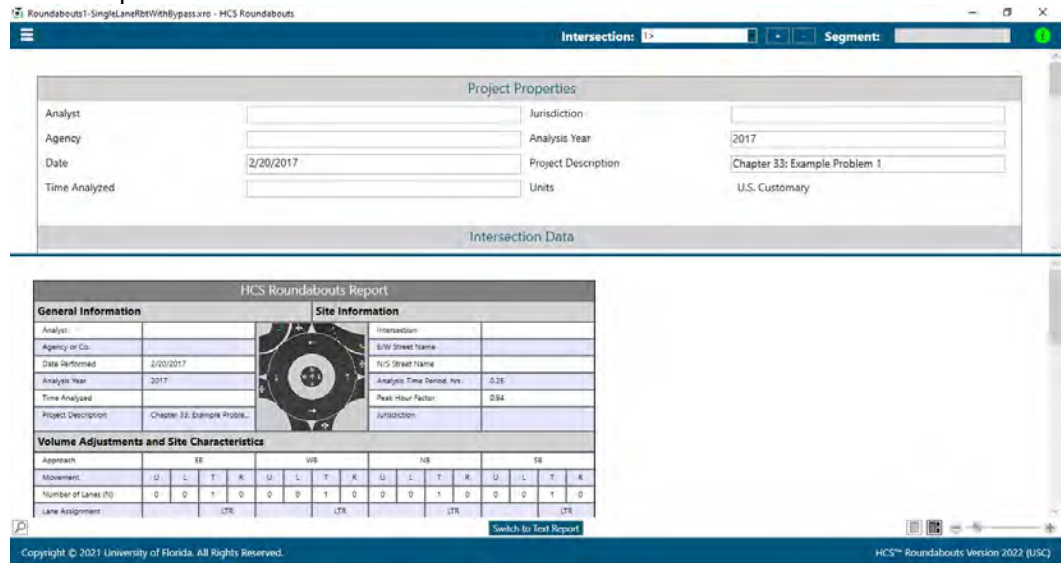
1. When a file is open, there are three main options for the view of the program:
 - a. Page View: the inputs and results reports are separated into pages as seen below. You can navigate between pages using the “Back” and “Next” buttons or by clicking the page names found at the top of the screen.



- b. Full View with the report on the right of the screen: the screen is split with all inputs on the left side and the results reports on the right side. You can access all inputs and view all of the current report by using the corresponding scroll bars. There is also a screen splitter that can be moved to adjust the views of the input screen and results report.



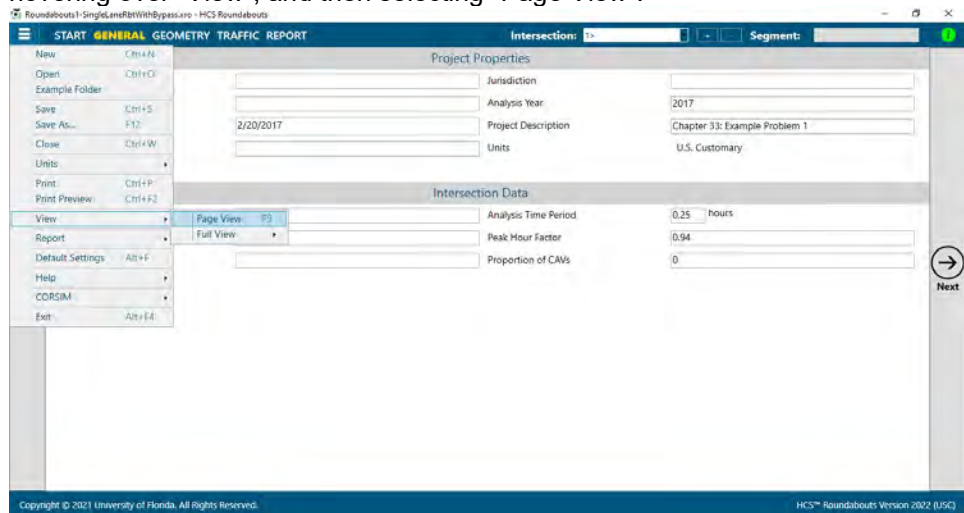
- c. Full View with the report on the bottom of the screen: the screen is split with all inputs on the top of the screen and the results report on the bottom of the screen. You can access all inputs and view all of the current report by using the corresponding scroll bars. There is also a screen splitter that can be moved to adjust the view of the input screen and results report.



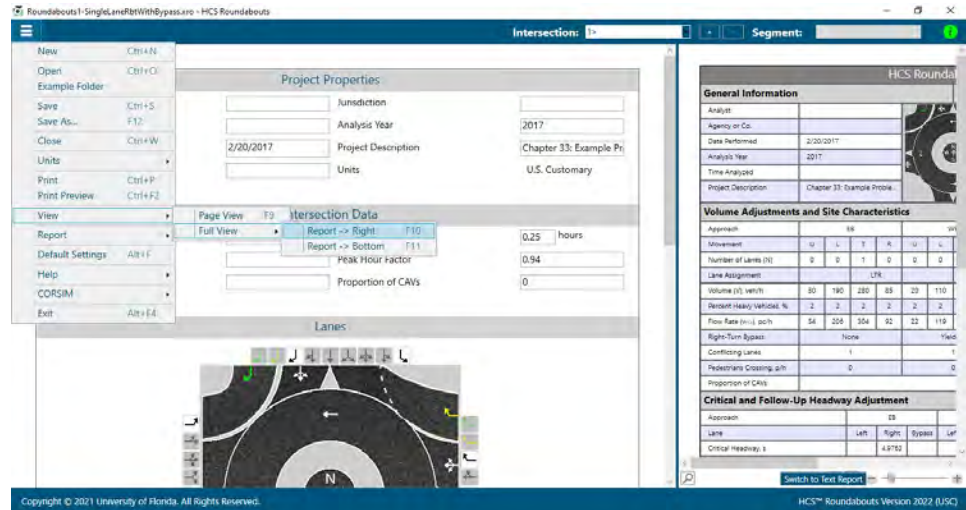
- 2. Views can be changed by using the main menu items or the keyboard shortcuts.

- a. Main Menu Items

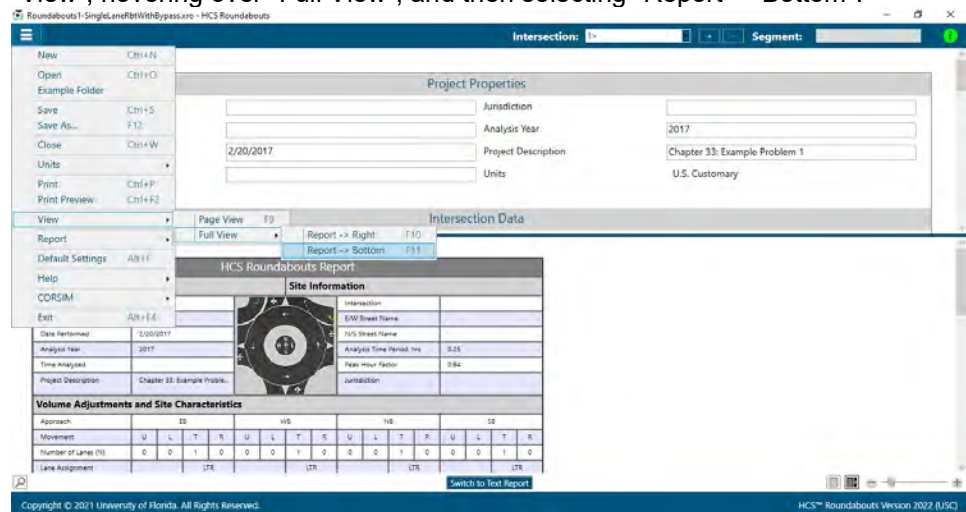
- i. To switch to Page View, select *File > View > Page View* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen, hovering over “View”, and then selecting “Page View”.



- ii. To switch to Full View with the report on the right of the screen, select *File > View > Full View > Report -> Right* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen, hovering over “View”, hovering over “Full View”, and then selecting “Report -> Right”.



- iii. To switch to Full View with the report on the bottom of the screen, select *File > View > Full View > Report -> Bottom* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen, hovering over “View”, hovering over “Full View”, and then selecting “Report -> Bottom”.

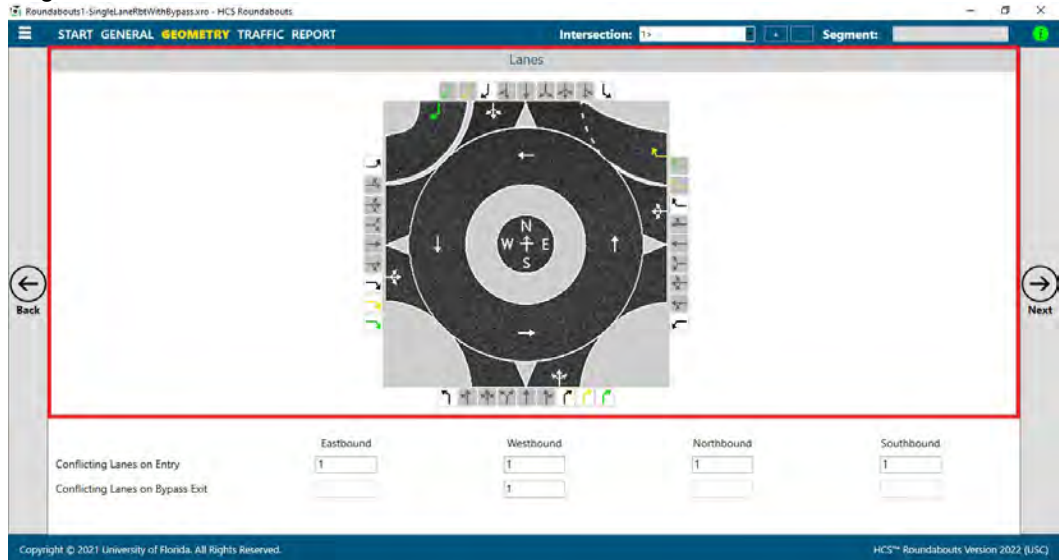


- b. Keyboard Shortcuts
 - i. Page View: keyboard shortcut is “F9”
 - ii. Full View with report on the right of the screen: keyboard shortcut is “F10”
 - iii. Full View with report on the bottom of the screen: keyboard shortcut is “F11”

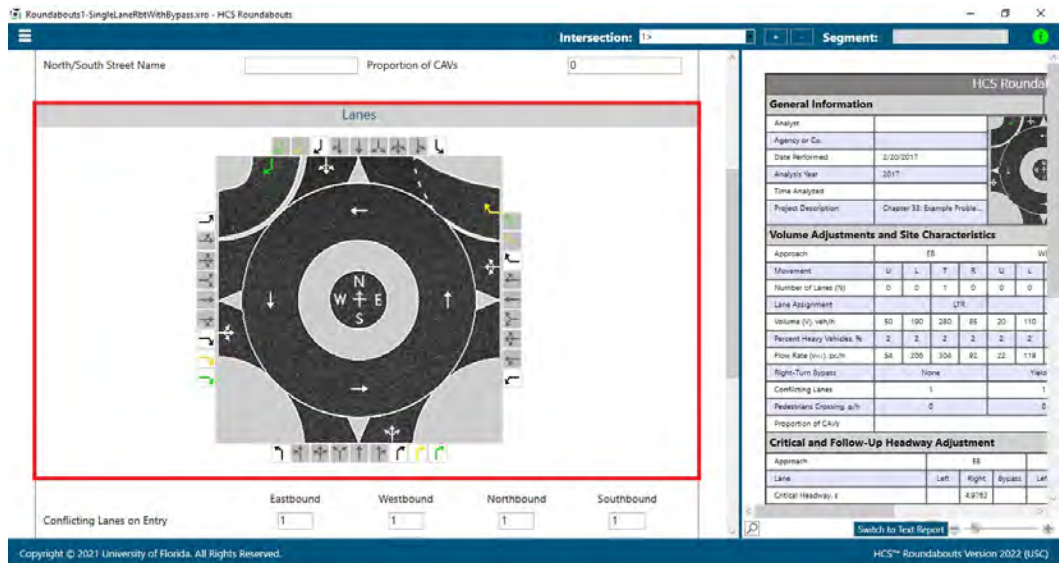
Change the Lane Configuration

1. When a new file is created or an existing file I opened, the lane configuration can be changed under the Lanes section. This can be found on the Geometry page if using Page View or the input portion of the split screen if using Full View.

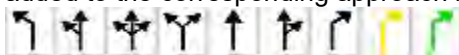
a. Page View



b. Full View

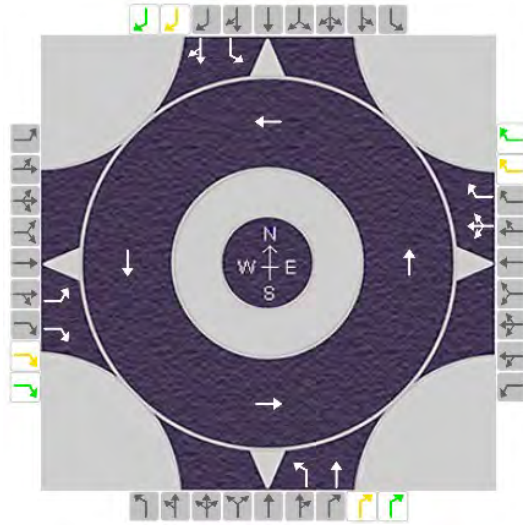


- To add lanes, click on the lane buttons (black, yellow, or green arrows within boxes) on the edges of the lanes graphic. If the background of a lane button is white, the lane is available to add to the corresponding approach. If the background of a lane button is gray, it is disabled and cannot be added to the corresponding approach based on the current lane configuration.

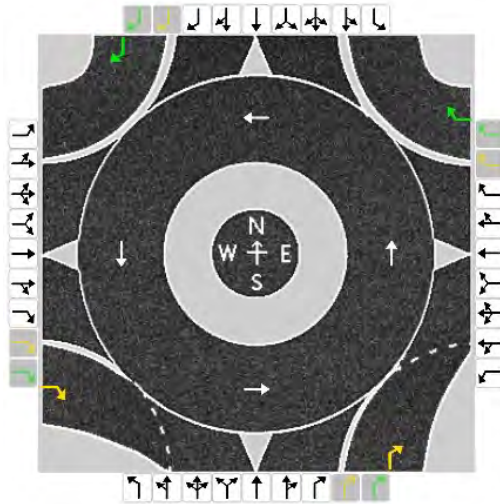


- The black arrows include all the standard lanes: exclusive left-turn (L), shared left-thru (LT), shared left-thru-right (LTR), shared left-right (LR), exclusive thru (T), shared thru-right (TR), and exclusive right (R) lanes.
- The yellow and green arrows include the right-turn bypass lanes. The yellow arrow indicates a yielding right-turn bypass lane; the green arrow indicates a non-yielding right-turn bypass lane.

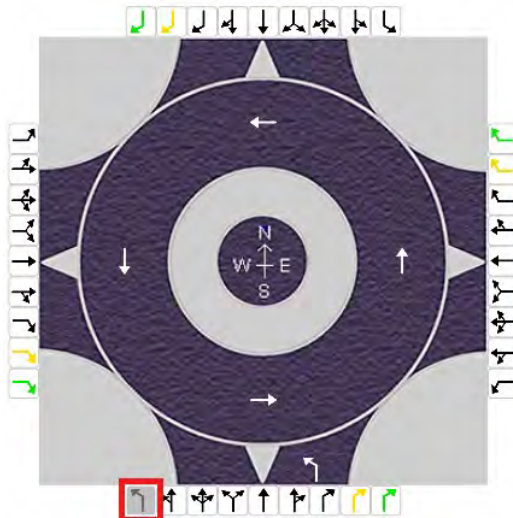
- c. Each approach allows up to two standard lanes to be added



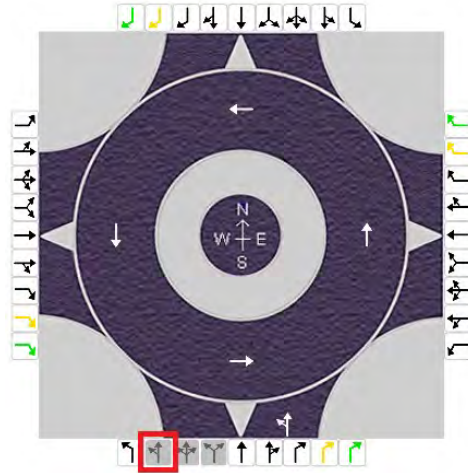
- d. Each approach allows up to one right-turn bypass lane to be added



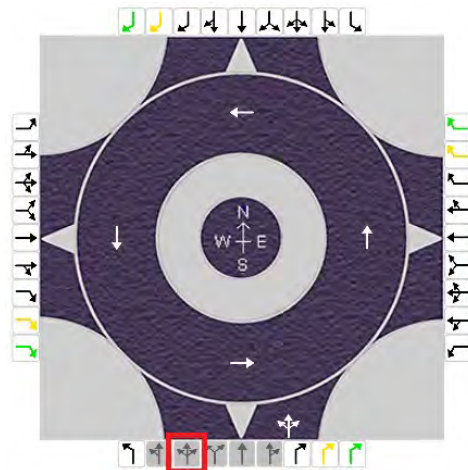
- e. Adding an exclusive left-turn (L) lane will disable the exclusive left-turn (L) lane



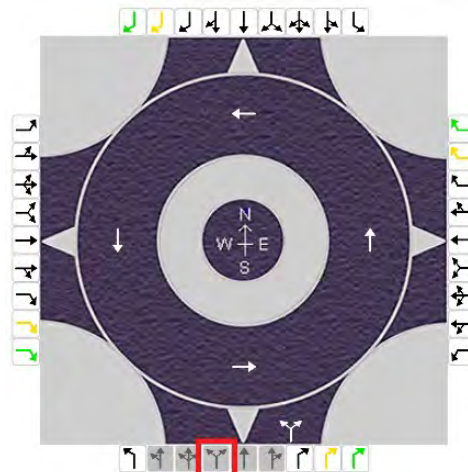
- f. Adding a shared left-thru (LT) lane will disable the shared left-thru (LT), shared left-thru-right (LTR), and shared left-right (LR) lanes



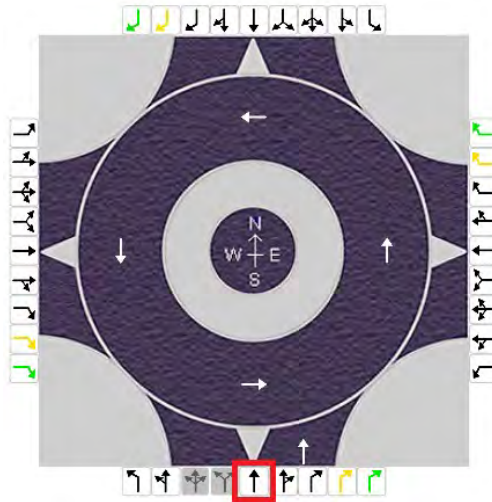
- g. Adding a shared left-thru-right (LTR) lane will disable the shared left-thru (LT), shared left-thru-right (LTR), shared left-right (LR), exclusive thru (T), and shared thru-right (TR) lanes



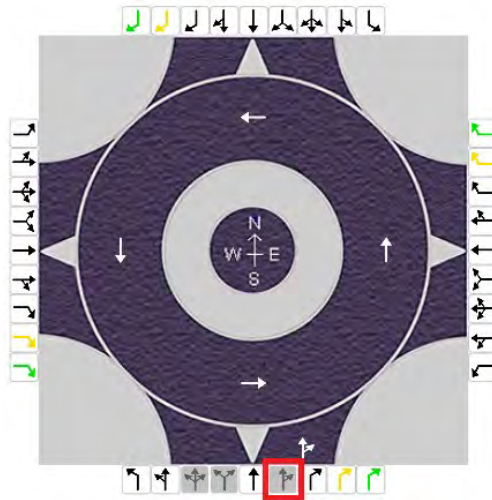
- h. Adding a shared left-right (LR) lane will disable the shared left-thru (LT), shared left-thru-right (LTR), shared left-right (LR), exclusive thru (T), and shared thru-right (TR) lanes



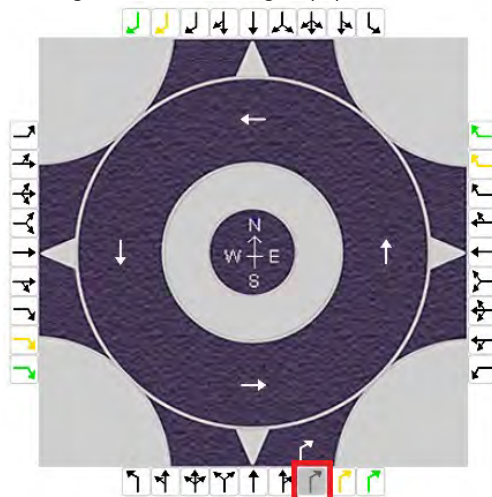
- i. Adding an exclusive thru (T) lane will disable the shared left-thru-right (LTR) and shared left-right (LR) lanes



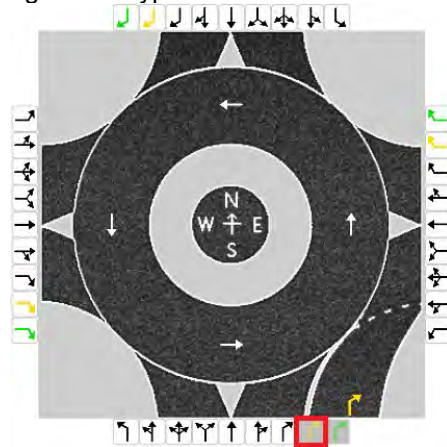
- j. Adding a shared thru-right (TR) lane will disable the shared left-thru-right (LTR), shared left-right (LR), and shared thru-right (TR) lanes



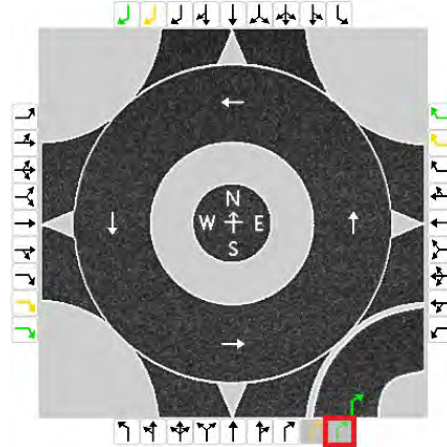
- k. Adding an exclusive right (R) will disable the exclusive right (R) lane



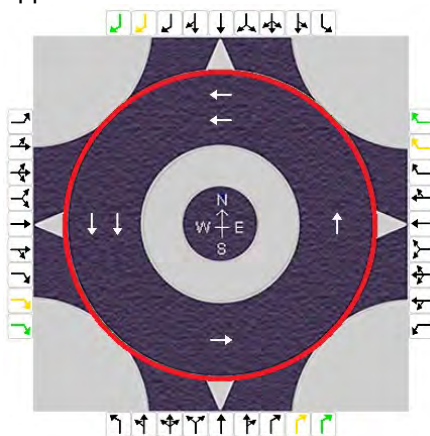
- l. Adding a yielding right-turn bypass lane will disable both the yielding and non-yielding right-turn bypass lanes



- m. Adding a non-yielding right-turn bypass lane will disable both the yielding and non-yielding right-turn bypass lanes



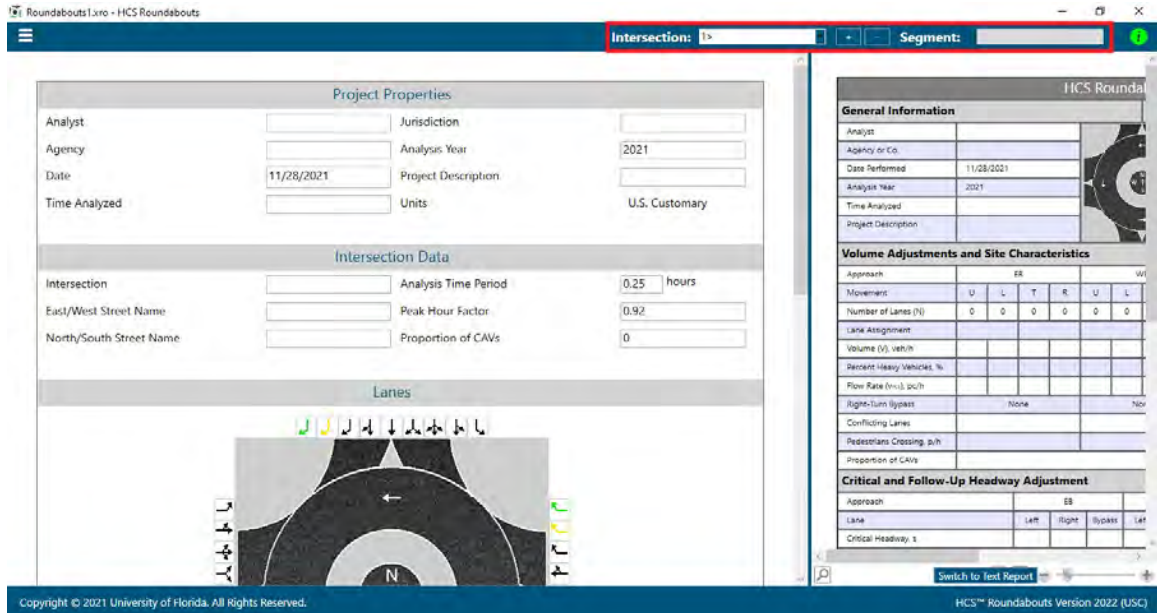
- To remove lanes, click on the lanes within the approach (white arrows and/or yellow or green arrows outside of the roundabout circle). Clicking on an arrow will immediately remove the lane and change which lane buttons are enabled/disabled for the corresponding approach.
- Within the roundabout circle are white arrows for each approach. These represent the number of circulating lanes. The circulating flow arrow(s) simply toggles between one and two lanes for each approach.



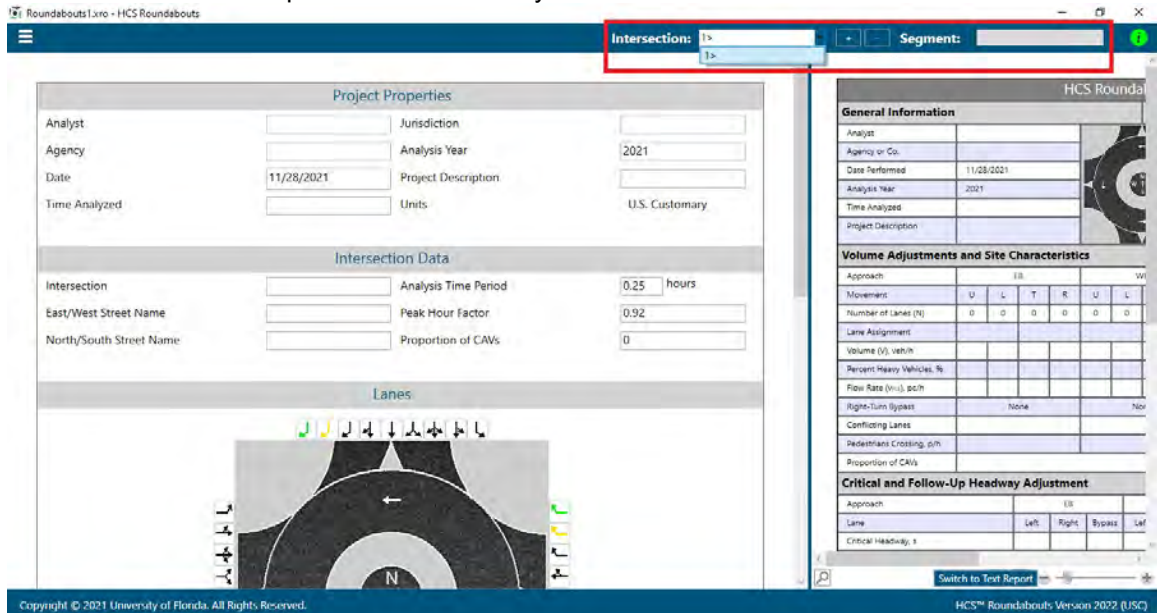
- Changes to the lane configuration on the lanes graphic in the input screen will be reflected on the lanes graphic in the formatted report and the lane information in both the formatted and text reports.

Add or Delete Roundabout Intersections

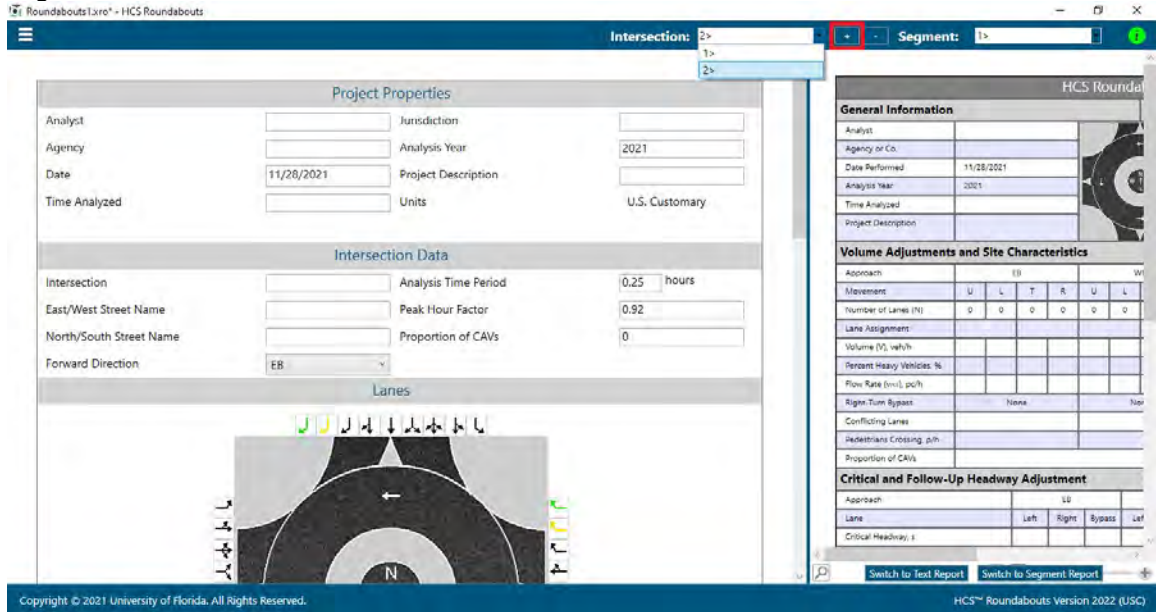
- In a roundabout analysis, there can be a single roundabout or multiple roundabouts. Whether in Page View or Full View, drop down menus for Intersection and Segment, along with plus (+) and minus (-) buttons are provided at the top right-hand corner of the window next to the information icon.



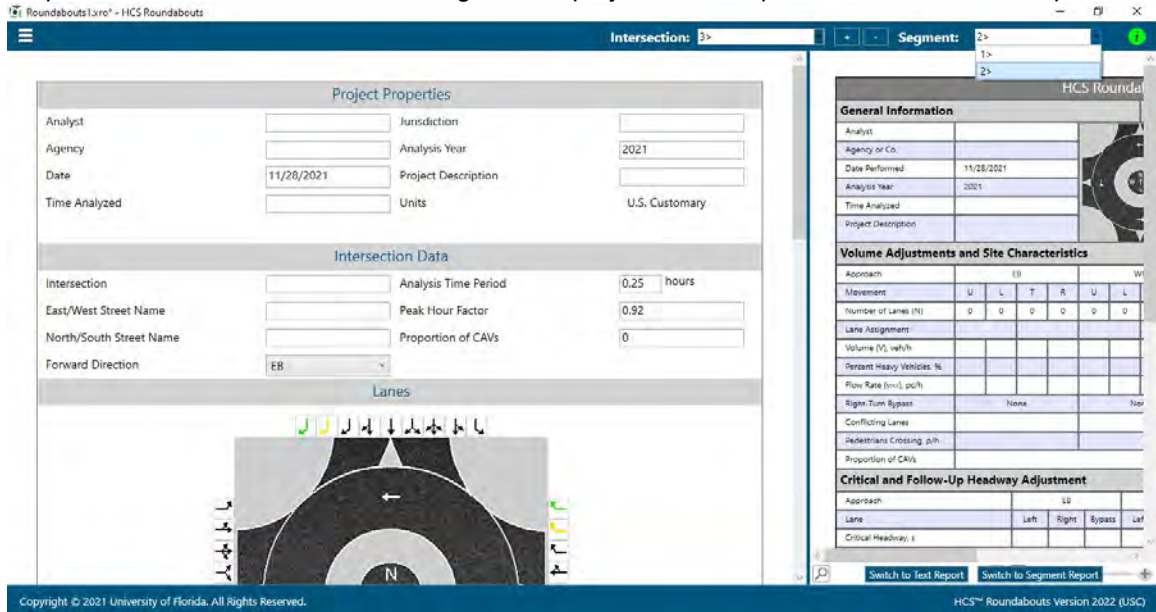
- When the current analysis only has one roundabout, the Segment drop down menu is disabled and the Intersection drop down menu will only have one choice.



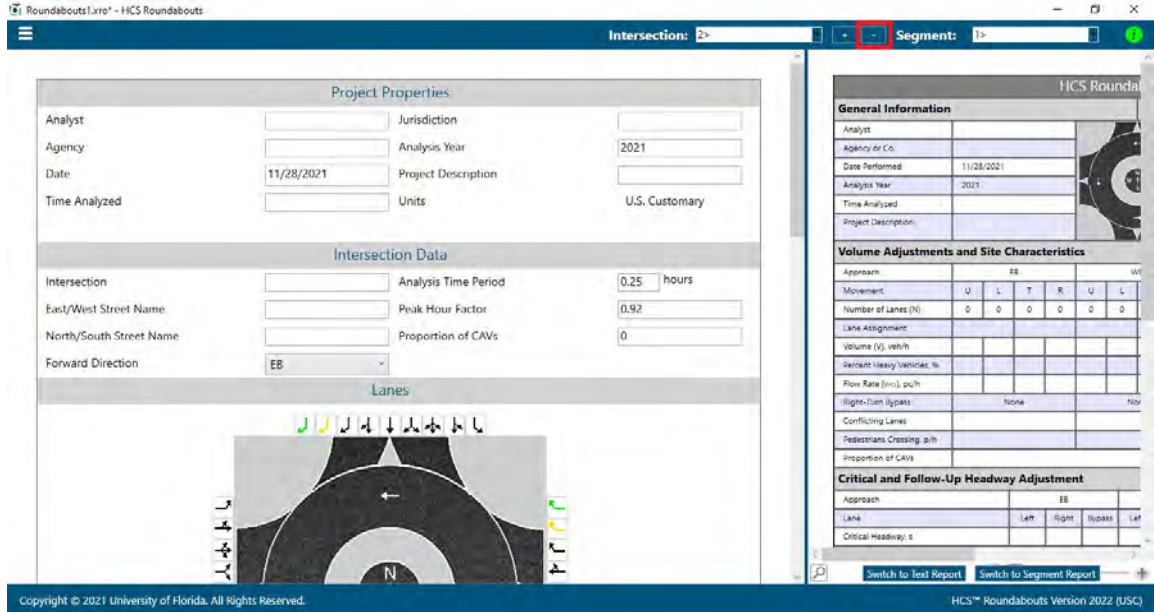
- To add a roundabout to an analysis, select the plus (+) button next to the Intersection drop down menu. This will add a roundabout intersection after whichever roundabout is currently selected in the Intersection drop down menu. When a new intersection is added, it will also be listed in the drop down menu. If the Segment drop down menu was previously disabled, it will now be enabled and a new segment will be listed in the Segment drop down menu. For every intersection included in an analysis, there will be one less segment included. For example, an analysis with two intersections will have one segment and an analysis with three intersections will have two segments.



- The intersection selected in the Intersection drop down menu will be the current intersection displayed on the input screen and results report. Similarly, the segment selected in the Segment drop down menu will be the current segment displayed on the input screen and results report.

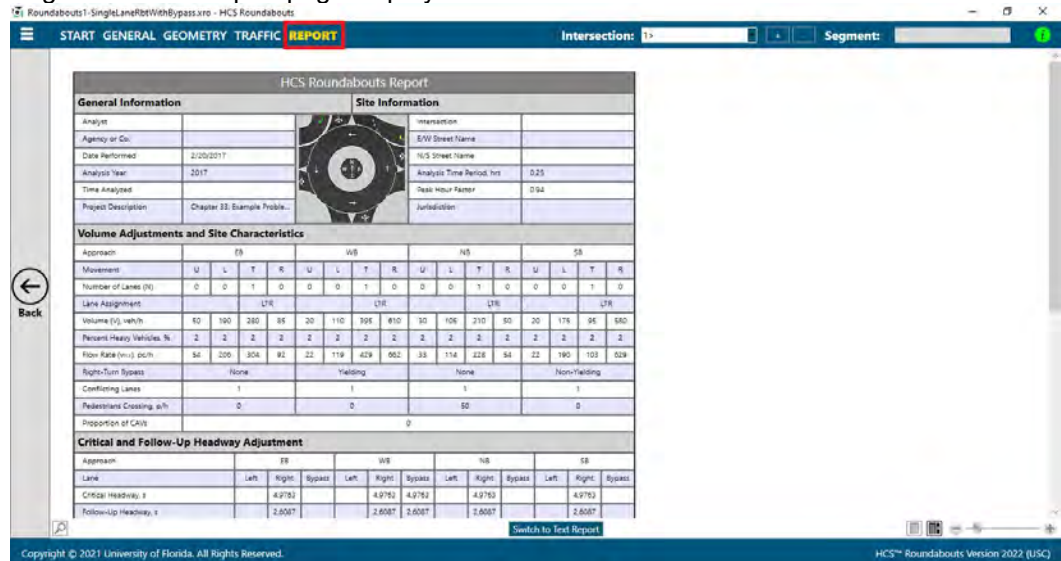


- To delete a roundabout from an analysis, select the minus (-) button next to the Intersection drop down menu. This will remove whichever roundabout intersection is currently selected in the Intersection drop down menu.

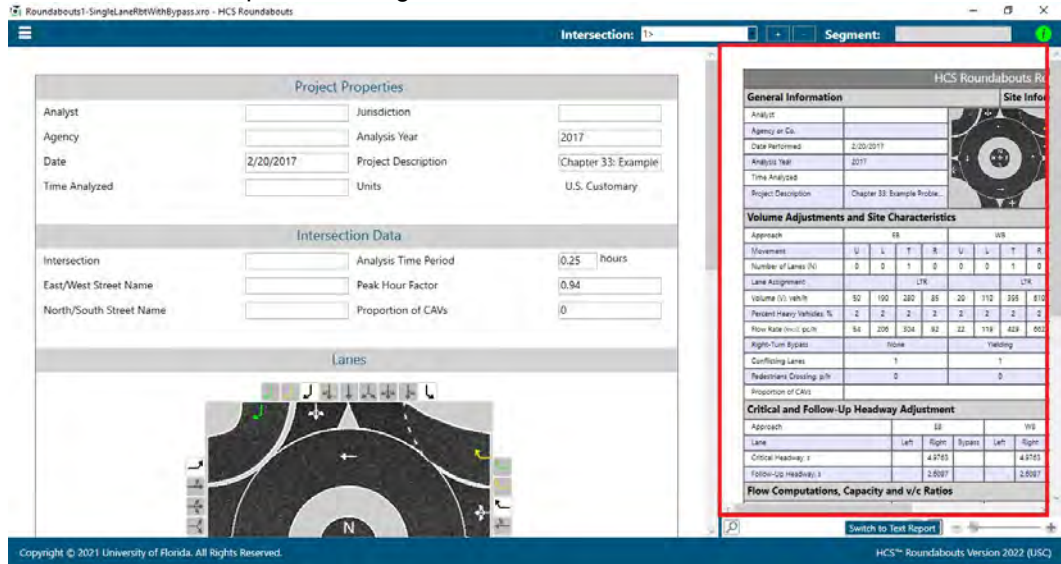


View Results of the Analysis

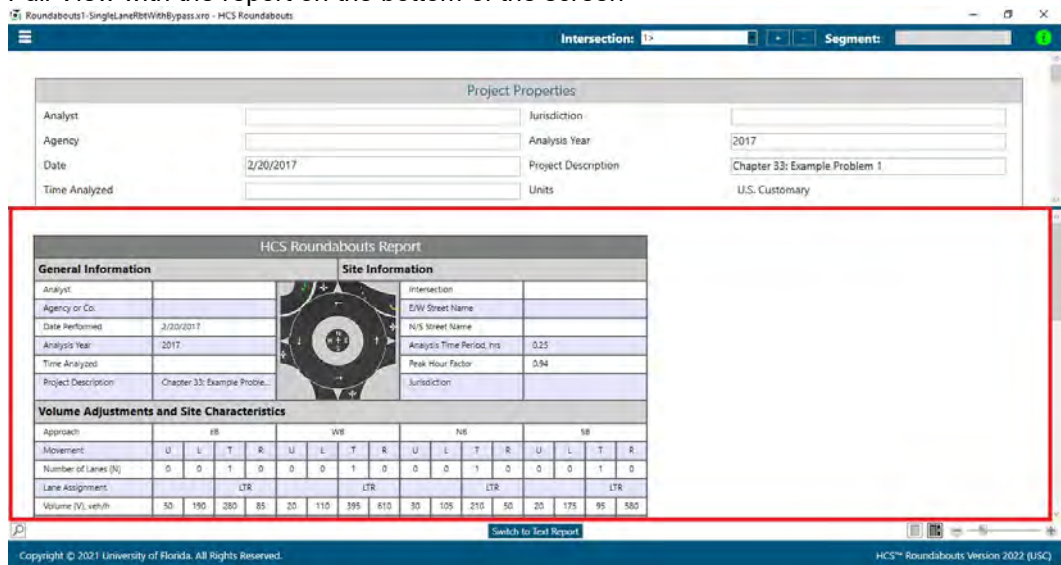
- After editing all the necessary inputs, results of the analysis can be found in the form of reports. Reports can be found on the Report page if using Page View or on the results portion of the split screen if using Full View.
 - Page View with Report page displayed



b. Full View with the report on the right of the screen



c. Full View with the report on the bottom of the screen



2. There are two types of reports: Formatted and Text

- a. Formatted reports show the most important results in a presentable format. Options available for formatted reports include: Roundabout Formatted Report, Segment Formatted Report, and Full Segments Report.

HCS Roundabouts Report																
General Information						Site Information										
Analyst						Interaction										
Agency or Co.						E/W Street Name										
Date Performed						N/S Street Name										
Analysis Year						Analysis Time Period, hrs										
Time Analyzed						Peak Hour Factor										
Project Description						Jurisdiction										
Volume Adjustments and Site Characteristics																
Approach	EB			WB			NB			SB						
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR			LTR			LTR			LTR						
Volume (V), veh/h	50	190	280	85	20	110	395	610	30	105	210	50	20	175	95	580
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v), pc/h	54	206	304	92	22	119	429	662	33	114	228	54	22	190	103	629
Right-Turn Bypass	None			Yielding			None			Non-Yielding						
Conflicting Lanes	1			1			1			1						
Pedestrians Crossing, p/h	0			0			50			0						
Proportion of CAVs	0															
Critical and Follow-Up Headway Adjustment																
Approach	EB			WB			NB			SB						
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Critical Headway, s	4.9763			4.9763			4.9763			4.9763						
Follow-Up Headway, s	3.6087			2.6087			2.6087			3.6087						
Flow Computations, Capacity and v/c Ratios																
Approach	EB			WB			NB			SB						
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Entry Flow (v), pc/h	656			570			429			629						
Entry Volume, veh/h	643			559			649			617						
Circulating Flow (v), pc/h	489			657			796			771						
Exiting Flow (v), pc/h	570			597			454			547						
Capacity (c), pc/h	838			706			867			611						
Capacity (c), veh/h	832			692			850			595						
v/c Ratio (v)	0.78			0.81			0.76			0.77						
Delay and Level of Service																
Approach	EB			WB			NB			SB						
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Lane Control Delay (d), s/veh	22.1			27.3			20.3			22.8						
Time LOS	C			D			C			B						
95% Queue, veh	8.0			8.4			7.5			6.7						
Approach Delay, s/veh	22.1			23.5			22.8			4.7						
Approach LOS	C			C			C			A						
Intersection Delay, s/veh LOS	17.7 C															

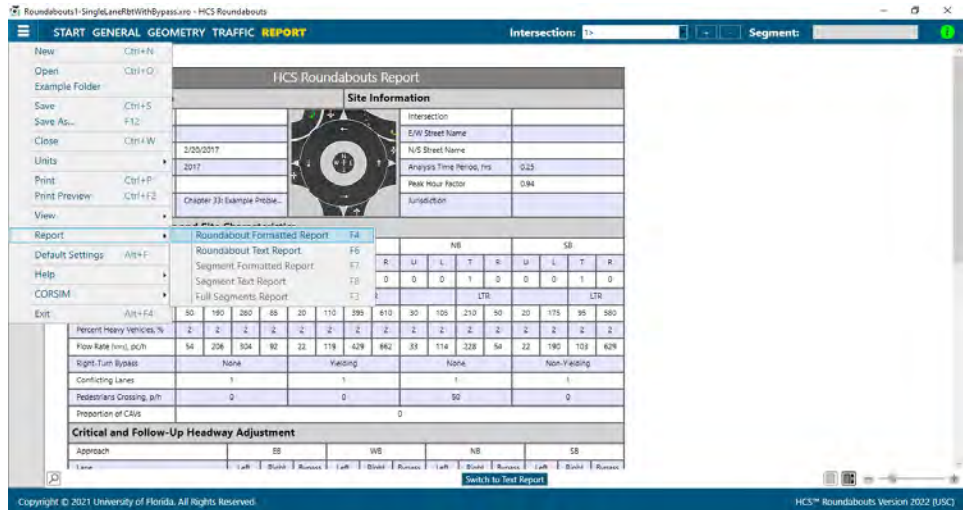
- b. Text reports show a more detailed analysis in plain text. Options available for text reports include: Roundabout Text Report and Segment Text Report.

HCS Roundabouts Text Report												
STEP 1: GENERAL INFORMATION Project Name: Roundabout Analysis Agency or Co.: Roundabout Engineering, Inc. Date Performed: 11/16/2017 Analysis Year: 2017 Time Analyzed: 10:30 AM Project Description: Chapter 33: Example Problem						STEP 2: DETERMINE CIRCULATING AND EXITING FLOW RATES Circulating Flow (v), pc/h: 711 Exiting Flow (v), pc/h: 547						
STEP 3: DETERMINE PEDESTRIAN DEMAND FOR VEHICLES Pedestrians Crossing (p/h): 50						STEP 4: ASSIGN FLOW RATES AND CAPACITY INTO VEHICLES PER HOUR Capacity (c), pc/h: 838 Capacity (c), veh/h: 832						
STEP 5: ASSIGN FLOW RATES FOR HEAVY VEHICLES Percent Heavy Vehicles (%): 2						STEP 6: CALCULATE VOLUME TO CAPACITY RATIO, AVERAGE CONTROL DELAY, AND LOS v/c Ratio (v): 0.78 Average Control Delay (d), s/veh: 22.1 Time LOS: C						

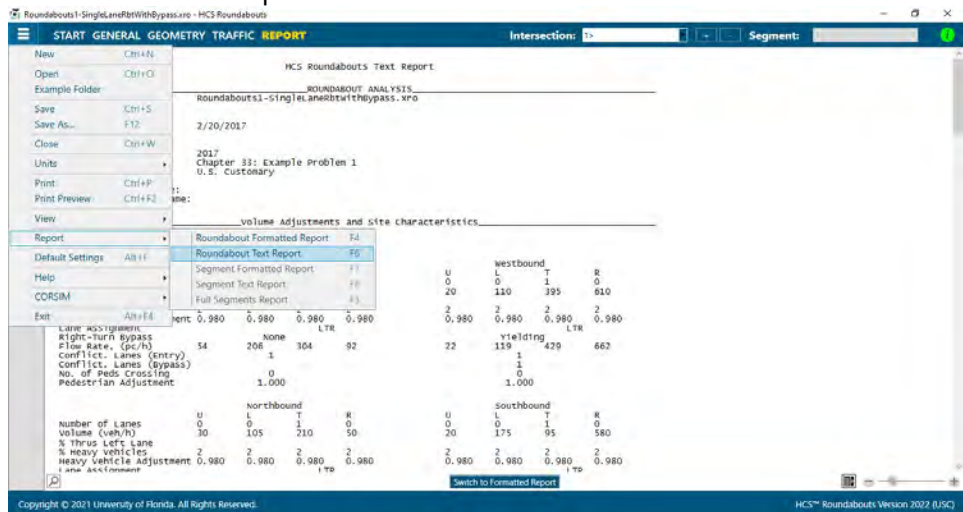
3. The type of report displayed can be changed by using the main menu items, keyboard shortcuts, or toggle buttons found under the report

a. Main Menu Items

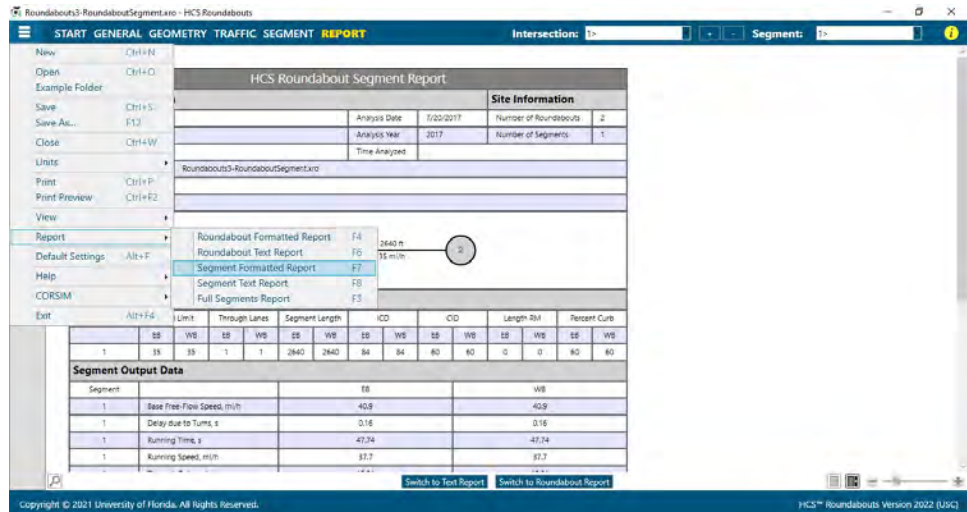
- i. To switch to the Roundabout Formatted Report, select *File > Report > Roundabout Formatted Report* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen, hovering over "Report", and then selecting "Roundabout Formatted Report".



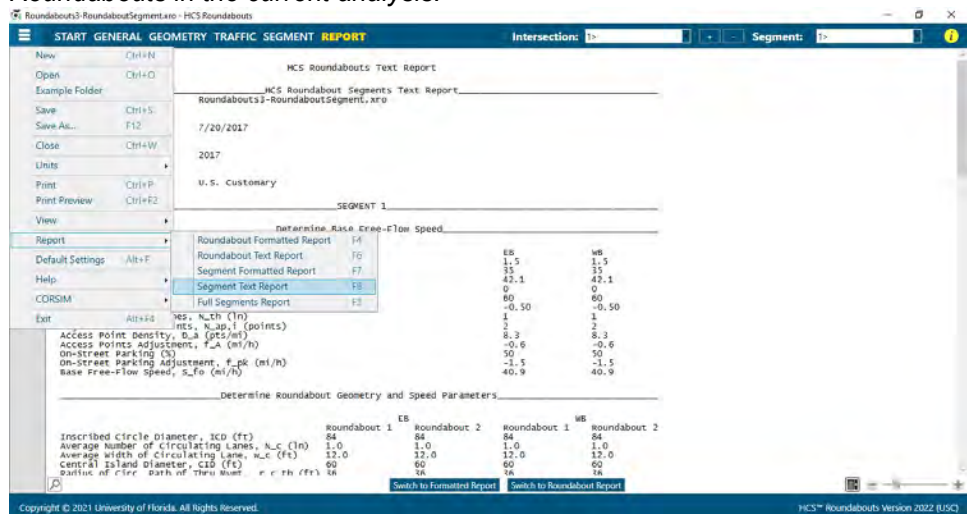
- ii. To switch to the Roundabout Text Report, select *File > Report > Roundabout Text Report* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen, hovering over “Report”, and then selecting “Roundabout Text Report”.



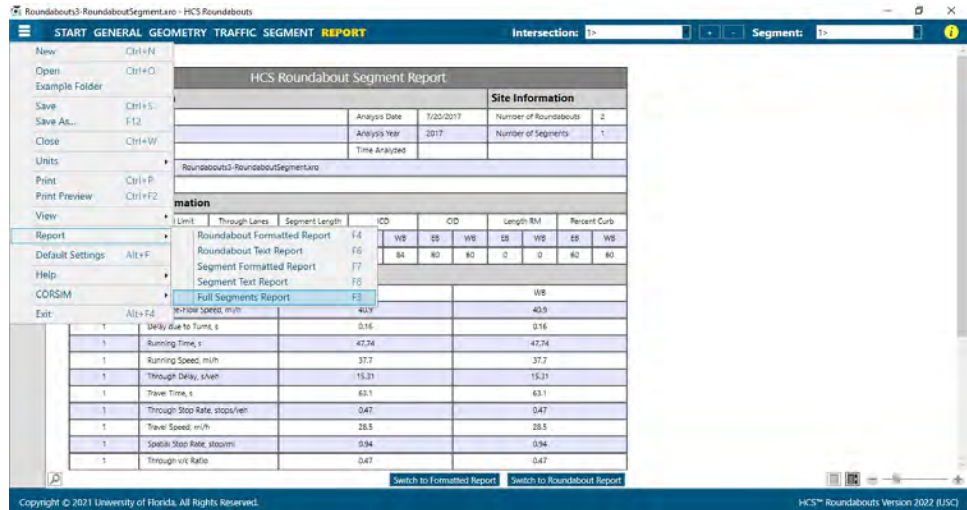
- iii. To switch to the Segment Formatted Report, select *File > Report > Segment Formatted Report* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen, hovering over “Report”, and then selecting “Segment Formatted Report”. *Note: This will only be enabled if there are multiple Roundabouts in the current analysis.*



- iv. To switch to the Segment Text Report, select *File > Report > Segment Text Report* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen, hovering over “Report”, and then selecting “Segment Text Report”. *Note: This will only be enabled if there are multiple Roundabouts in the current analysis.*



- v. To switch to the Full Segments Report, select *File > Report > Full Segments Report* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen, hovering over “Report” and then selecting “Full Segments Report”. *Note: This will only be enabled if there are multiple Roundabouts in the current analysis.*

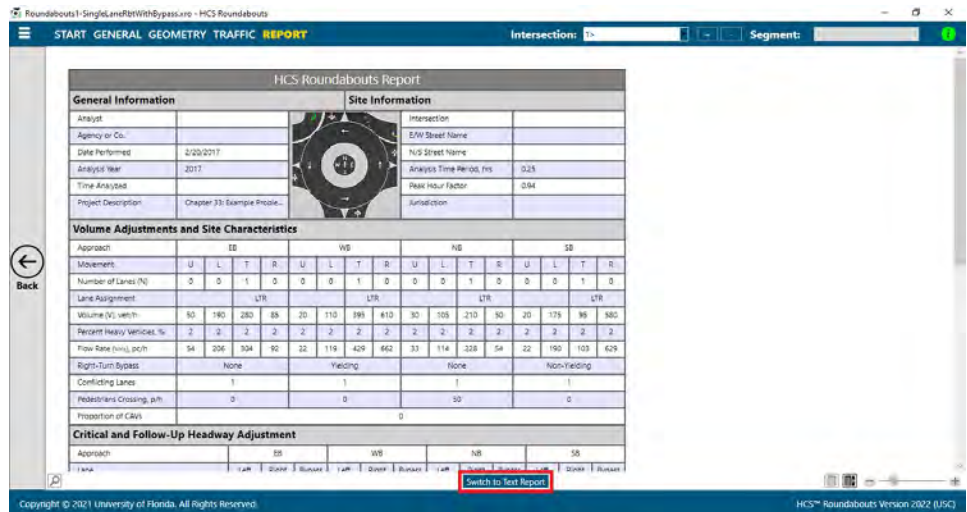


b. Keyboard Shortcuts

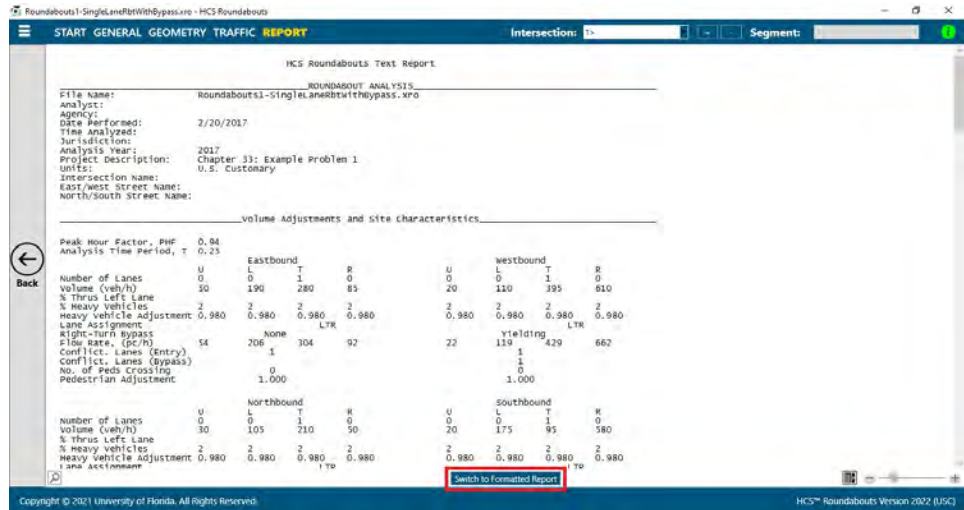
- i. Formatted Report: keyboard shortcut is “F4”
- ii. Text Report: keyboard shortcut is “F6”

c. Report Toggle Buttons

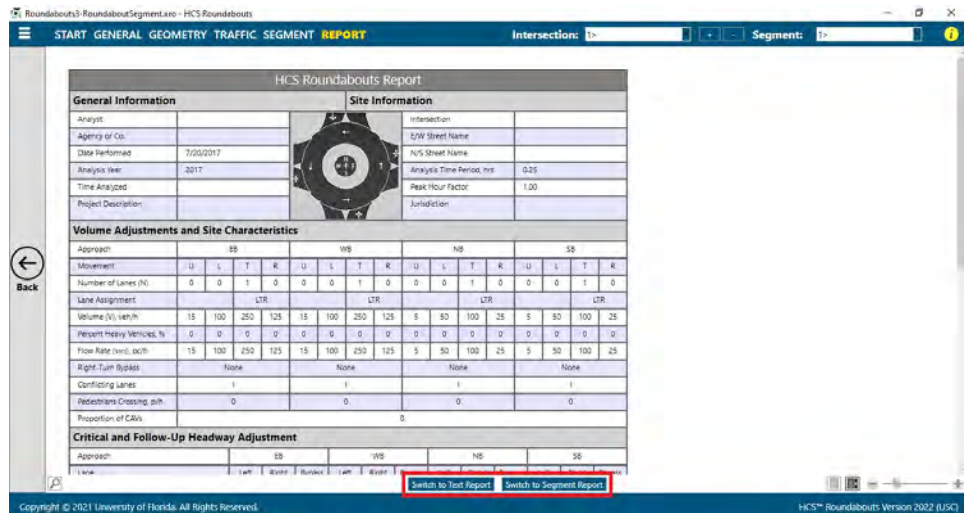
- i. Whether viewing the report in Page View or Full View, a toggle button(s) will be available at the bottom of the screen underneath the report.
- ii. If there is a single roundabout in the current analysis and the roundabout formatted report is currently being displayed, one toggle button will be displayed and will say “Switch to Text Report” which will allow you to display the roundabout text report if clicked.



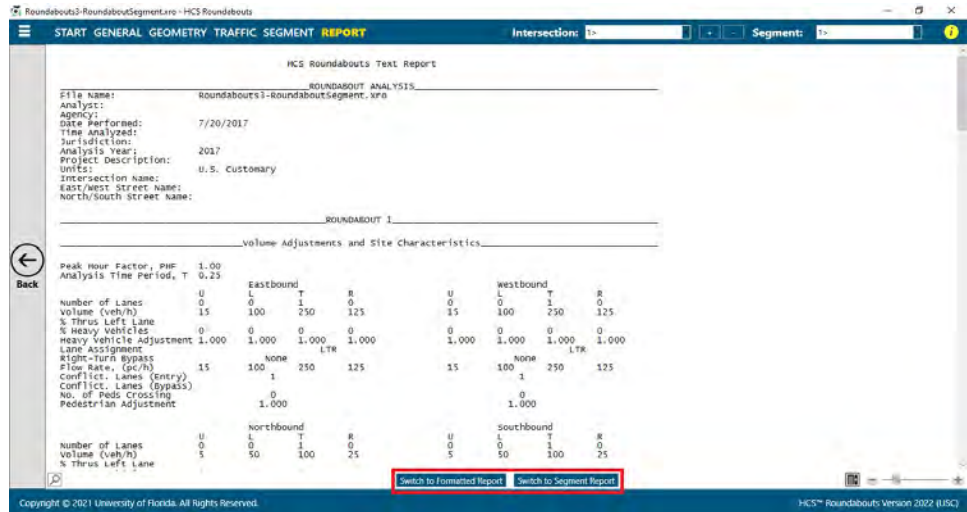
- iii. If there is a single roundabout in the current analysis and the roundabout text report is currently being displayed, one toggle button will be displayed and will say “Switch to Formatted Report” which will allow you to display the roundabout formatted report if clicked.



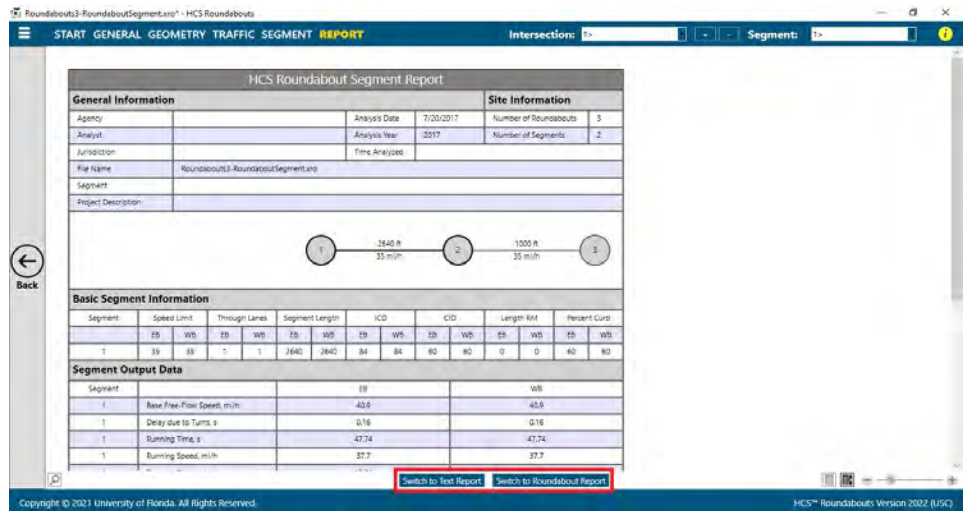
- iv. If there are multiple roundabouts in the current analysis and the roundabout formatted report is currently being displayed, two toggle buttons will be displayed. One will say “Switch to Text Report” which will allow you to display the roundabout text report if clicked. The other will say “Switch to Segment Report” which will allow you to display the segment formatted report if clicked.



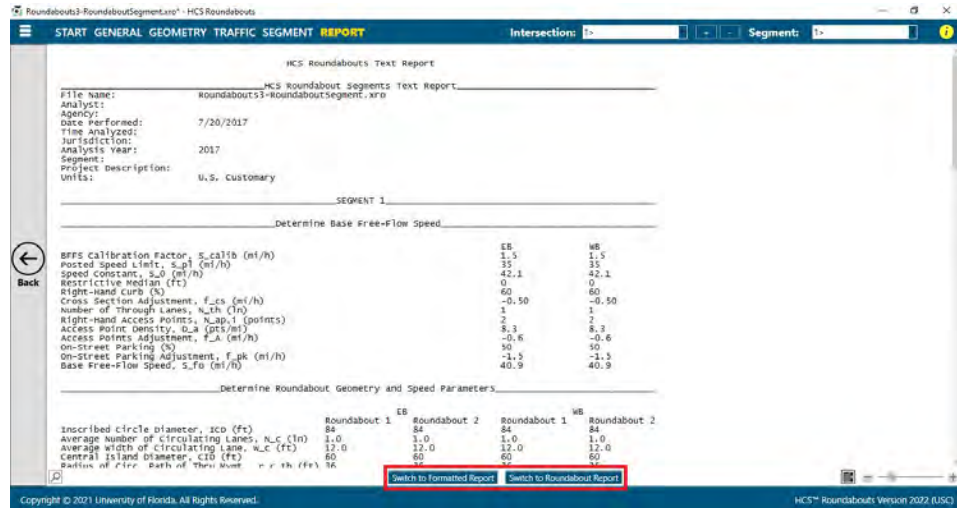
- v. If there are multiple roundabouts in the current analysis and the roundabout text report is currently being displayed, two toggle buttons will be displayed. One will say “Switch to Formatted Report” which will allow you to display the roundabout formatted report if clicked. The other will say “Switch to Segment Report” which will allow you to display the segment text report if clicked.



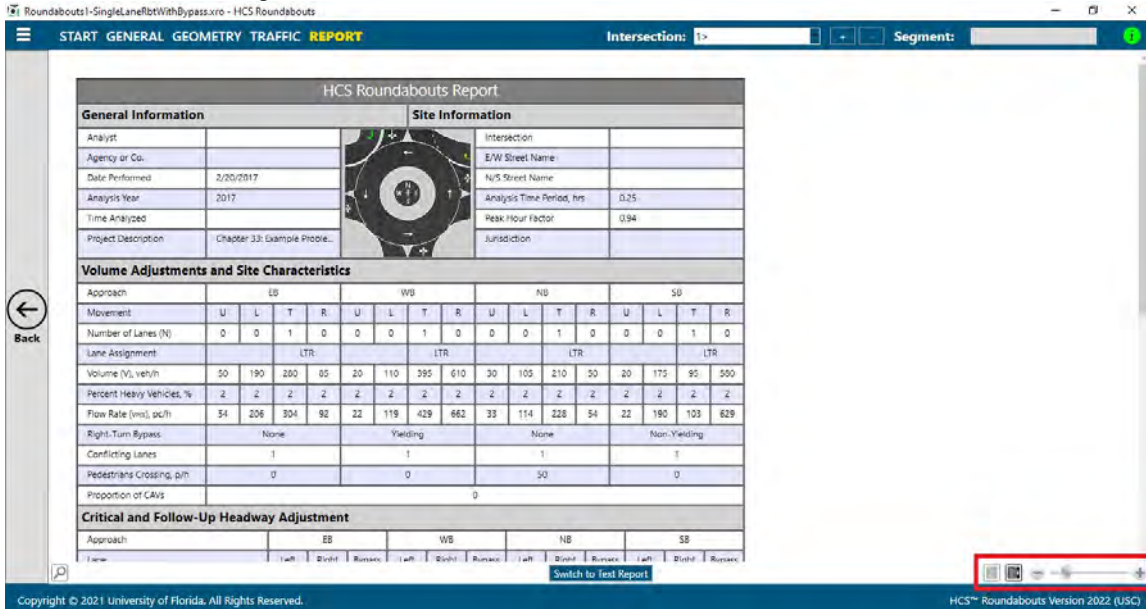
- vi. If there are multiple roundabouts in the current analysis and the segment formatted report is currently being displayed, two toggle buttons will be displayed. One will say “Switch to Text Report” which will allow you to display the segment text report if clicked. The other will say “Switch to Roundabout Report” which will allow you to display the roundabout formatted report if clicked.



- vii. If there are multiple roundabouts in the current analysis and the segment text report is currently being displayed, two toggle buttons will be displayed. One will say “Switch to Formatted Report” which will allow you to display the segment formatted report if clicked. The other will say “Switch to Roundabout Report” which will allow you to display the roundabout text report if clicked.



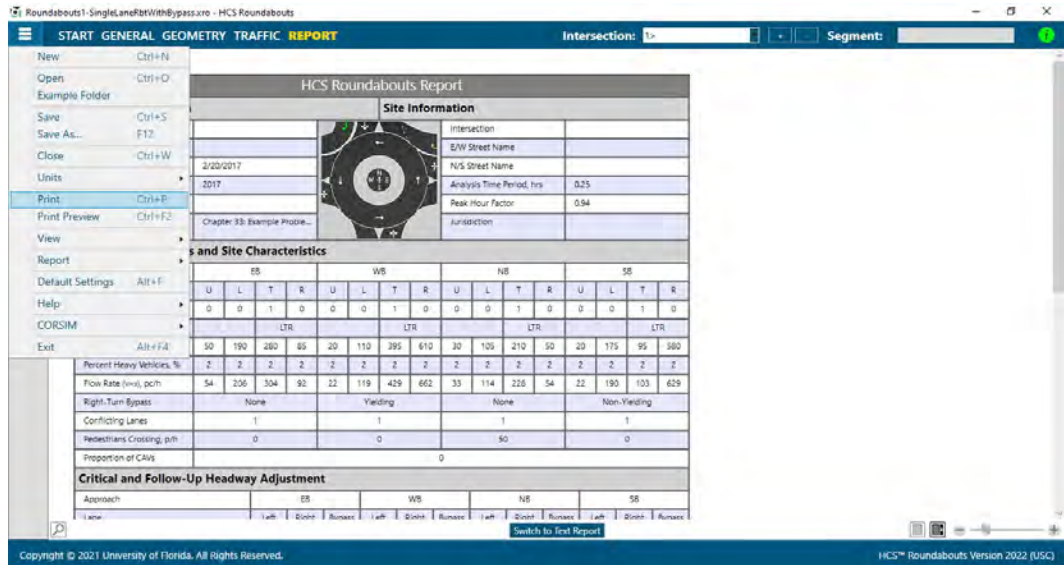
4. The magnification of the report currently being displayed can be changed using the zoom slider found at the bottom right-hand corner of the screen.



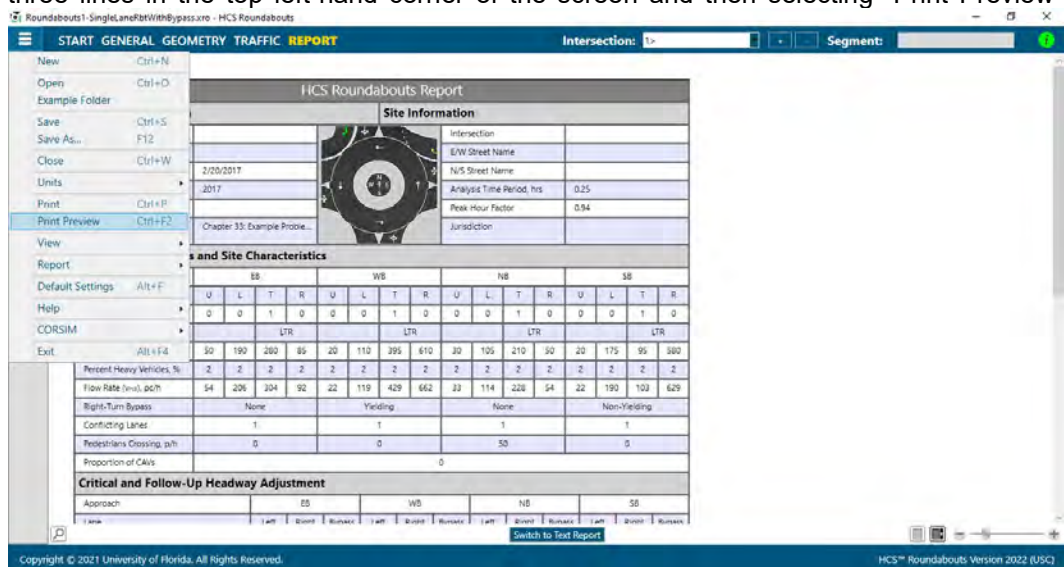
- a. To zoom in, drag the slider to the right; to zoom out, drag the slider to the left
- b. Clicking the plus (+) button will zoom in; clicking the minus (-) button will zoom out
- c. Holding down “ctrl” on the keyboard and scrolling up on the mouse wheel will zoom in; holding down “ctrl” on the keyboard and scrolling down on the mouse wheel will zoom out

Print a Report

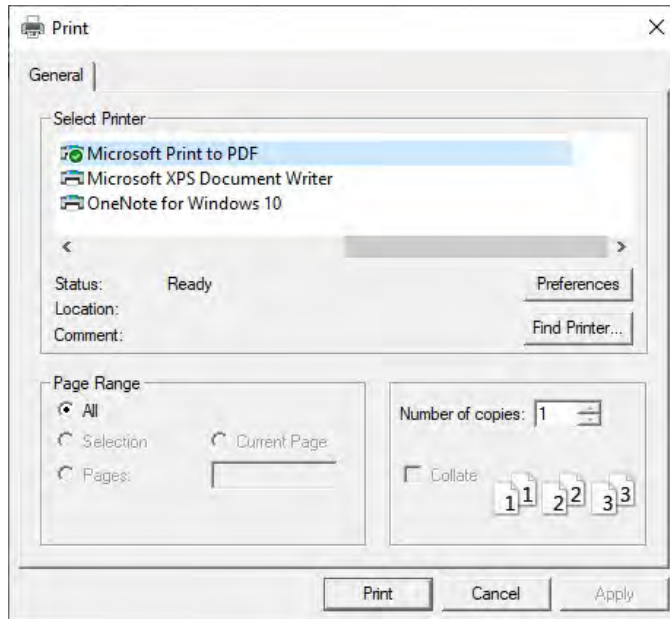
1. There are four options for printing a report:
 - a. Selecting *File > Print* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “Print”



- a. Selecting *File > Print Preview* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “Print Preview”

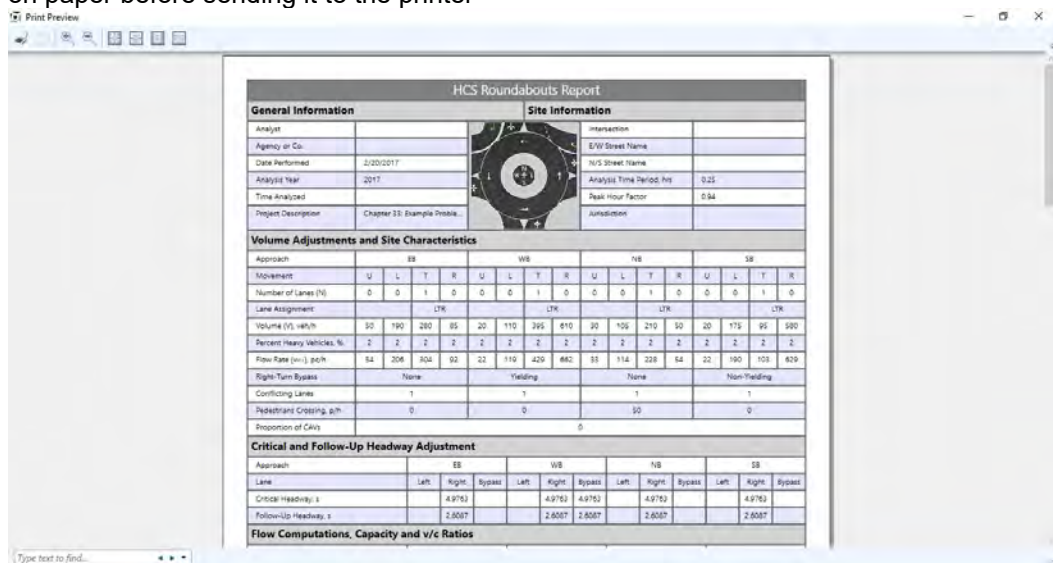


- c. Using keyboard shortcut “Ctrl+P” for Print
 - d. Using keyboard shortcut “Ctrl+F2” for Print Preview
2. Print
 - a. Using Print will bring up a Print dialog box where you can select which printer to print to



3. Print Preview

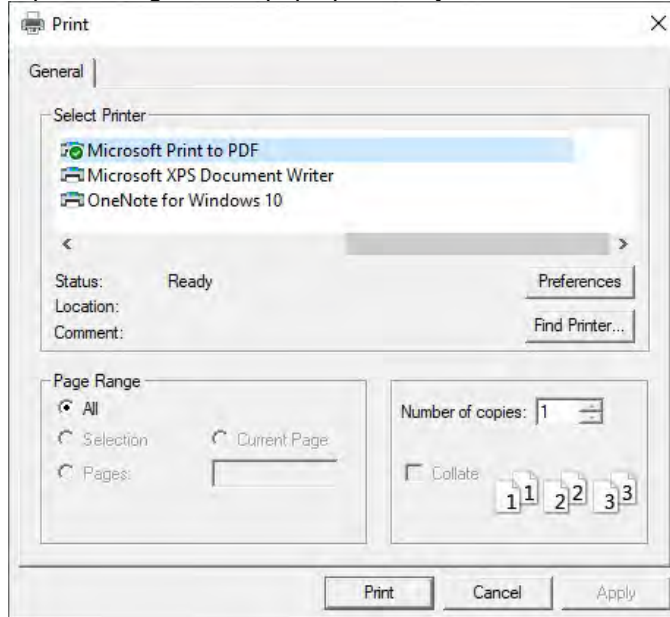
- a. Using Print Preview will bring up a window where you can view how the report will look on paper before sending it to the printer



- b. The print icon in the toolbar found in the top left-hand corner can then be selected



- c. A print dialog box will pop up where you can select which printer to print to



Glossary of Terms

Agency

This field is provided to document the agency or company associated with this analysis or project.

Analysis Time Period

The length of time (T) the peak flow remains constant (usually 0.25 hr) and is used in the delay equations

Analysis Year

This field is provided to document the year for which the analysis is being performed.

Analyst

This field is provided to document the individual performing the analysis.

Base Free-Flow Speed Calibration Factor

The Base Free-Flow Speed Calibration Factor, S_{calib} , is used to adjust Base Free-Flow Speed and is in units of miles per hour (or kilometers per hour in metric). The Base-Free Flow Speed equation has been calibrated using data for many urban street segments collectively located throughout the U.S., so the default value of 0.0 mi/h (or km/h in metric) for S_{calib} is believed to yield results that are reasonably representative of driver behavior in most urban areas. However, if desired, a locally representative value can be determined from field-measured estimates of the base free-flow speed for several street segments. The local default value can be established for typical street segments, or for specific street types.

Capacity

The maximum sustainable hourly flow rate at which persons or vehicles can be reasonably expected to traverse a point or a uniform section of a lane or roadway during a given time period under prevailing roadway, environmental, traffic, and control conditions.

CAVs

Connected and automated vehicles, or CAVs, integrate two separate types of technology, communications and automation. The combination of these technologies is required to achieve roadway capacity increases, as described below:

- *Connected vehicles* transmit data about their status to their surroundings (e.g., roadside infrastructure, other road users). They also receive information about their surroundings (e.g., traffic conditions, weather conditions, presence of potential conflicting vehicles, traffic signal timing) that motorists can use to adjust their driving behavior in response to conditions present at a given time and location. The exchange of information offers potential safety, fuel economy, and environmental benefits. However, it is not clear how connectivity affects car following and driver behavior and subsequently intersection movement capacity.
- *Automated vehicles* take over all or a portion of the driving task. Depending on the level of automation, a human may still need to take over under certain conditions. In the absence of connectivity, the information available to automated vehicles is limited to that which can be gathered by on-board sensors, which is typically constrained by a sensor's line of sight and the rate at which the sensor takes measurements (e.g., 10 times per second). As a result, for both safety and passenger comfort reasons, current adaptive cruise control systems offer minimum time gaps that are similar to, or longer than, the gaps used by human drivers, and thus may decrease roadway capacity when in widespread use.
- *Connected and automated vehicles* communicate with each other and with roadside infrastructure. The connectivity element provides automated driving systems with more complete information about a vehicle's surroundings and enables cooperative vehicle maneuvers that improve roadway operations. The vehicle's enhanced detection capabilities, as well as redundancy in detection, enable an automated driving system to operate more efficiently and more safely than with only an on-board system.

Conflicting Lanes on Bypass Exit

Conflicting Lanes on Bypass Entry are the lanes that pass directly in front of the subject yielding bypass lane. For this field, select the number of conflicting lanes.

Conflicting Lanes on Entry

The Conflicting Lanes of Entry are the lanes that pass directly in front of the subject entry. For this field, select the number of conflicting lanes.

Control Delay

The portion of total delay attributed to traffic control measures

Critical Headway

The minimum headway in the traffic stream that will allow entry of one vehicle into the roundabout. Critical headway is used in determining capacity equations:

$$c_{pce} = Ae^{(-Bv)}$$

$$A = \frac{3,600}{t_f}$$

$$n \quad t_c - (t_f/i)$$

where

C_{pce} = lane capacity, adjusted for heavy vehicles (pc/h),

v_c = conflicting flow (pc/h)

t_c = critical headway (s), and

t_f = follow-up headway (s).

Current Intersection

A drop-down menu is provided for the current intersection to allow the user to change which intersection information to display on the input screen and for the reports.

Current Segment

A drop-down menu is provided for current segment to allow the user to change which segment information to display on the input screen and for the reports.

Date

The date will default to the computer's date, but may be edited. The format of the date is determined by the user's 'Short date style' preferences (regional setting icon on the Control Panel).

Delay

The difference between the travel time actually experienced and the reference travel time that would result during conditions with ideal geometric characteristics and in the absence of incidents, control, and traffic

Delay Due to Turns

The delay due to turns is the delay to through vehicles that follow vehicles turning from the major street into an unsignalized access point intersection. This delay can be incurred at any access point intersection along the street. For right-turn vehicles, the delay results when the following vehicles' speed is reduced to accommodate the turning vehicles. For left-turn vehicles, the delay results when the following vehicles must wait in queue while a vehicle ahead executes a left-turn maneuver at the access point. This delay occurs primarily on undivided streets; however, it can also occur on divided streets when the left-turn queue exceeds the available storage and spills back into the inside through lane.

The delay estimation process consists of the following two procedures:

- Delay due to left turns, and
- Delay due to right turns

East/West Street Name

This field is provided to document the name of the east/west intersecting street of the intersection being analyzed.

Entry Flow

The traffic flow entering a roundabout on the subject approach

Follow-Up Headway

The time between the departure of one vehicle from an approach and the departure of the next vehicle using the same critical headway, under a condition of continuous queueing.

Follow-up headway is used in determining capacity equations:

$$c_{pce} = Ae^{(-Bv_c)}$$

$$A = \frac{3,600}{t_f}$$

$$B = t_c - (t_f/2)$$

where

- c_{pce} = lane capacity, adjusted for heavy vehicles (pc/h),
- v_c = conflicting flow (pc/h)
- t_c = critical headway (s), and
- t_f = follow-up headway (s).

Forward Direction

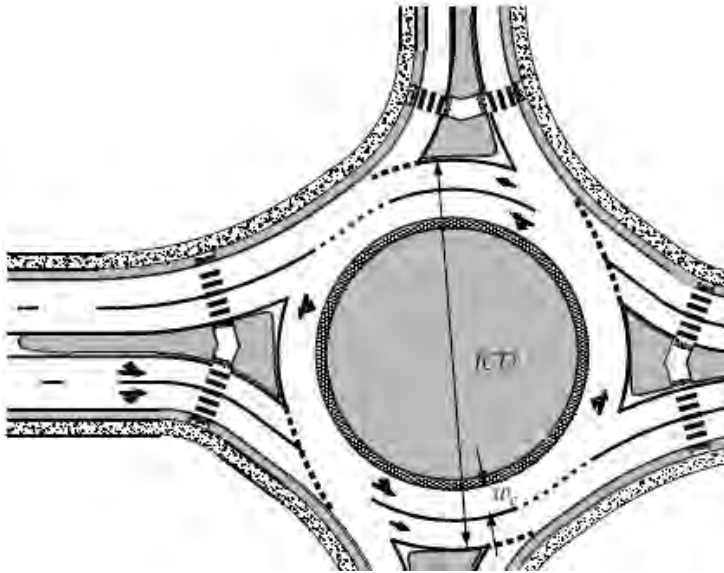
This specifies the direction the segments run and the direction for segment calculations such as running time, through delay, travel speed, etc. There are four choices for Forward Direction: EB, WB, NB, and SB. If EB is the Forward Direction, then WB is the Reverse Direction, and vice versa. Similarly, if NB is the Forward Direction, then SB is the Reverse Direction, and vice versa.

Geometry

Geometry is a graphic data entry screen for coding lane configuration data. Lane combinations can be selected by clicking on the appropriate arrows to place them on the central diagram for each approach. Clicking on an arrow on the central diagram will remove it. As arrows are selected, others may become disabled as appropriate. For right-turn bypass lanes, the yellow right-turn arrow is used for yielding and the green right-turn arrow is used for non-yielding. While these will show just outside of the approach, clicking on them will also remove them. The circulating flow arrow simply toggles between one and two lanes for each approach.

Inscribed Circle Diameter

The inscribed circle diameter, ICD, is the diameter of the largest circle that can be inscribed within the outer edges of the circulatory roadway. The ICD serves as the width of the roundabout and is measured in feet (or meters in metric). This is illustrated in the following:



Intersection

The name of the intersection, usually defined by the two intersecting streets, is coded to document the intersection being analyzed and will be printed on the report.

Intersection Delay

The Intersection Delay is the total additional travel time experienced by drivers, passengers, or pedestrians as a result of control measures and interaction with other users of the facility, divided by the volume departing from the corresponding cross section of the facility.

Jurisdiction

This field is provided to document any jurisdiction convention or project related information.

Level of Service (LOS)

A level of service is a letter designation that describes a range of operating conditions on a particular type of facility. Six levels of service are defined; using the letters A through F. Level of service A represents the best level of service, and generally describes operation of free flow and very low delay. Level of service F represents the worst operating conditions.

LOS criteria for Roundabouts are given in the exhibit below.

Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio ^a	
	$v/c \leq 1.0$	$v/c > 1.0$
0–10	A	F
>10–15	B	F
>15–25	C	F
>25–35	D	F
>35–50	E	F
>50	F	F

Note: ^a For approaches and intersectionwide assessment, LOS is defined solely by control delay.

Midsegment Demand Flow Rate

The number of vehicles or other roadway users passing the middle of the segment.

North/South Street Name

This field is provided to document the name of the north/south intersecting street of the intersection being analyzed.

Number of Circulating Lanes

The number of circulating lanes represents the count of circulating lanes immediately downstream of the entry that forms the end of the segment under study.

On-Street Parking

The percentage of the segment with on-street parking represents that percent of the link length that has parking stalls (either marked or unmarked) available along the right side of the segment. The user enters this value as a percentage, which is converted into a proportion. This proportion is computed as the length of street with parking stalls divided by the link length. Parking stalls considered include those described as having either a parallel or angle design. This proportion is separately computed for each direction of travel along the segment.

Passenger Car Equivalent

The number of passenger cars that will result in the same operational conditions as a single heavy vehicle of a particular type under identical roadway, traffic, and control conditions.

Peak Hour Factor

The hourly volume during the analysis hour divided by the peak 15-min flow rate within the analysis hour; a measure of traffic demand fluctuation within the analysis hour. The peak-hour factor is entered for the intersection to compute peak flow rates.

Pedestrians Crossing Entry

The number of pedestrians per hour crossing the approach entry

Percent Heavy Vehicles

The percentage of heavy vehicles is entered for each movement. This value is used to adjust flow rate for heavy vehicles.

Percent of Entry Vehicles Using Left Lane

When the corresponding approach has two lanes coded with the same movement, the field is activated to specify the percentage of vehicles using the left lane.

Project Description

This field is provided for the user to document the analysis with any information for identification purposes.

Proportion of CAVs

This is the proportion of CAVs in the traffic stream. CAV is a connected and automated vehicle, defined here as a vehicle with an operating cooperative adaptive cruise control system. The range of proportion of CAVs in the traffic stream is from 0 to 100.

CAVs may improve the capacity of roundabout approaches through their potential to safely accept smaller gaps in traffic than human drivers. The proportion of the traffic stream that is composed of CAVs will influence the achievable capacity increase. The greater the proportion of CAVs in the traffic stream, the more frequently the benefits of connectivity can be realized, because more vehicles will be able to accept smaller gaps safely.

The proportion of CAVs is used in determining the adjustment factor for the intercept parameter (f_A) and the adjustment factor for the slope parameter (f_B), which are then used in determining the entry lane capacity. The HCM exhibit below is used to determine f_A and f_B .

Proportion of CAVs in Traffic Stream	1-Lane Entry				1 Circulating Lane, Both Lanes ^a		2-Lane Entry 2 Circulating Lanes, Left Lane	
	1 Circulating Lane		2 Circulating Lanes ^a		f_A	f_B	f_A	f_B
	f_A	f_B	f_A	f_B				
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
20	1.05	0.99	1.03	0.99	1.05	0.99	1.03	0.99
40	1.12	0.97	1.08	0.96	1.12	0.97	1.08	0.96
60	1.22	0.94	1.18	0.92	1.22	0.94	1.18	0.92
80	1.29	0.90	1.28	0.89	1.29	0.90	1.28	0.89
100	1.35	0.85	1.38	0.85	1.35	0.85	1.38	0.85

Notes: ^a These cases were not specifically analyzed in the research and thus are suggested a CAV = connected and automated vehicle, defined here as a vehicle with an operating cooperative adaptive cruise control system.

Restrictive Median Length

The restrictive median length represents the length, in feet (or meters in metric), of street with a restrictive median (e.g., raised curb). This length is measured from median nose to median nose along the centerline of the street. It does not include the length of any median openings on the street. This is specified for both the Forward and the Reverse Directions.

Right-Hand Access Points

The number of access point approaches along a segment represents the count of all unsignalized driveway and public-street approaches to the segment, regardless of whether the access point is considered to be "active." This number is counted separately for each side of the segment. It must equal or exceed the number of "active" access point approaches for which delay to segment through vehicles is computed.

Right-Hand Curb

The percentage of the segment with curb represents that percent of the link length that has curb along the right side of the segment and this curb is within 4 feet of the traveled way (i.e., within 4 feet of the nearest edge of traffic lane). The user enters this value as a percentage, which is converted into a proportion. This proportion is computed as the length of street with a curb present (and within 4 feet) divided by the link length. The length of street with a curb present is measured from the start of the curbed cross section to the end of the curbed cross section on the link. The width of driveway openings is not deducted from this length. This proportion is computed separately for each direction of travel along the segment.

Right-Turn Bypass

Right-turn bypass lanes can either be yielding or non-yielding. A yielding right-turn bypass lane terminates at a high angle, with right-turning traffic yielding to exiting traffic. A non-yielding right-turn bypass lane merges at a low angle with exiting traffic or forms a new lane adjacent to exiting traffic.

Roundabout

A roundabout is an intersection with a generally circular shape, characterized by yield on entry and circulation around a central island.

Segment Length

Segment length represents the distance between the boundary intersections that define the segment. The point of measurement at each intersection is the stop line, yield line, or the functional equivalent in the subject direction of travel. This length is measured along the centerline of the street. If it differs in the two travel directions, then an average length is used. This value is measured in units of feet (or meters in metric).

Segment Name

This field is provided to document the name of the segment being analyzed.

Speed Limit

The posted speed limit along the direction of travel in miles per hour (or kilometers per hour in metric). Speed limit influences Base Free-Flow Speed and is used to determine the Speed Constant in the Base Free-Flow Speed calculation. The range of speed limits is restricted to 25 through 50 mi/h (or 40.2 through 80/5 km/h in metric). The following table shows how to determine the Speed Constant based on the Speed Limit.

Speed Limit (mi/h)	Speed Constant S_0 (mi/h) ^a	Median Type	Percent with Restrictive Median (%)	Adjustment Section No Curb
25	37.4	Restrictive	20	0.3
30	39.7		40	0.6
35	42.1		60	0.9
40	44.4		80	1.2
45	46.8		100	1.5
50	49.1		Nonrestrictive	Not applicable
		No median	Not applicable	0.0

Access Density D_a (points/mi)	Adjustment for Access Points f_a by Lanes			Percent with On-Street Parking (%)
	N_{th} (mi/h) ^c			
	1 Lane	2 Lanes	3 Lanes	
0	0.0	0.0	0.0	0
2	-0.2	-0.1	-0.1	20
4	-0.3	-0.2	-0.1	40
10	-0.8	-0.4	-0.3	60
20	-1.6	-0.8	-0.5	80
40	-3.1	-1.6	-1.0	100
60	-4.7	-2.3	-1.6	

Notes: ^a $S_0 = 25.6 + 0.47S_{pl}$ where S_{pl} = posted speed limit (mi/h).
^b $f_{CS} = 1.5 p_{im} - 0.47 p_{curb} - 3.7 p_{curb} p_{im}$ where p_{im} = proportion of link length with n (decimal) and p_{curb} = proportion of segment with curb on the right-hand side (dec

Time Analyzed

This field is provided to document the time period over which the analysis was conducted.

v/c Ratio

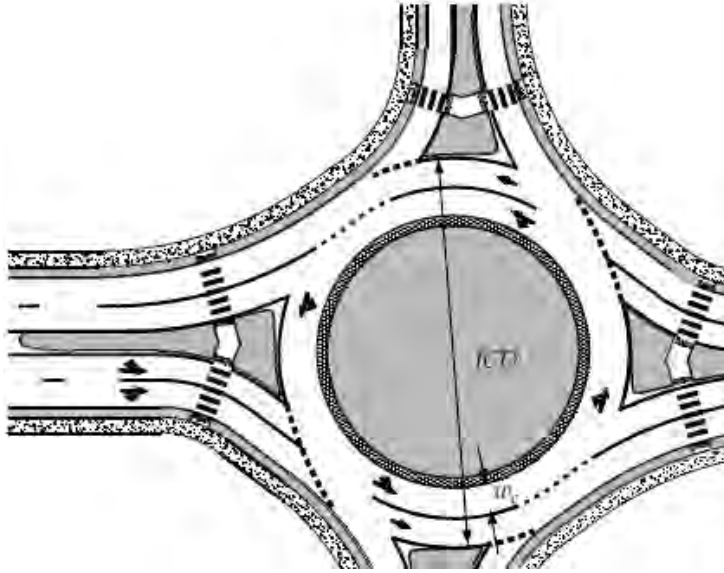
The v/c ratio is the volume-to-capacity ratio, which is the volume of one movement (or shared-lane movements) divided by the movement capacity of the movement (or shared-lane movements).

Volume

The total number of vehicles or other roadway users that pass over a given point or section of a lane or roadway during a given time interval. The volumes (V) for each movement are coded in vehicles per hour (veh/h).

Width of Circulating Lanes

The width of circulating lanes is measured in the section of circulatory roadway immediately downstream of the entry, that is, the same location where the number of circulating lanes is counted. It is measured in feet (or meters in metric). This is illustrated in the following:



Index

A

Acknowledgements 4
Add or Delete Roundabout Intersections 33
Agency 47
Analysis Time Period 47
Analysis Year 47
Analyst 47

B

Base Free-Flow Speed Calibration Factor 47

C

Capacity 47
CAVs 47
Change the Lane Configuration 27
Change the View 25
Close 6
Close a File 21
Conflicting Lanes on Bypass Exit 48
Conflicting Lanes on Entry 48
Control Delay 48
CORSIM 7
Create a New File 13
Critical Headway 48
Current Intersection 49
Current Segment 49

D

Date 49
Default Settings 7
Delay 49
Delay Due to Turns 49

E

East/West Street Name 49
Edit the Default Settings 23

Entry Flow 49
Exit 7
Exit the Program 22

F

Follow-Up Headway 50
Forward Direction 50

G

Geometry 50
General Controls 6
Getting Started 5
Glossary of Terms 47

H

HCM Chapter 22 8
HCM Chapter 30 11
HCM Chapter 33 8
Help 7
How To 13

I

Inscribed Circle Diameter 50
Intersection 51
Intersection Delay 51
Introduction 1

J

Jurisdiction 51

L

Level of Service (LOS) 51
License Agreement 1

M

Menu Items 6
Midsegment Demand Flow Rate 52

N

New 6
North/South Street Name 52
Number of Circulating Lanes 52

O

On-Street Parking 52
Open 6
Open an Existing File 16

Operational Data 9, 11

P

Passenger Car Equivalent 52
Peak Hour Factor 52
Pedestrians Crossing Entry 52
Percent Heavy Vehicles 52
Percent of Entry Vehicles Using Left Lane 52
Print 6
Print a Report 43
Print Preview 6
Project Description 53
Proportion of CAVs 53

R

Report 6
Restrictive Median Length 53
Right-Hand Access Points 53
Right-Hand Curb 54
Right-Turn Bypass 54
Roundabout 54
Roundabout Analysis 6
Roundabout Report 10
Roundabout Segments 11
Roundabout Segments Report 12
Roundabouts 8

S

Save 6
Save a File 20
Save As... 6
Segment Length 54
Segment Name 54
Speed Limit 54

T

Time Analyzed 55
Trademarks and Copyrights 4

V

v/c Ratio 55
View 6
View Results of the Analysis 35
Volume 55

W

Width of Circulating Lanes 55