HCS™

MUTCD Warrants Module

USER GUIDE

UF Transportation Institute UNIVERSITY of FLORIDA | McTrans

Contents

Introduction

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Acknowledgements

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Trademarks and Copyrights

Getting Started

System Requirements

HCS is designed for standard Windows installations. For optimal performance, the system should be Windows 10 or newer. While HCS may be compatible with older versions of Windows, any installation and operational issues arising from using these older versions will be the sole responsibility of the end user.

Getting Started

To begin, click on File then New (or "New File" from the Start screen). Normal Windows keyboard and mouse functions are available. In Full View, the PgUp and PgDn keys will scroll the entry screen up and down respectively. Tabbing or clicking to a new field, or pressing the Enter key, will trigger a recalculation and update the Report pane in Full View.

General Controls

Menu Items

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

Open – Opens an existing Warrants file (*.xhy, *.xsw); shortcut is Ctrl+O

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

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

Save As… – Saves an open Warrants file (*.xsw) using a specified file name; shortcut is F12

Close – Closes an existing Warrants file (*.xsw); 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 Warrants 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

Formatted Report – Displays formatted report including the most important values; shortcut is F4

Text Report – Displays text report with all input, intermediary, and final results; shortcut is F6

Default Settings – Opens 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 MUTCD Chapter 4C procedure; shortcut is Ctrl+F1

Index – Allows user to search for keywords within the glossary

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

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

HCM Reference Guide – Opens a reference guide for the HCM in PDF format

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 pages in the default web browser

Support

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

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

McTrans Website – 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

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

Signal Warrants

MUTCD Chapter 4C

According to the Manual on Uniform Traffic Control Devices (MUTCD), the investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants:

Warrant 1, Eight-Hour Vehicular Volume
Warrant 2, Four-Hour Vehicular Volume
Warrant 3, Peak Hour
Warrant 4, Pedestrian Volume
Warrant 5, School Crossing
Warrant 6, Coordinated Signal System
Warrant 7, Crash Experience
Warrant 8, Roadway Network
Warrant 9, Intersection Near a Grade Crossing

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

The entire text of the warrant descriptions can be found at: MUTCD

Operational Data

GENERAL

First, the user enters the General Information into the respective fields: Analyst, Agency, Date and Time Period Analyzed, as well as site information for Jurisdiction, Analysis Year and Project Description.

If a School Crossing exists, the user enters the number of schoolchildren crossing an established school crossing during the highest crossing hour, the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing, and the number of minutes in the same period.

For a roadway network, the user can indicate if there are two major routes, if the analysis involves a weekend count, and if there are 5-year project traffic volumes.

If a Grade Crossing exists, the user selects the Grade Crossing Approach direction and the Highest Volume Hour with Trains. Then the user enters the Distance to the Stop Line, Rail Traffic (trains per day), Percent of High Occupancy Buses, and Percent of Tractor-Trailer Trucks.

INTERSECTION

In this section, the user enters the geometric configurations that are to be simulated. The user selects the Major Street Direction and Median Type, enters the Starting Time Interval, Major Street Speed (miles per hour, or kilometers per hour in metric), Nearest Signal (ft, or m in metric), and number of crashes per year. There are also checkboxes for the user to indicate if the population is less than 10,000, if there is a coordinated signal system, and if there were adequate trials of crash experience alternatives. The user can set the lane configuration by adding or deleting lanes in the Lanes graphic.

TRAFFIC

Traffic Volumes (vehicles per hour) are entered for up to twelve hours, beginning at the Start Time, for the Minor and Major Street directions.

PEDESTRIANS

Pedestrians (per hour) and Gaps (acceptable per hour) are entered for the Minor and Major Street directions.

DELAY

Delay (seconds per vehicle and vehicles-hours) data are entered for the Minor Street approaches.

Results

The results are interpreted through a two-page formatted report. The first provides general information, along with information on Geometry and Traffic, School Crossing, Roadway Network, and Railroad Crossing. The second details Warrants 1 through 4, hour-by-hour as met or not, and a summary of each warrant and sub-warrant as either met or not with appropriate boxes checked or not, respectively.

Warrants 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 switched 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 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 page 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.

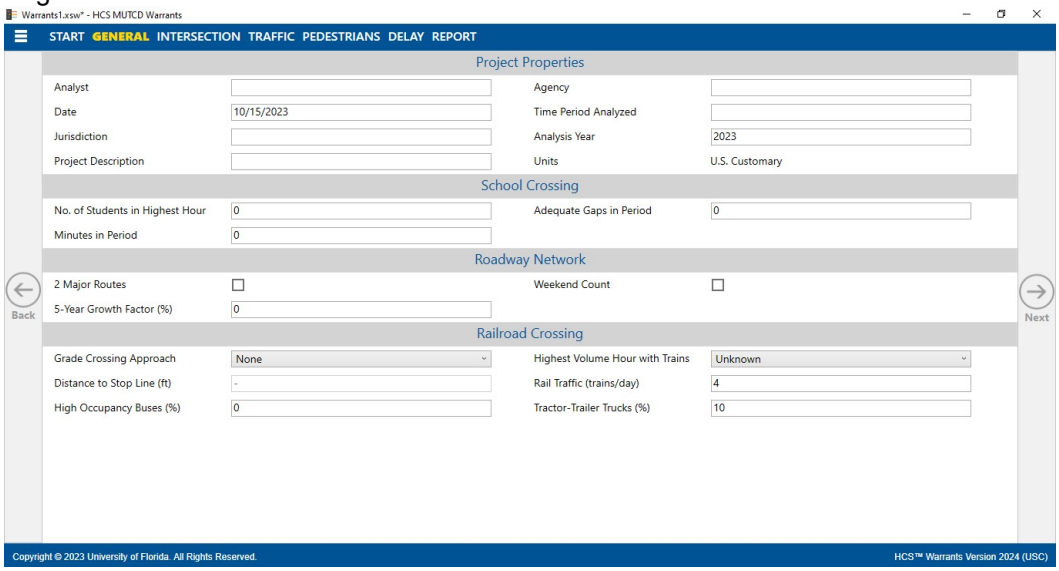
a. Selecting *File* > *New* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “New”

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

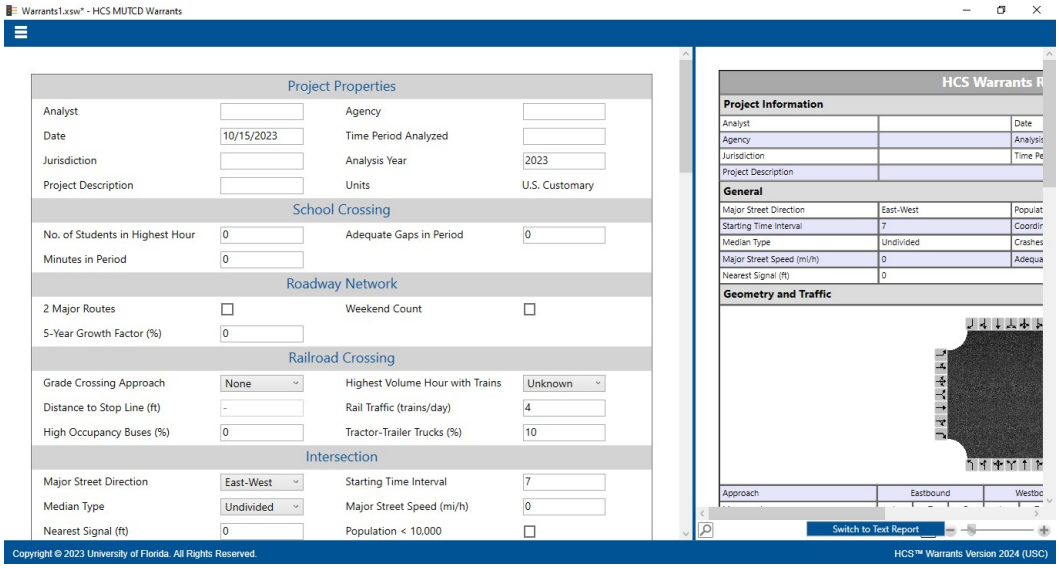
c. Using the keyboard shortcut “Ctrl+N”

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



b. Full View



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”

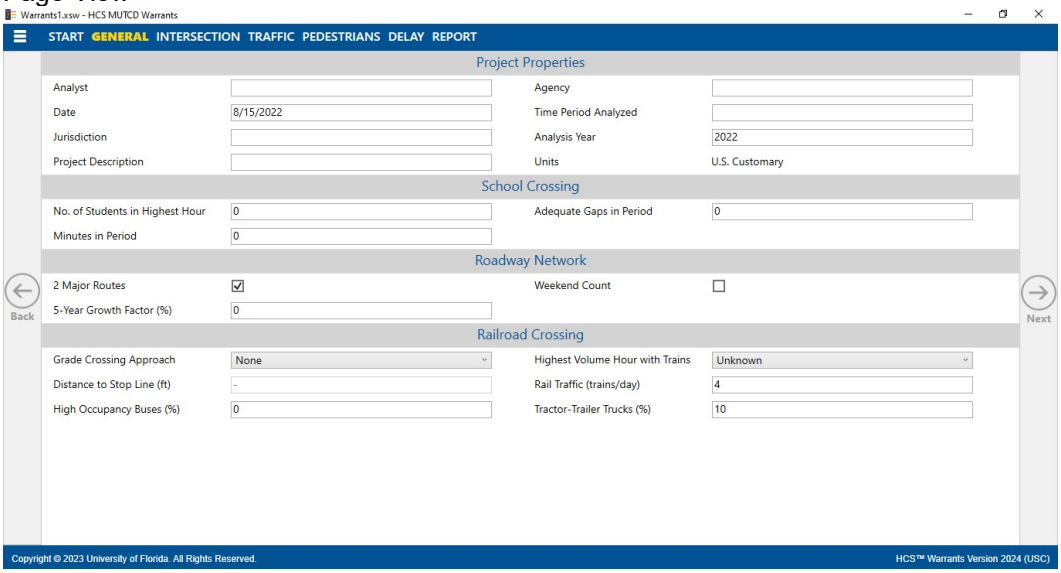
d. Selecting a file under the Recent files list from the Start screen; this can be found below in the red box

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 Warrants program.

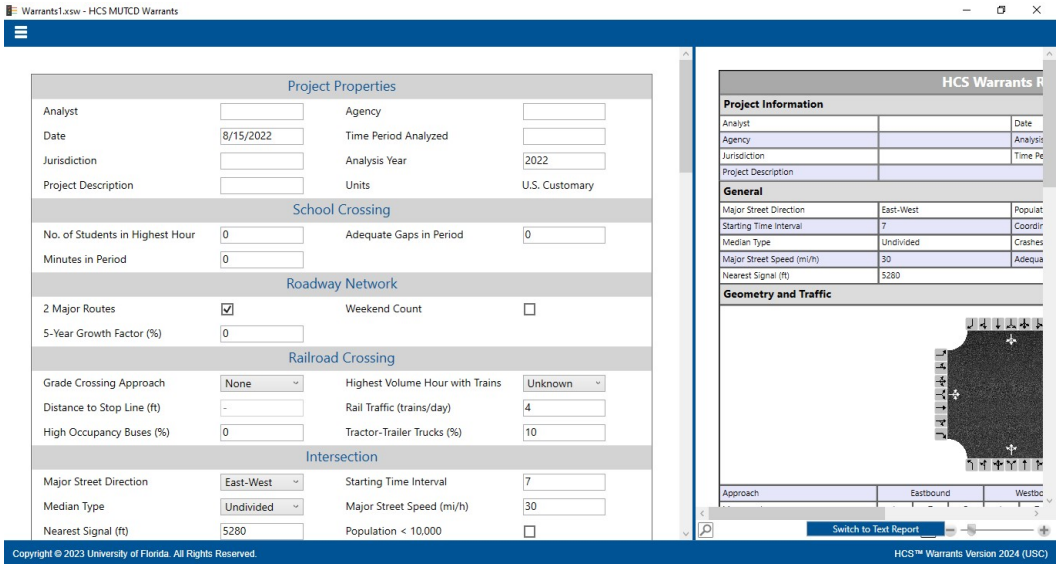
f. Selecting “Example Folder…” from the Start screen; this can be found below in the red box. Opening the example folder will open the path of the HCS example files in File Explorer. The desired example file can be double-clicked or right-clicked and selecting ‘Open’, which will open the example file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



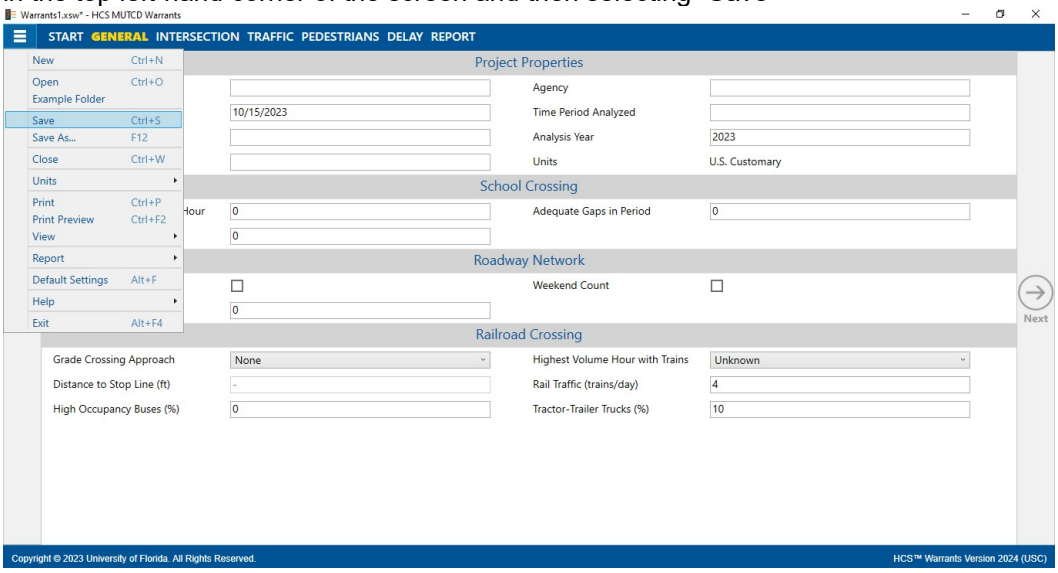
   b. Full View



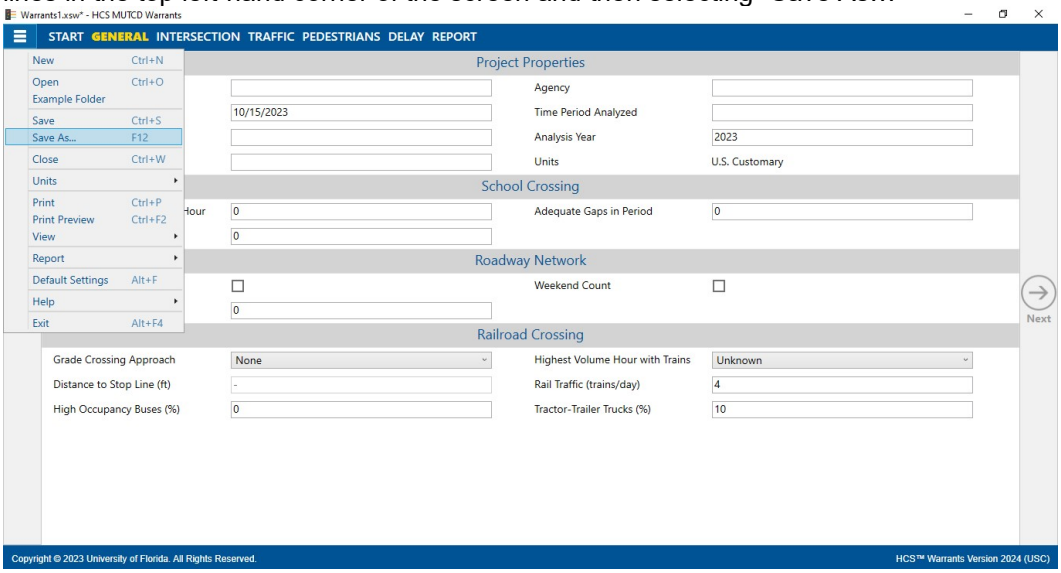
Save a File

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”



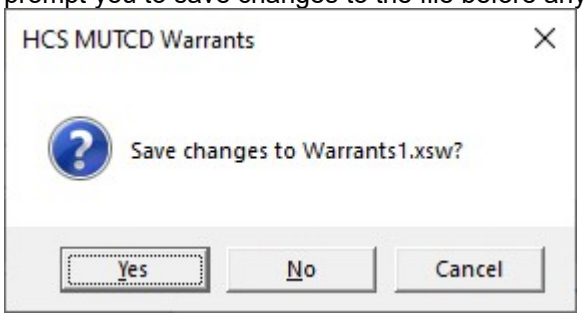
   b. Selecting *File* > *Save As…* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “Save As…”



   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 popup 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

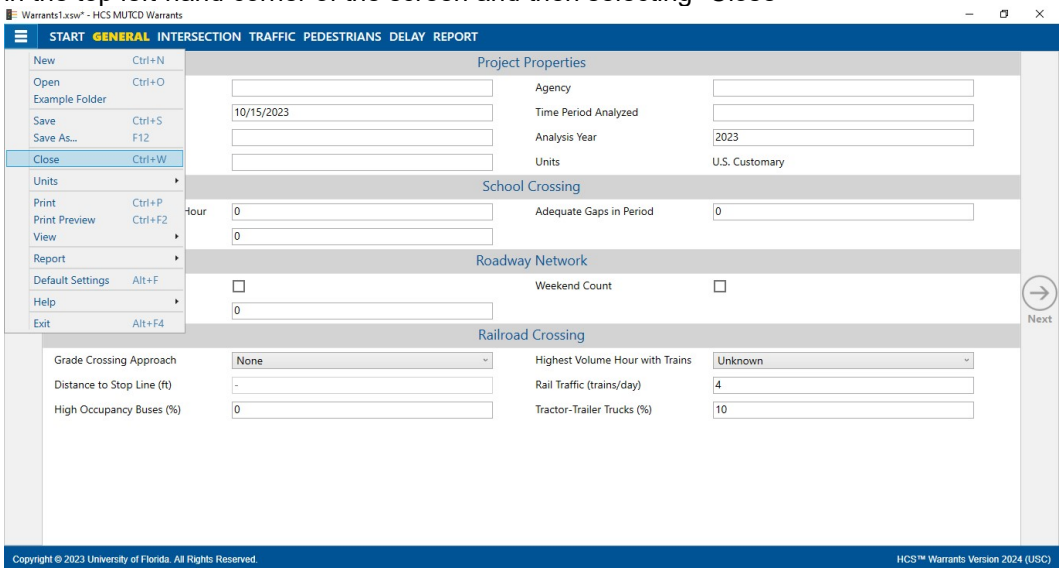
iii. Selecting “Cancel” will prevent the file from closing

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.

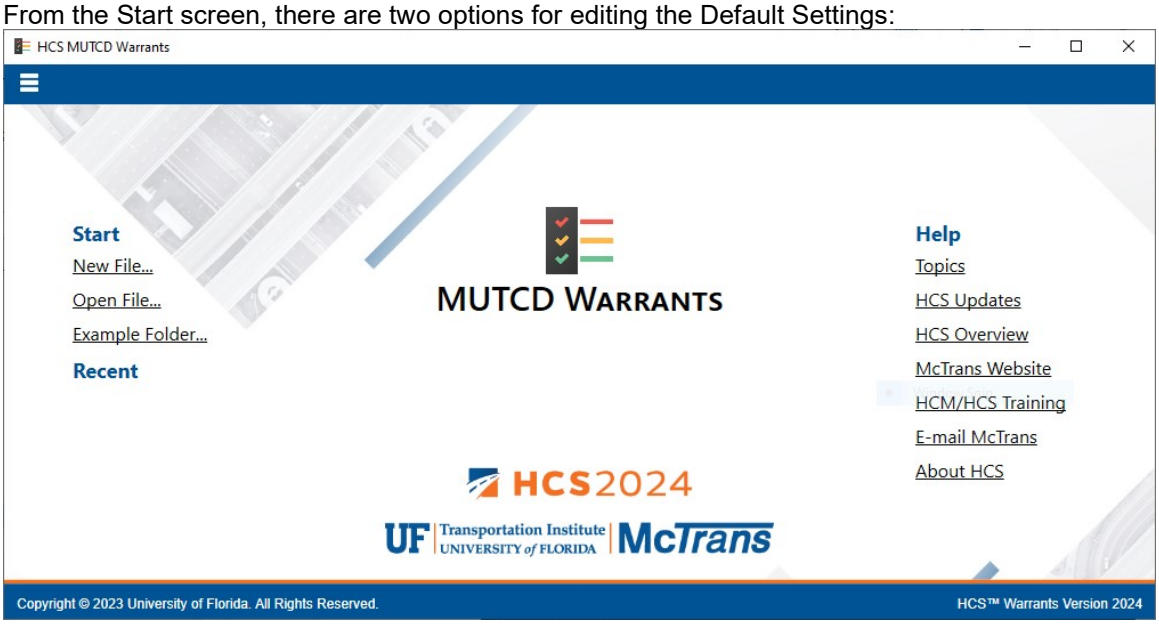
   a. Selecting *File* > *Exit* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “Exit”

   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:

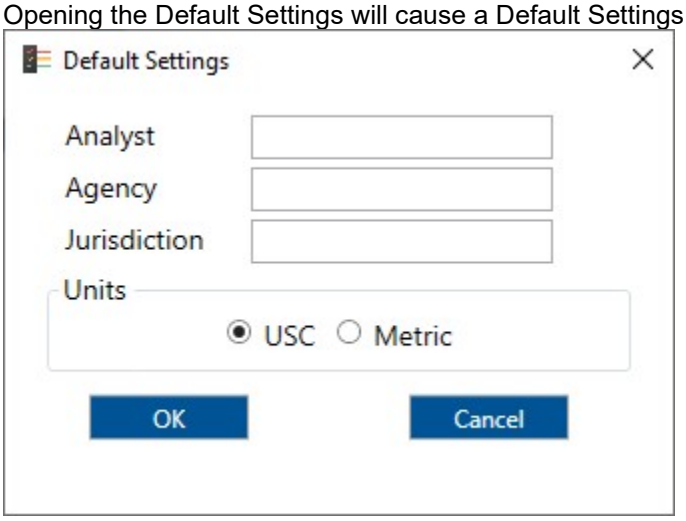


Note: The Default Settings can be changed even if an existing file is already open; you do not need to start from the Start screen.

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”

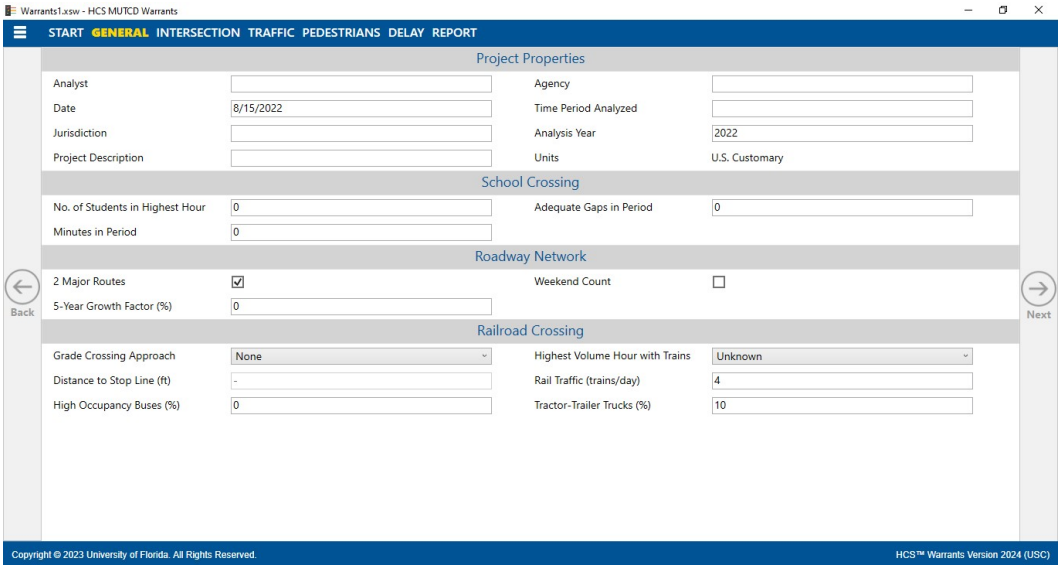
2. Opening the Default Settings will cause a Default Settings window to pop up:



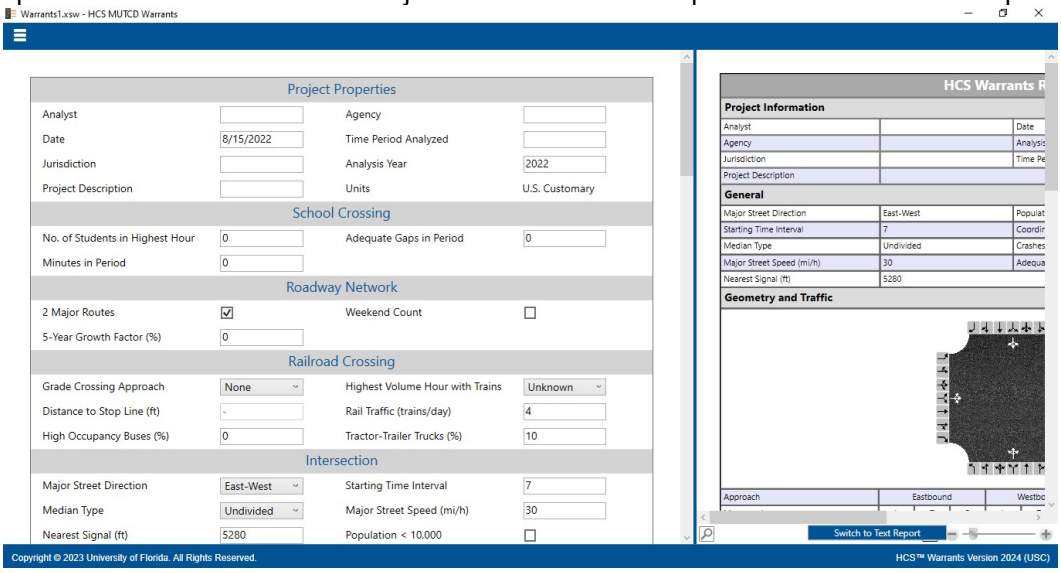
3. You can specify the Analyst, Agency, and Jurisdiction by clicking in the corresponding text boxes and typing the desired text.
4. Under ‘Units’, you are given the option of running the analysis in either *U.S. Customary (USC)* or *SI (Metric)* units.
5. Clicking “OK” will save the changes made and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

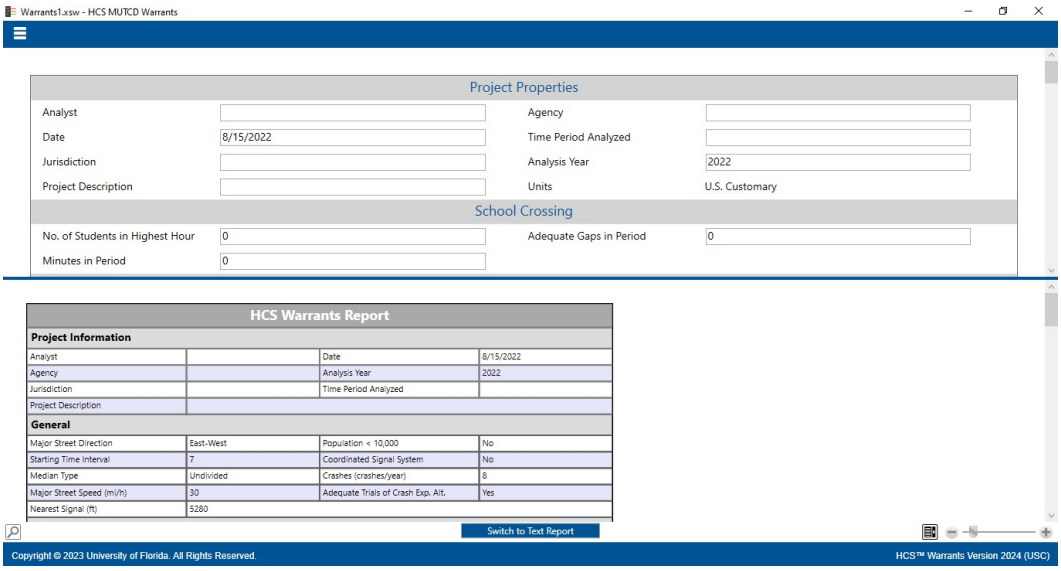
1. When a file is open, there are three main options for the view of the program:
    a. Page View: the inputs and results reports are separated into pages as seen below. You can navigate between pages using the “Back” and “Next” buttons or by clicking the page names found at the top of the screen.



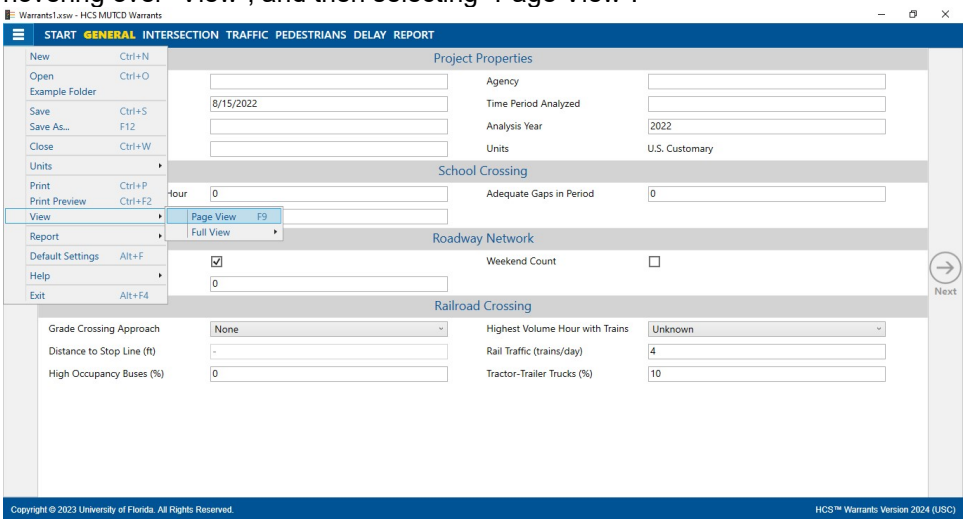
    b. Full View with the report on the right of the screen: the screen is split with all inputs on the left side and the results reports on the right side. You can access all inputs and view all of the current report by using the corresponding scroll bars. There is also a screen splitter that can be moved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



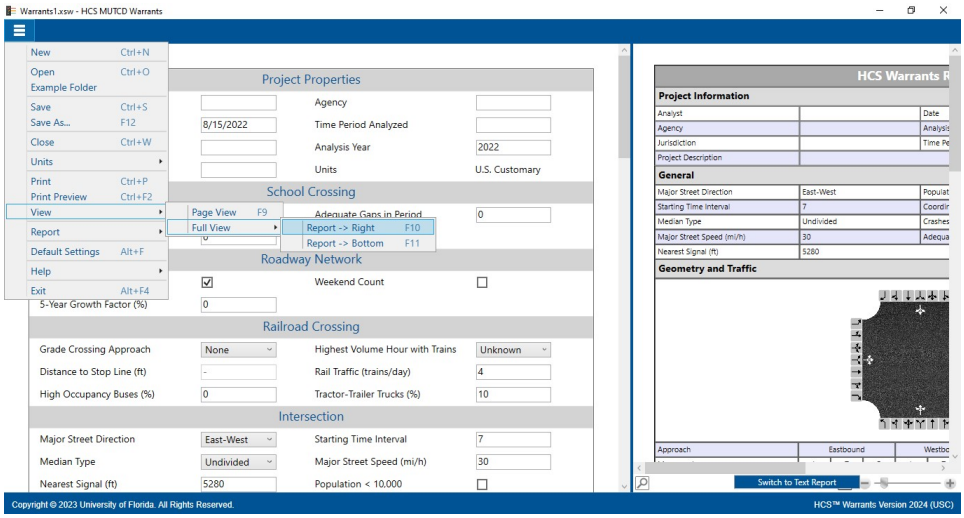
    c. Full View with the report on the bottom of the screen: the screen is split with all inputs on the top of the screen and the results reports on the bottom of the screen. You can access all inputs and view all of the current report by using the corresponding scroll bars. There is also a screen splitter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



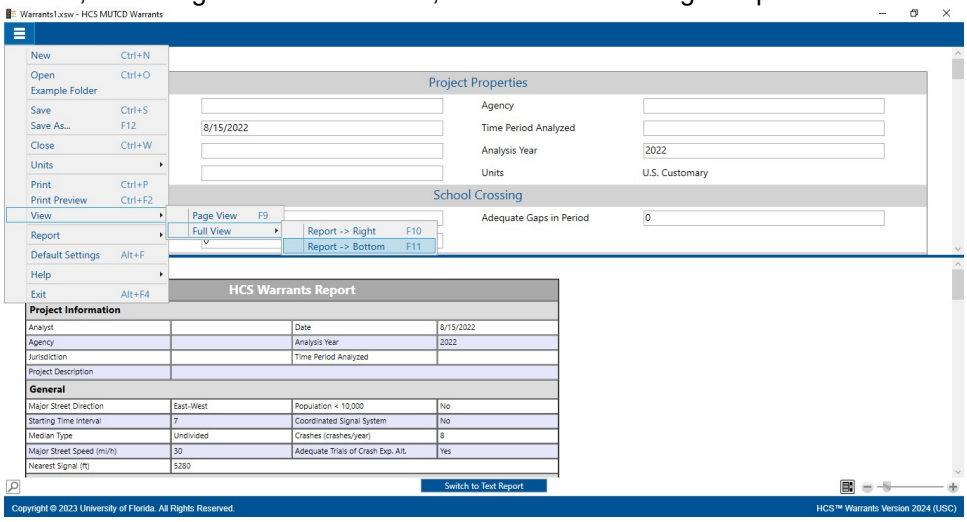
2. Views can be changed by using the main menu items or the keyboard shorcuts.
    a. Main Menu Items
        i. To switch to Page View, select *File* > *View* > *Page View* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen, hovering over “View”, 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"

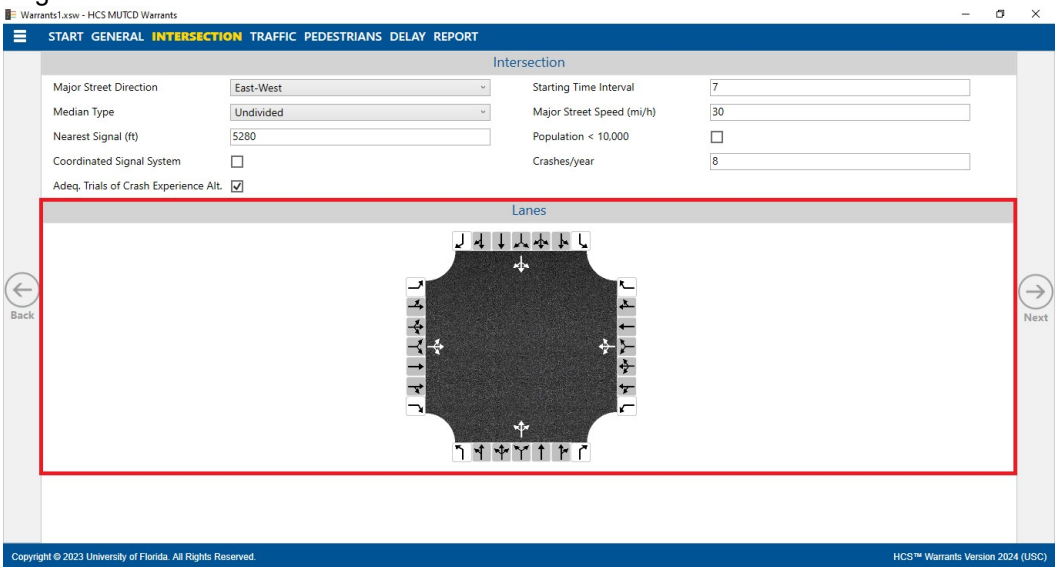
ii. Full View with report on the right of the screen: keyboard shortcut is "F10"

iii. Full View with report on the bottom of the screen: keyboard shortcut is "F11"

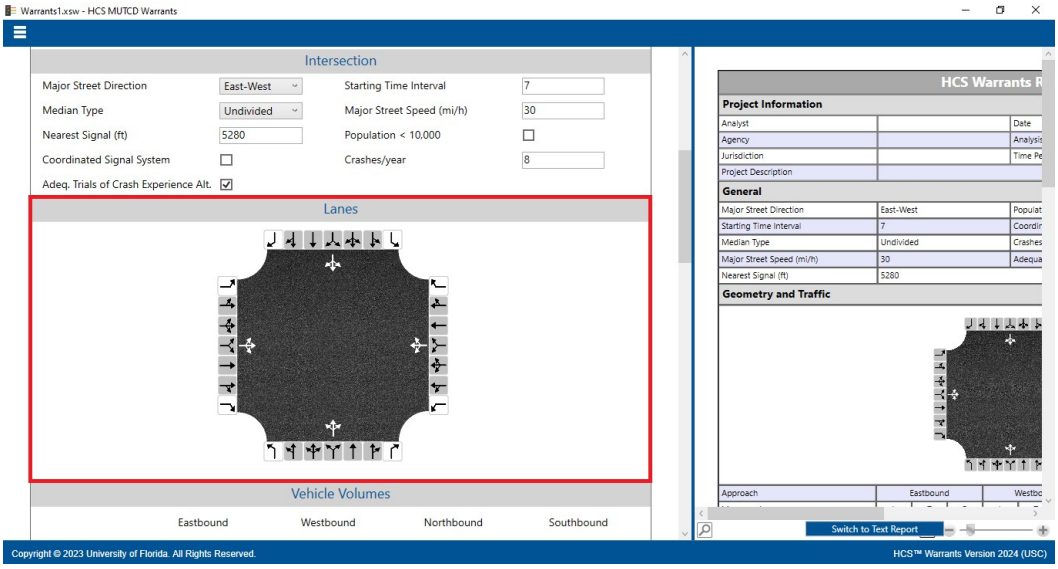
Change the Lane Configuration

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

a. Page View

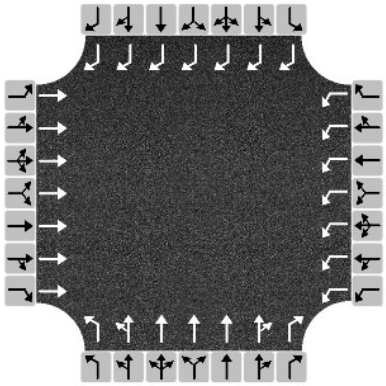


b. Full View

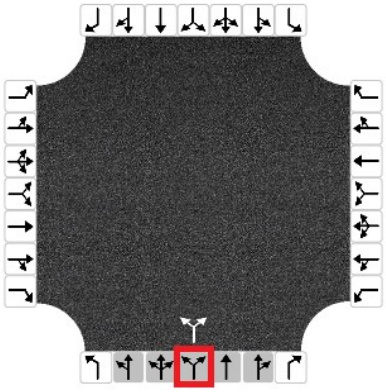


2. To add lanes, click on the lane buttons (black arrows) on the edges of the lanes graphic. If the background of a lane button is white, the lane is available to add to the corresponding approach. If the background of a lane button is gray, it is disabled and cannot be added to the corresponding approach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

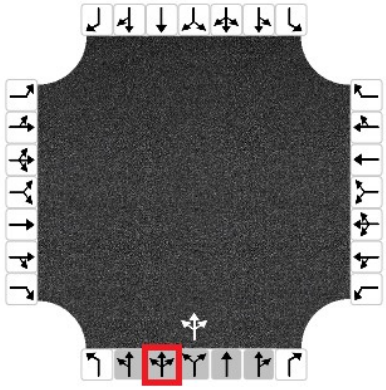
a. Each approach allows up to seven lanes to be added



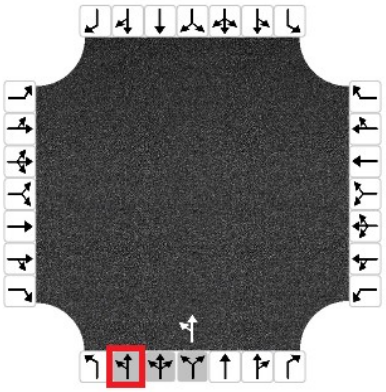
b. Adding a shared left-right (LR) lane will disable all other lanes except left (L) and right (R)



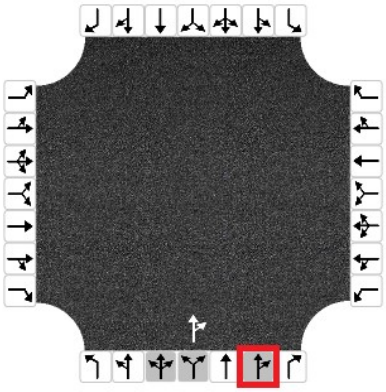
c. Adding a shared left-thru-right (LTR) lane will disable all other lanes except left (L) and right (R)



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



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

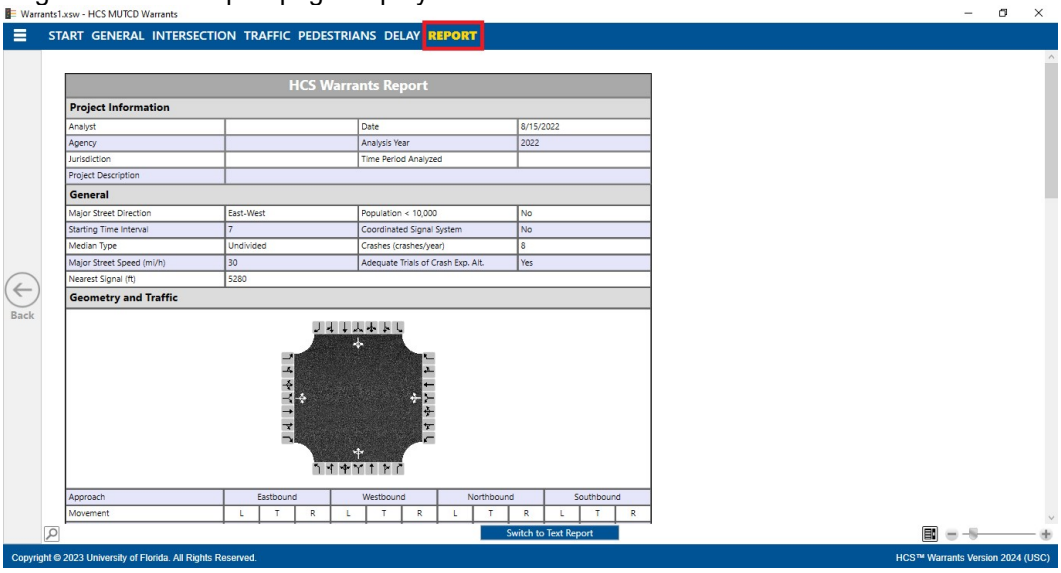


3. To remove lanes, click on the lanes within the center of the lanes graphic (white arrows). Clicking on an arrow will immediately remove the lane and change which lane buttons are enabled/disabled for the corresponding approach.
4. Changes to the lane configuration on the lanes graphic in the input screen will be reflected on the lanes graphic in the formatted report and the lane information in both the formatted and text reports.

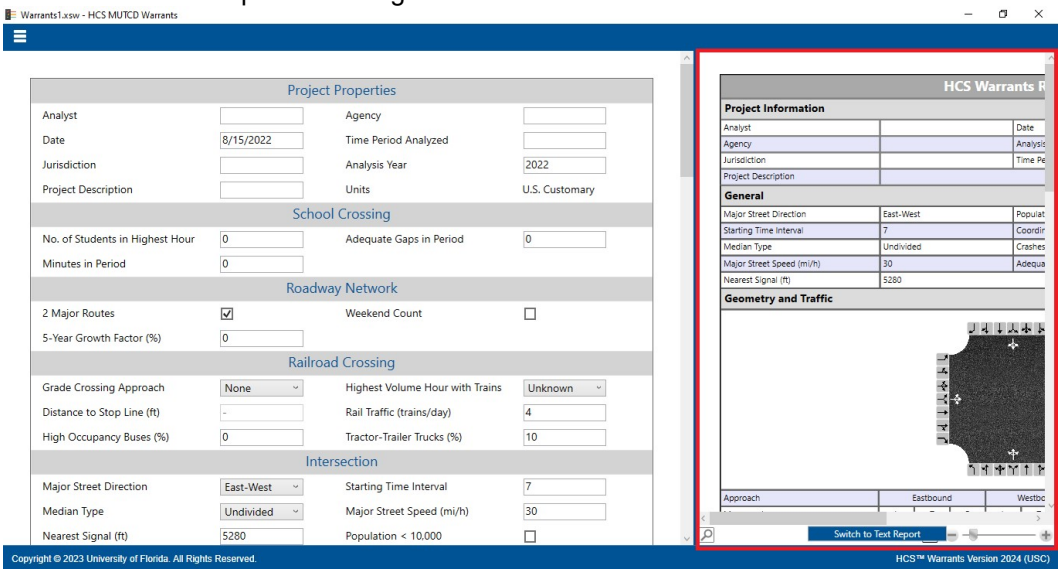
View Results of the Analysis

1. 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.

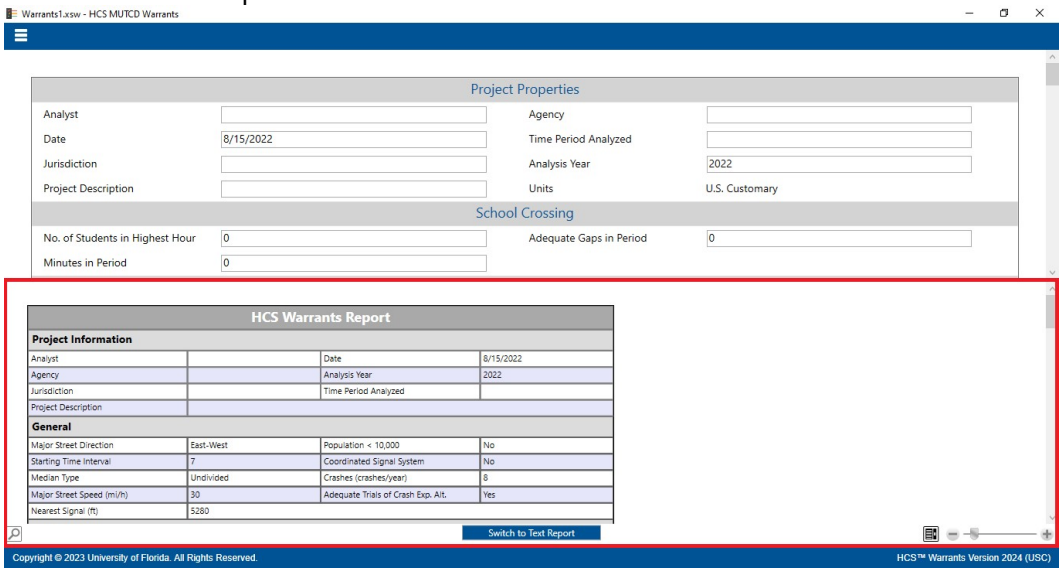
a. Page View with Report page displayed



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

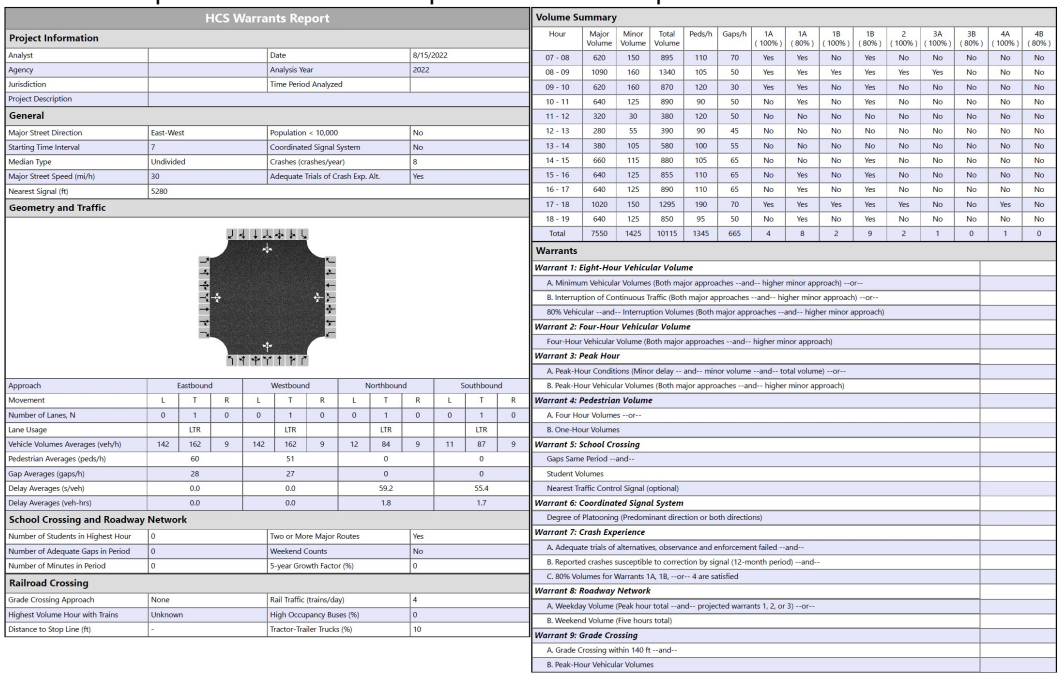


c. Full View with the report on the bottom of the screen



2. There are two options for reports: Formatted and Text

a. Formatted reports show the most important results in a presentable format



HCS Warrants Report

Project Information

Analyst		Date	8/15/2022
Agency		Analysis Year	2022
Jurisdiction		Time Period Analyzed	
Project Description			

General

Major Street Direction	East-West	Population < 10,000	No
Starting Time Interval	7	Coordinated Signal System	No
Median Type	Undivided	Crashes (crashes/year)	8
Major Street Speed (mi/h)	30	Adequate Trials of Crash Exp. Alt.	Yes
Nearest Signal (ft)	5280		

Geometry and Traffic

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Number of Lanes, N	0	1	0	0	1	0	0	1	0	0	1	0
Lane Usage		LTR			LTR			LTR			LTR	
Vehicle Volumes Averages (veh/h)	142	162	9	142	162	9	12	84	9	11	87	9
Pedestrian Averages (peds/h)	60			51			0			0		
Gap Averages (gaps/h)	28			27			0			0		
Delay Averages (s/veh)	0.0			0.0			59.2			55.4		
Delay Averages (veh-hrs)	0.0			0.0			1.8			1.7		

School Crossing and Roadway Network

Number of Students in Highest Hour	0	Two or More Major Routes	Yes
Number of Adequate Gaps in Period	0	Weekend Counts	No
Number of Minutes in Period	0	5-year Growth Factor (%)	0

Railroad Crossing

Grade Crossing Approach	None	Rail Traffic (trains/day)	4
Highest Volume Hour with Trains	Unknown	High Occupancy Buses (%)	0
Distance to Stop Line (ft)	-	Tractor-Trailer Trucks (%)	10

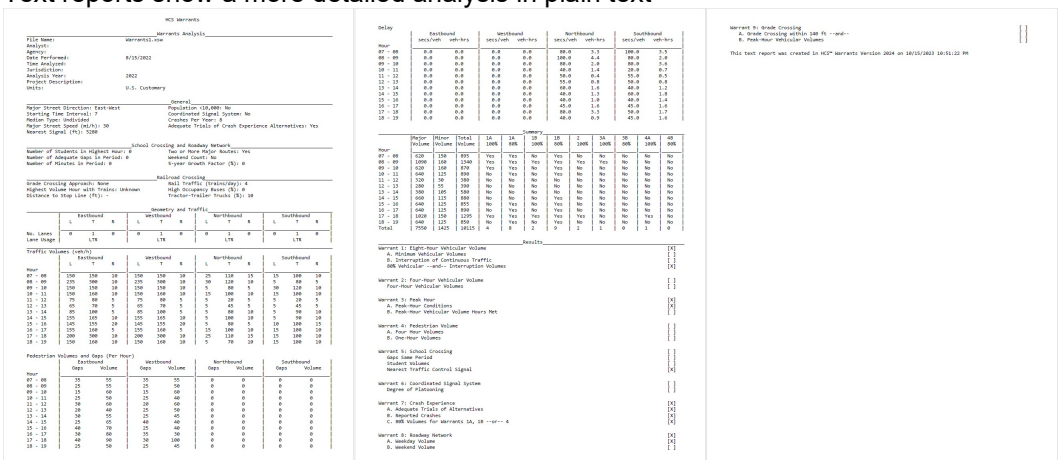
Volume Summary

Hour	Major Volume	Minor Volume	Total Volume	Peds/h	Gaps/h	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (80%)	4A (100%)	4B (80%)
07 - 08	620	150	895	110	70	Yes	Yes	No	Yes	No	No	No	No	No
08 - 09	1090	160	1340	105	50	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
09 - 10	620	160	870	120	30	Yes	Yes	No	Yes	No	No	No	No	No
10 - 11	640	125	890	90	50	No	Yes	No	Yes	No	No	No	No	No
11 - 12	320	30	380	120	50	No	No	No	No	No	No	No	No	No
12 - 13	280	55	390	90	45	No	No	No	No	No	No	No	No	No
13 - 14	380	105	580	100	55	No	No	No	No	No	No	No	No	No
14 - 15	660	115	880	105	65	No	No	No	Yes	No	No	No	No	No
15 - 16	640	125	855	110	65	No	Yes	No	Yes	No	No	No	No	No
16 - 17	640	125	890	110	65	No	Yes	No	Yes	No	No	No	No	No
17 - 18	1020	150	1295	190	70	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
18 - 19	640	125	850	95	50	No	Yes	No	Yes	No	No	No	No	No
Total	7550	1425	10115	1345	665	4	8	2	9	2	1	0	1	0

Warrants

Warrant 1: Eight-Hour Vehicular Volume	
A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	
B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	
80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	
Warrant 2: Four-Hour Vehicular Volume	
Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach)	
Warrant 3: Peak Hour	
A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or--	
B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	
Warrant 4: Pedestrian Volume	
A. Four Hour Volumes --or--	
B. One-Hour Volumes	
Warrant 5: School Crossing	
Gaps Same Period --and--	
Student Volumes	
Nearest Traffic Control Signal (optional)	
Warrant 6: Coordinated Signal System	
Degree of Platooning (Predominant direction or both directions)	
Warrant 7: Crash Experience	
A. Adequate trials of alternatives, observance and enforcement failed --and--	
B. Reported crashes susceptible to correction by signal (12-month period) --and--	
C. 80% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied	
Warrant 8: Roadway Network	
A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or--	
B. Weekend Volume (Five hours total)	
Warrant 9: Grade Crossing	
A. Grade Crossing within 140 ft --and--	
B. Peak-Hour Vehicular Volumes	

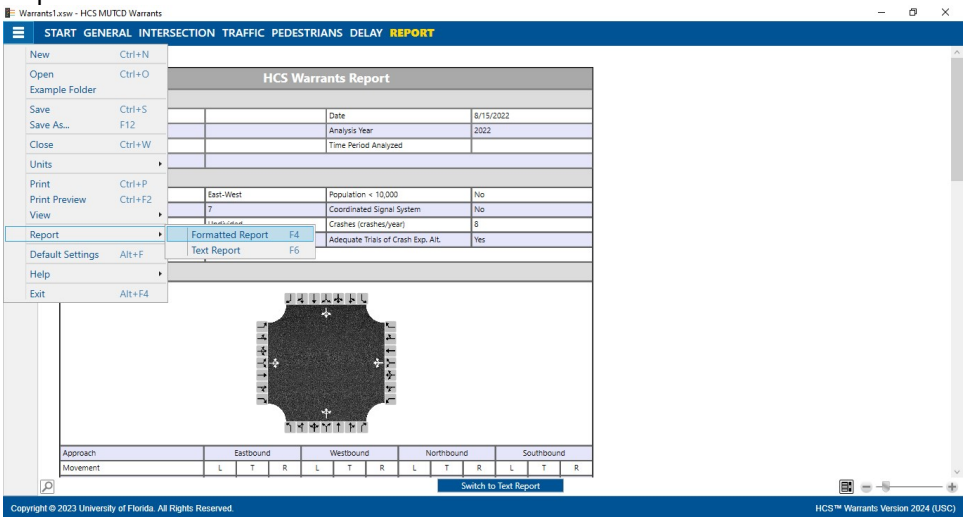
b. Text reports show a more detailed analysis in plain text



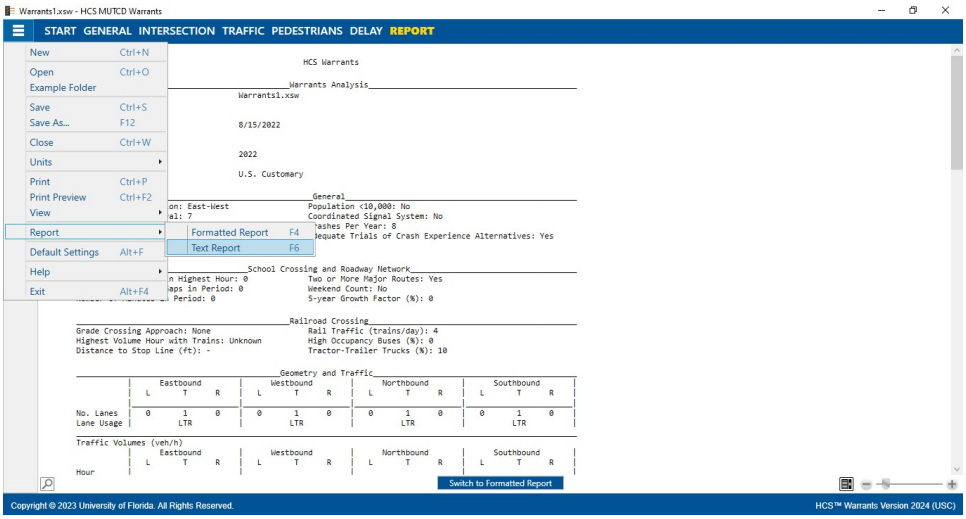
3. The type of report displayed can be changed by using the main menu items, keyboard shortcuts, or toggle buttons under the report.

   a. Main Menu Items

      i. To switch to the Formatted Report, select *File* > *Report* > *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 “Formatted Report”.



      ii. To switch to the Text Report, select *File* > *Report* > *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 “Text Report”.



b. Keyboard Shortcuts

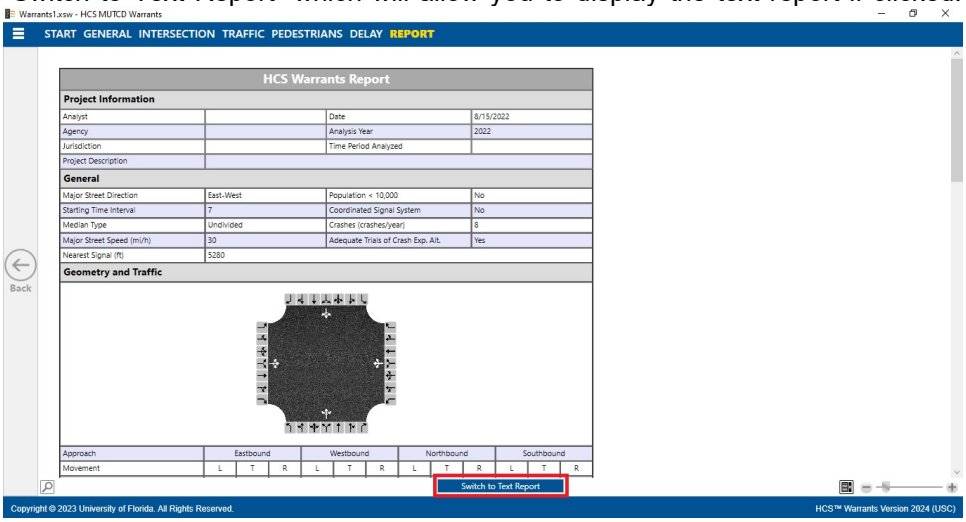
   i. Formatted Report: keyboard shortcut is “F4”

   ii. Text Report: keyboard shortcut is “F6”

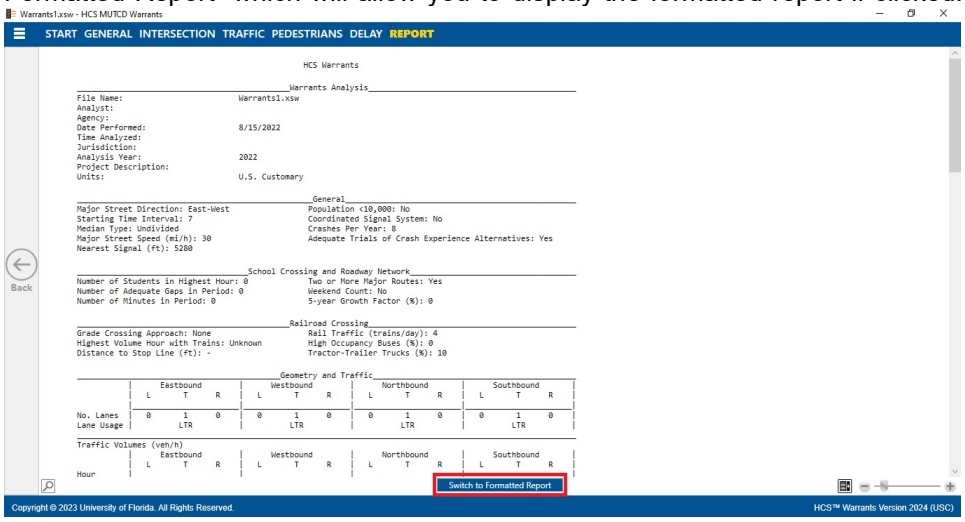
c. Report Toggle Buttons

   i. Whether viewing the report in Page View or Full View, a toggle button will be available at the bottom of the screen underneath the report.

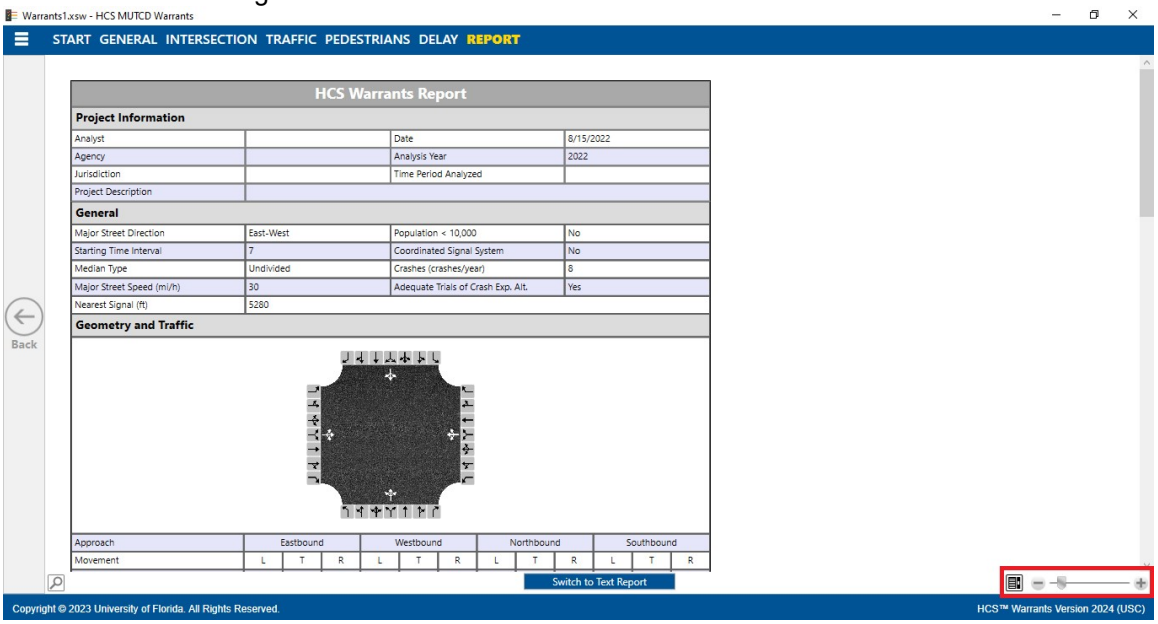
   ii. If the formatted report is currently being displayed, the toggle button will say “Switch to Text Report” which will allow you to display the text report if clicked.



iii. If the text report is currently being displayed, the toggle button will say “Switch to Formatted Report” which will allow you to display the formatted 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

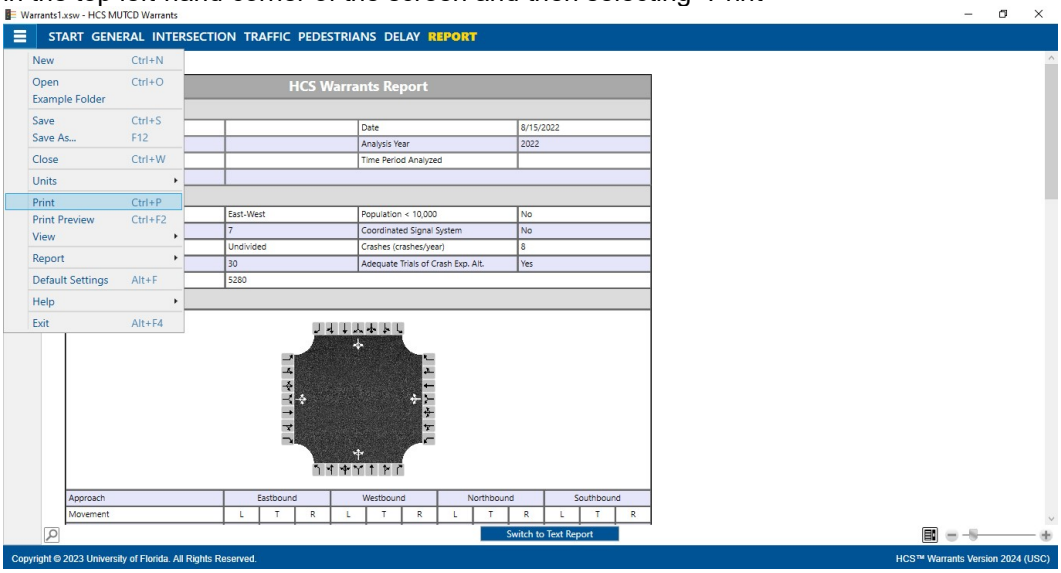
b. Clicking the plus (+) button will zoom in; clicking the minus (-) button will zoom out

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

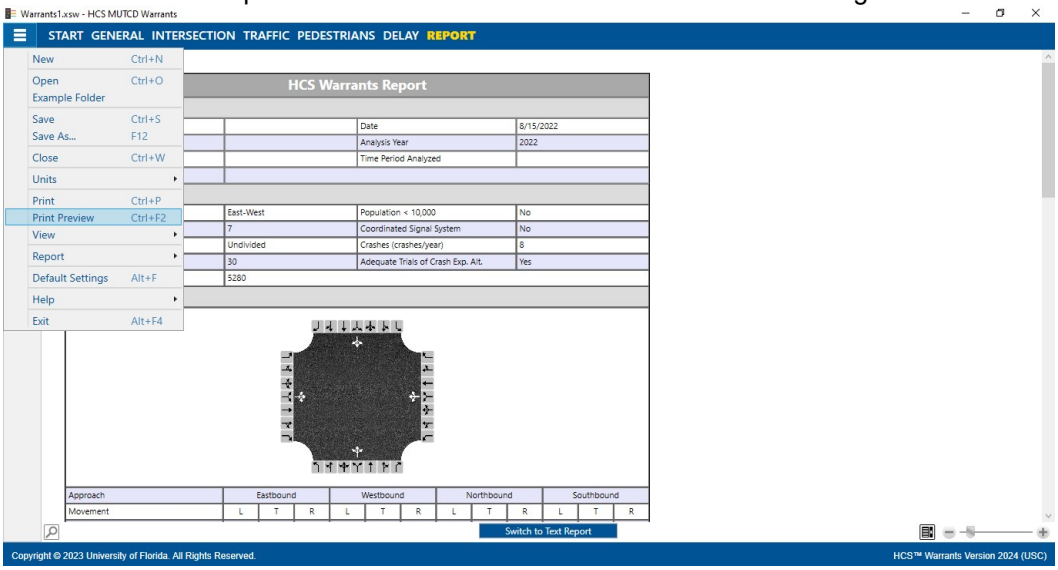
Print a Report

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”



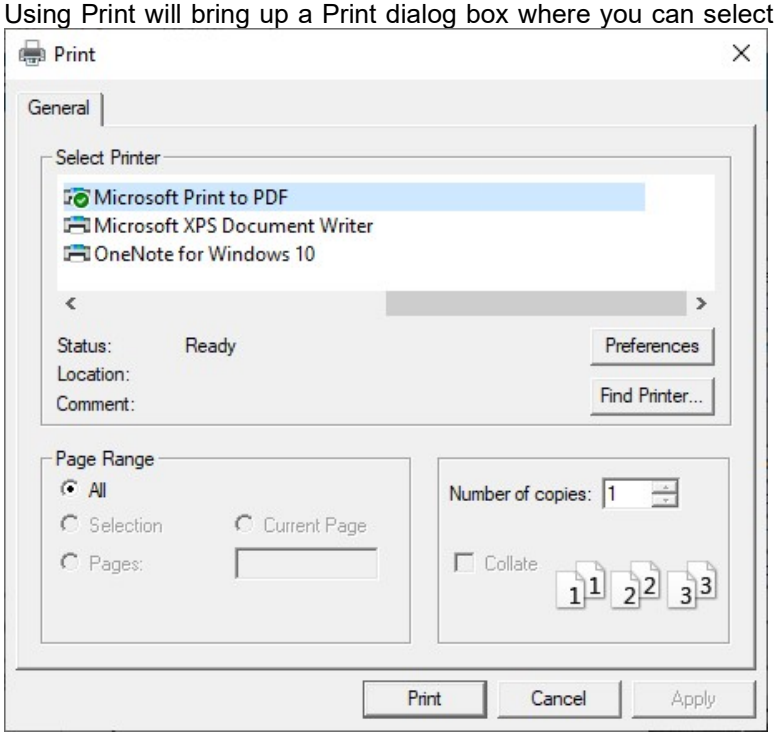
   b. Selecting *File* > *Print Preview* from the main menu; this can be found by selecting the three lines in the top left-hand corner of the screen and then selecting “Print Preview”



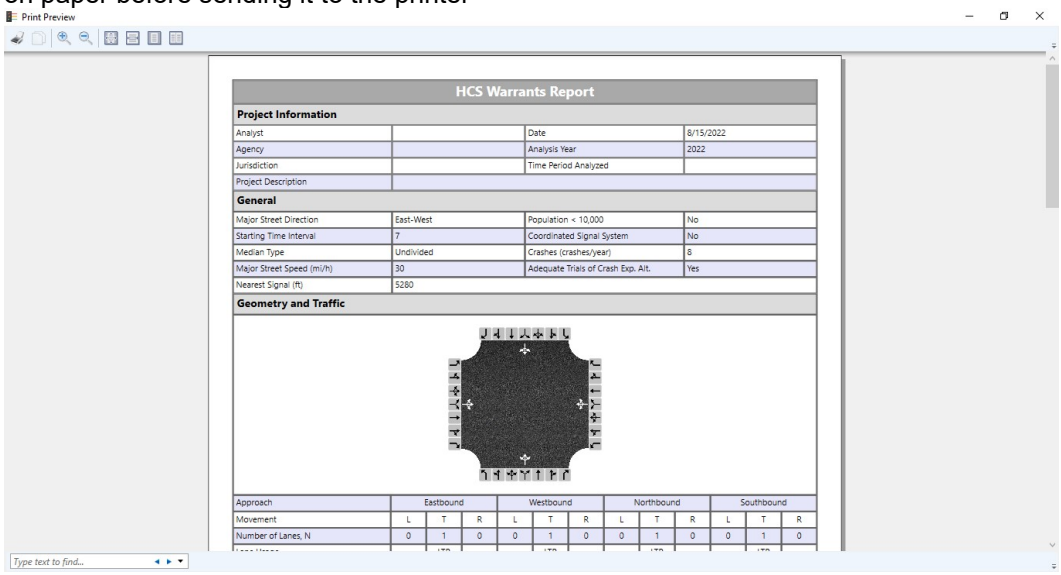
   c. Using the keyboard shortcut “Ctrl+P” for Print

   d. Using the keyboard shortcut “Ctrl+F2” for Print Preview

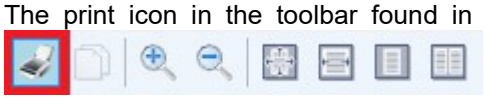
2. Print
    a. Using Print will bring up a Print dialog box where you can select which printer to print to



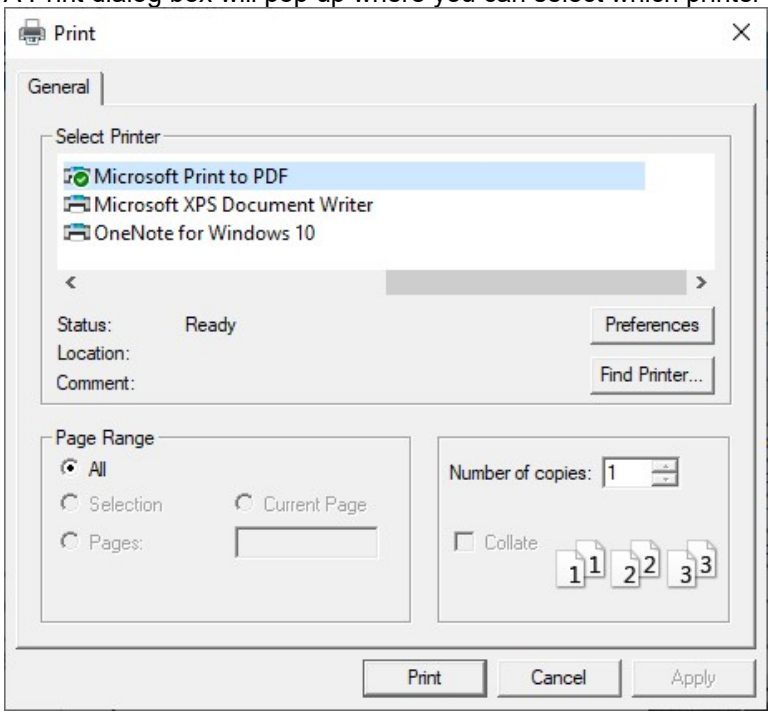
3. Print Preview
    a. Using Print Preview will bring up a window where you can view how the report will look on paper before sending it to the printer



    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

Adequate Trials of Alternatives

Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency.

Agency

This field is provided to document the name of the Agency or the Company conducting the analysis.

Analysis Time Period

Enter the time period over which the analysis was conducted.

Analysis Year

This field is provided to document the year the analysis is modeling. For example, a current or past operational year or a future design or planning year might be coded here.

Analyst

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

Coordinated Signal System

This is from engineering judgment from the description of Warrant 6, Coordinated Signal System.

Crashes/Year

This number is compared to the five required in the Crash Experience warrant, but only those crashed susceptible to correction by signal installation should be included, as described in Warrant 7.

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 settings icon on the Control Panel).

Delay

The average stopped delay for each approach is coded in seconds per vehicle. The appropriate volumes will be used to calculate the total stopped delay in vehicle hours. Alternatively, the total stopped delay in vehicle hours may be coded directly, and the appropriate volumes will be used to calculate the delay in seconds per vehicle.

The option of which units to input is provided by selecting one of the radio buttons for Delay Units. The textbox inputs of the selected units will be enabled. The textbox inputs for the other units will be disabled, but the corresponding values will automatically be converted and used for determining Warrant 3.

Distance to Stop Line

The distance from the center of the track nearest the intersection and the stop line on the approach. This is measured in feet (or meters in metric).

Gaps

Gaps per hour in the traffic stream of adequate length to allow pedestrians to cross during the same period when the pedestrian volume criterion is satisfied. Where there is a divided street having a median of sufficient width for pedestrians to wait, the requirement applies separately to each direction of vehicular traffic.

Grade Crossing Approach

The user selects the approach direction where the grade railway crossing exists. If no grade crossing exists, the user selects ‘None’.

High Occupancy Buses

The percentage of vehicles crossing the track that are high-occupancy buses. A high-occupancy bus is defined as a bus occupied by a least 20 people.

Highest Volume Hour with Trains

The user selects the highest traffic volume hour during which rail traffic uses the crossing.

Intersection

Description or name of the intersection can be coded here.

Jurisdiction

Generally the agency for which the analysis is being performed or has jurisdiction over the freeway being analyzed.

Major Street Direction

This must be defined in order to use the appropriate data for the stop-controlled approaches.

Major Street Speed

This speed is used to determine which MUTCD tables and figures are to be used. Lower thresholds are required when the major street speed is above 40 mi/h (or 64.4 km/h in metric) in Warrant 1, Warrant 2, Warrant 3, and Warrant 7.

Median

Whether a median of sufficient width for pedestrians to wait exists is coded here.

Nearest Signal

This information is used to determine the applicability of the Pedestrian Volume, School Crossing, and Coordinated Signal System in Warrant 4, Warrant 5 and Warrant 6.

Pedestrians

The number of pedestrians per hour crossing the approach.

Population

If the population is less than 10,000 people, the user checks this field.

Project Description

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

Rail Traffic

The number of trains per day that use the rail crossing.

Roadway Network

The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of **two or more major routes** (A major route as used in this signal warrant shall have one or more of the following characteristics: A) It is part of the street or highway system that serves as the principal roadway network for through traffic flow; or B) It includes rural or suburban highways outside, entering, or traversing a City; or C) It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study).meets one or both of the following criteria:

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has **5-year projected traffic volumes**, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or

B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a **weekend**, nonnormal business day (Saturday or Sunday).

School Crossing

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the **number and size of groups of school children** at an established school crossing across the major street shows that the number of **adequate gaps** in the traffic stream during the period when the children are using the crossing is less than the **number of minutes** in the same period (see Section 7A.03) and there are a minimum of 20 students during the **highest crossing hour**.

Start Time

The Start Time is coded to allow for subsequent periods to be automatically labeled.

Tractor-Trailer Trucks

The percentage of vehicle crossing the track that are tractor-trailer trucks.

Traffic Volumes

The hourly volumes (*V*) for each movement are coded in vehicles per hour (veh/h).

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