Memorandum

To: Roger Krahn, CRCOG

Date: 6/24/22

Project #: 42852.00

From: Joseph Balskus, Project Manager

Re: Roundabout Screening Study
Screening Methodology

The Roundabout Screening Study is underway with the crash screening and volume screening efforts. This memorandum summarizes the completed screening efforts and is the Task 2 deliverable for the scope of work prepared to describe the following 5-step screening process: 1) Crash Methodology, 2) Traffic Volume Screening Methodology, 3) Geometry of Intersection, 4) Known Congestion/Operational hotspots, and 5) Desktop reviews. These steps outline the screening process to identify potential locations of single lane roundabouts in the CRCOG region.

Development of Intersection Locations

An existing GIS-based intersection inventory for the CRCOG region is not available. VHB developed the following methodology to create intersections for use in the roundabout study. The methodology leverages Esri's ArcGIS Pro software.

Input Data

CTDOT State Roads GIS Feature Class

CTDOT Local Roads GIS Feature Class

Methodology for Creating Intersection Locations:

1. Combine the State & Locals roads feature classes into a Composite Roads layer.
2. Perform an **Intersect** geoprocessing analysis where the Composite Roads layer is intersected with itself, which produces point features where roads intersect "cross" each other.
3. Perform a **Dissolve** geoprocessing analysis on the results of Step 2 to create a single intersection point for each road crossing. The Dissolve function eliminates overlapping points. Approximately 34,000 potential intersection locations were identified after the Dissolve analysis.
4. Perform a **Buffer** geoprocessing analysis against the results of Step 3. A 5-ft buffer distance was used.
5. Perform an **Intersect** geoprocessing analysis where the Results of Step 4 (intersection buffers) are intersected with the Composite Roads Layer. The result is a list of intersection approaches for each potential intersection location.
6. Perform a **Summary Statistics** analysis on the results of Step 5 to count the number of intersection approaches at each potential intersection location. This step is necessary to eliminate non-roadway intersections such as intersections at town lines, stream crossings, ramp merges, etc.
7. Delete potential intersection locations where the approach count from Step 5 was less than 3. This process eliminates road merges where a ramp merge with the mainline or where two divided roads merge together, breaks in roads at town lines and stream crossings, etc.
8. Several additional GIS overlay analyses were performed against the potential intersection locations to further reduce the number of potential intersections, resulting in a final intersection layer for use in the roundabout

study. For example, a functional class evaluation was performed on the intersection approaches to identify which intersections were local/local, were associated with an interstate or freeway, and ownership. VHB eliminated all local/local intersections, in accordance with the scope of work, that stated that the screening study would only consider intersections with a functional classification of minor collector road or higher on at least one leg of the intersection. The results of the analysis are summarized below by ownership (ownership information pulled from CTDOT's road inventory database):

- 4,508 Local Intersections (all approaches are owned by the municipality)
- 3,650 State/Local Intersections (DOT owns at least one of the intersection approaches)
- Total = 8,158 Intersections

These total intersections may include some duplicates resulting from median divided intersections. These will be filtered during the screening process.

9. Finally, a series of summary analyses were run against the intersection locations and their associated roadway approaches to identify the following information:

    - min/max functional classification
    - min/max speeds,
    - min/max lane count
    - street names

In Summary, a total of 8,158 intersections within the CRCOG region will undergo the 5-step screening as described in the following steps. The data for these screened intersections will be provided to CRCOG in GIS data set for CRCOG to disseminate to the communities as needed.

Figures 1 through 3 below provide a graphical summary of the genesis of the above roadway screening to generate the total listing of screened intersections.

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Figure 1: State & Local Roads within CRCOG Region

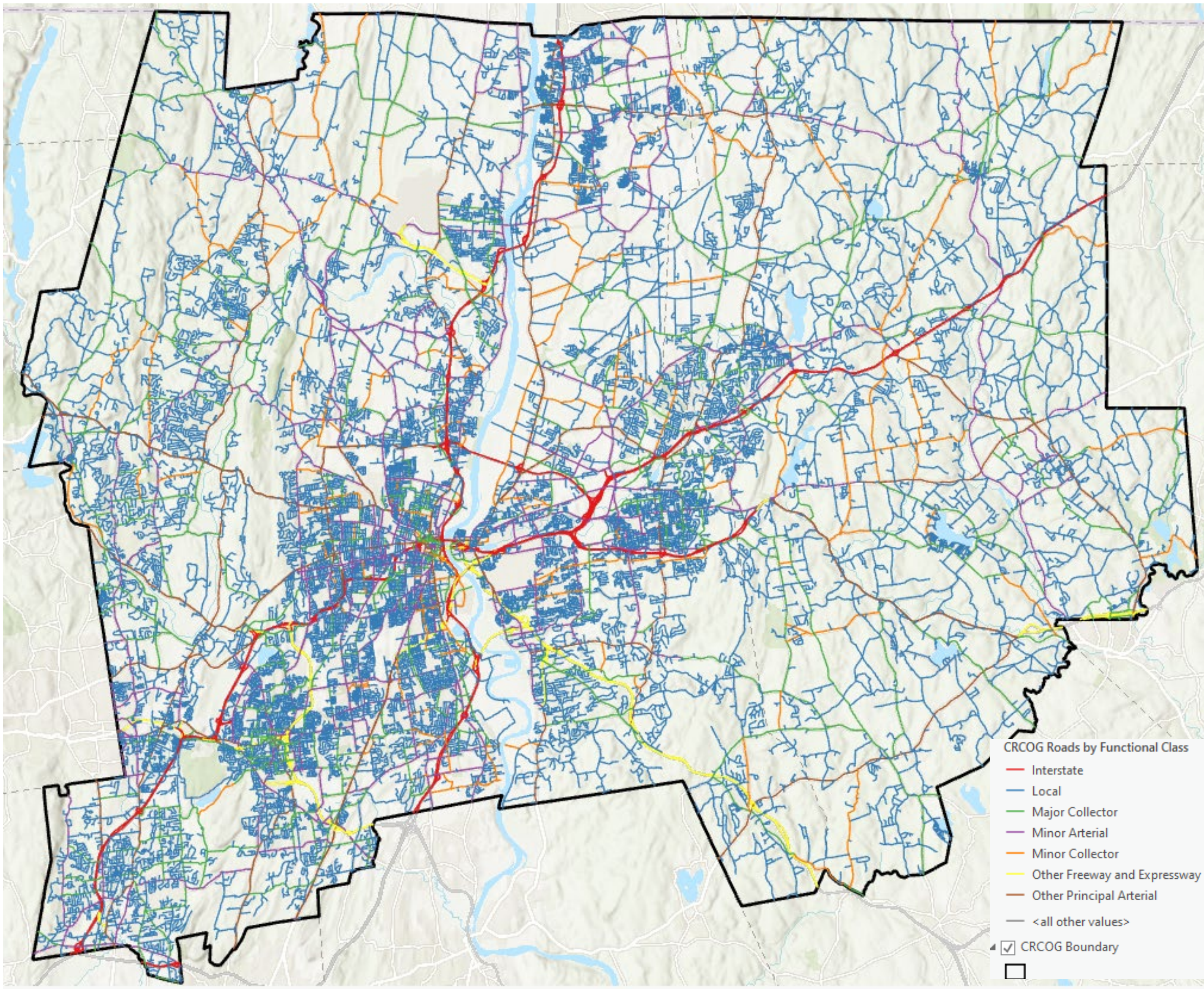

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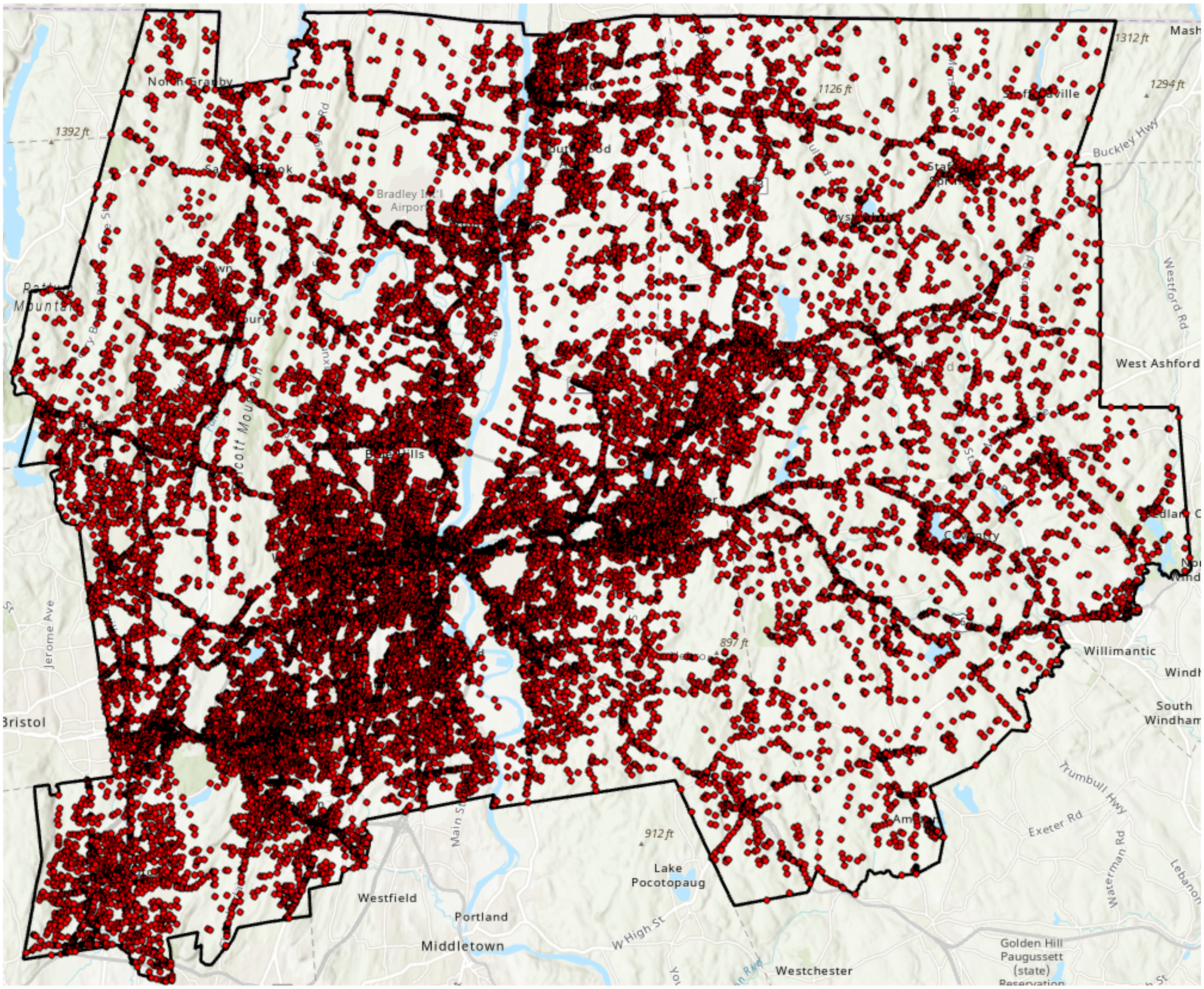
Figure 2: Preliminary Intersection Locations



This figure depicts the results of initial list of intersection locations with the CRCOG region. These locations were generated by intersecting the State & Locals roads, where the result is a point location where roads intersect "cross" each other. Only intersections with a functional classification of minor collector road or higher on at least one leg are included.

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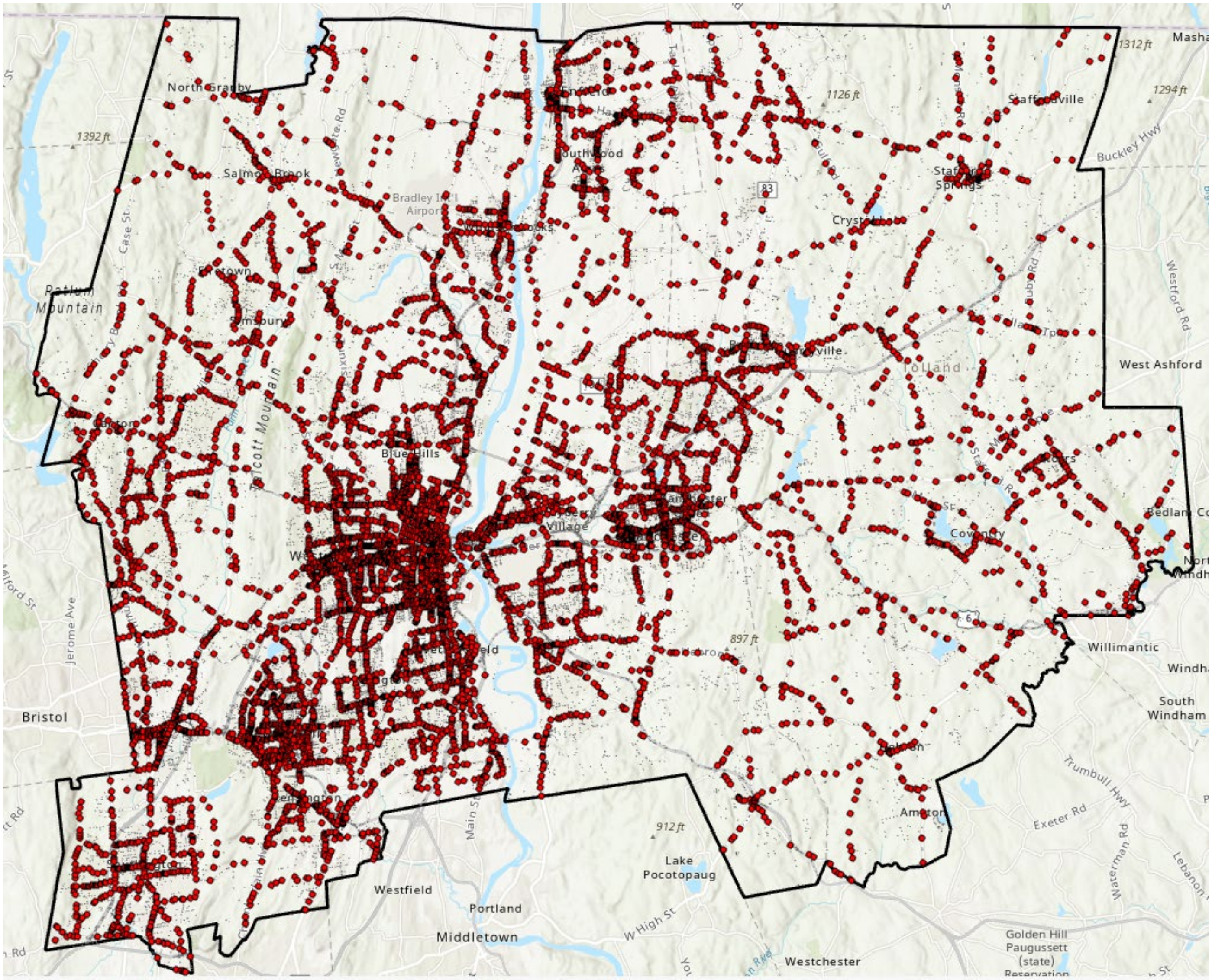
Figure 3: Study Area Intersections



This figure depicts the results of the intersection creation methodology. 8,158 intersection locations were identified for analysis. Many of these intersections will be eliminated after the crash data screening is applied to each location.

Step 1: Crash Methodology

The primary and initial screening criteria in the screening process is the crash data from the Connecticut Crash Data Repository (CTCDR). The crash data is being entered into a geodatabase to allow for summarization of the data to screen for locations with a documented crash history. The VHB Team is using the Connecticut Roadway Safety Management System (CRSMS) in part to inform the initial screening methodologies.

The following screening methodology is being utilized for the selection criteria elements, using a single elimination type process, based on the following steps:

The CTDOT Regional Transportation Safety Plan (RTSP) developed a crash severity weighting that was reviewed as part of this roundabout crash screening efforts and considered in the development of the following crash screening severity weighting. The RTSP severity weighting is included in the Appendix for refence. A new severity weighting formula was developed in concert with current FHWA requirements and Highway Safety Manual.

A. Crash Data Collection and Severity Weighting

   i. Document number of crashes from CT Crash Data Repository over the 3-year period from 2017 to 2019.

   ii. Apply the Equivalent Property Damage Only (EPDO) severity ranking methodology, similar to the that included in the CRCOG Regional Transportation Safety Plan 2020. VHB is using the EPDO screening methodology used in the CT Roadway Safety Management System from December 2020 (see Appendix for an explanation of the severity ranking weights). Below is a summary of the weighting factors by crash severity (KABCO injury scale):

   K – Weight Factor = 574
   A – Weight Factor = 30
   B – Weight Factor = 11
   C – Weight Factor = 6
   O – Weight Factor = 1

   For example, using the intersection of Newington Ave at John Downey Drive in New Britain, there are 11 PDO crashes, 2 C crashes, 7 B crashes, 0 A crashes, and 0 K crashes during a 3- year period, the related EPDO score for this location can be calculated as:

$$\text{Weighted Crash Score:} \quad \frac{(11*1+2*6+7*11+0*30+0*574)}{3} = 33.33$$

   As noted in the FHWA Highway Safety Improvement Manual, the KABCO Injury Scale is frequently used by law enforcement for classifying injuries and also can be used for establishing crash costs. (K – Fatal; A – Incapacitating injury; B – Non-incapacitating injury; C – Possible injury; and O – No injury.)

   iii. Perform crash query based on highest weighted crash score based on EPDO (as per procedures outlined in the CRSMS).

B. Crash Data Processing with Intersection Locations
   i. There are 89,383 total crashes with the CRCOG Region over the 3-year period from 2017 to 2019. Using the intersection layer developed for the roundabout study, VHB filtered the 89,383 crashes down to a subset of intersection crashes based on the methodology below:
      - Using the ***Traffic Way Class*** Attribute within crash database, filtered out any crashes that did not occur on a roadway (for example in parking lots and Non-Trafficway Crashes)
        Crash Count = 85,399
      - VHB analyzed the ***Crash Specific Location*** Attribute in the crash database to evaluate using only those crashes where the Crash Specific Location Attribute = Intersection. Based on our analysis, we ignored this potential filter. *VHB found too many front-to-rear crashes that were physically located at an intersection, that were miscoded (coded as non-intersection related in the crash database).*
      - The study area intersections were buffered by 125 feet (250' diameter study area) from the center of each intersection. This results in a 250-foot diameter circle as shown on the figures below. This is the same buffer used in the Regional Transportation Safety Plans (RTSP) for CTDOT. For the purposes of the roundabout study, the 125-foot intersection buffers serve as the intersection influence zone for screening the crash data on each approach to the intersection. See Figures 4, 5, 6, and 7.
      - The 125' intersection buffers were intersected with the 85,399 crashes as the final GIS filter resulting in a subset of crashes associated with the study area intersection locations.
        Total Crashes within Intersection Study Area = 45,942

VHB then performed a summary statistics analysis, where each 125-foot intersection buffer was summarized by crash severity with the results joined to the intersection locations as attribute data for use in running the EPDO screening analysis. Below is a count of the crash data associated with the study area intersections looking at crash severity and the collision type.

Count of crashes in the study area by severity:
K = 70 (Fatality)
A = 512 (Serious/incapacitating injury)
B = 5,350 (Non-incapacitating injury)
C = 7,103 (Possible injury)
O = 32,887 (No injury)
Null = 20

Collision Type Summary:
Angle= 12,328
Front to Front =1,111
Front to Rear = 18,631
Rear to Rear = 70
Rear to Side = 310
Sideswipe, opposite Direction = 1008
Sideswipe, same direction = 6,122
Other, Unknown, Not Applicable = 6,362

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Figure 4: 125-foot radius Intersection Buffers

This figure illustrates the 125-foot buffer area generated for each study intersection for use in screening the crash data. Note how local/local intersection locations have been removed. This segment of Newington Avenue is in New Britain.

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Figure 5: CRCOG crash locations show within 125-foot radius Intersection Buffers

This figure depicts the crashes within the CRCOG region in relation to the 125-foot intersection buffers along Newington Avenue in New Britain.

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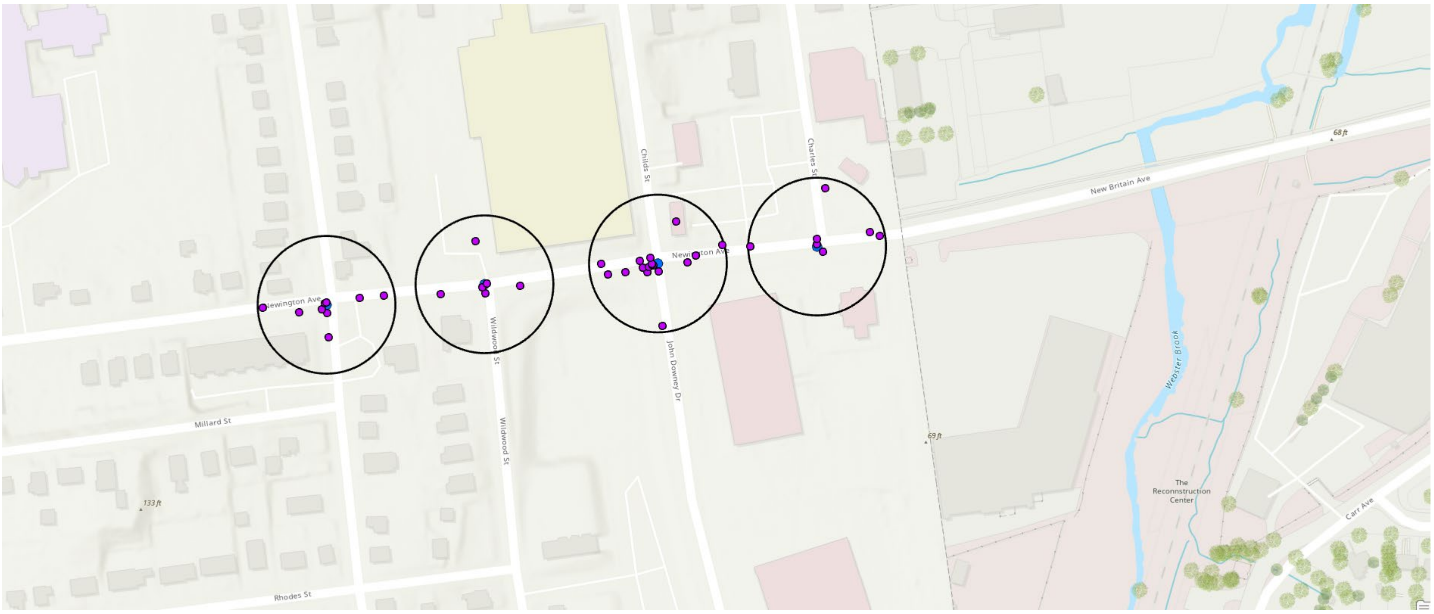
Figure 6: Crashes Filtered to Intersection Buffers



This figure depicts the results of the preliminary crash analysis where crashes are filtered down to the project area intersection locations (Newington Avenue). For each intersection buffer, the total crashes and crash severity were summarized for use in the EPDO screening analysis.

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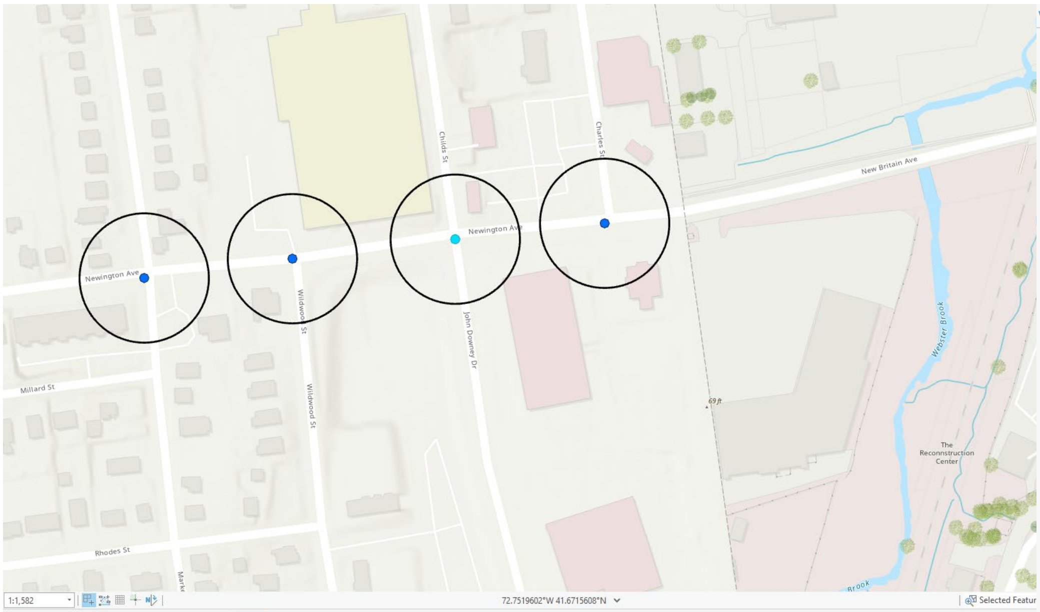
Figure 7: Example Crash Summary Results



VHB Intersection Results - 8969

Town	NEW BRITAIN
Min AADT	6700
Max AADT	13000
Min Functional Class	Local
Max Functional Class	Minor Arterial
Total Crashes	20
Total K Crashes	0
Total A Crashes	0
Total B Crashes	7
Total C Crashes	2
Total O Crashes	11
Total KA Crashes	0
Total KABC Crashes	9
Score	33.333333
Ownership	State/Other
Minimum Speed	35
Maximum Speed	35
Minimum Lanes	2
Maximum Lanes	4
Street 1	NEWINGTON AVE
Street2	CHILDS ST
Route ID	174-E
ParcelImpactCount	2
Parcel Impact Areas (SF)	1050.770752

This figure illustrates the crash data summary for the intersection in the center of the image: Newington Avenue at John Downey Drive. For this location there are 11 PDO crashes, 2 C crashes, 7 B crashes, 0 A crashes, and 0 K crashes during a 3-year period, the related EPDO score for the intersection can be calculated as:

$$\text{Weighted Crash Score: } \frac{(11*1+2*6+7*11+0*30+0*574)}{3} = 33.33$$

Step 2: Traffic Volume Screening Methodology

The volume screening methodology will be applied to all intersections that were screened under Step 1 Crash Screening. VHB is using the traffic volume data available within the Connecticut Roadway Safety Management System (CRSMS) for all locations screened in Step 1.

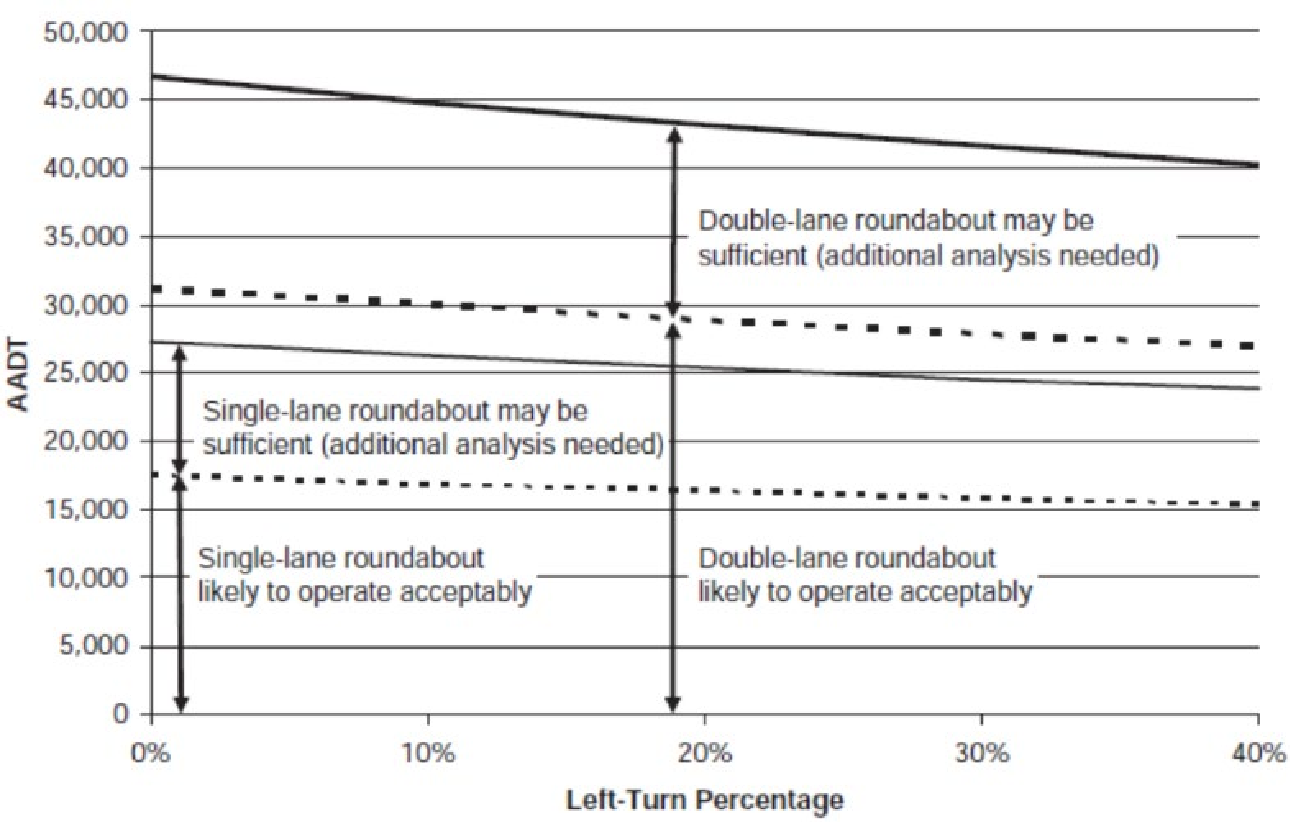
In addition, locations where traffic volume data is not available in the CRSMS, traffic data has been obtained from the CRCOG Travel Demand Model for inclusion in the data sets to ensure all screened intersections can be reviewed for traffic volumes.

<u>All traffic volume data to be utilized will be taken from years prior to 2020 (the pandemic).</u>

The following traffic volume screening steps will be conducted on all the 8,158 study intersection locations.

The NCHRP Report 672 Roundabouts: An Informational Guide, Exhibit 3-12, as shown below, is the primary reference to guide the traffic volume screening. Left turning volume data are not available and therefore an assumed 20% left-turn percentage will be used for all locations in the screening. This results in intersections with average daily traffic (ADT) exceeding 25,000 being eliminated from further consideration in this single lane roundabout screening. The ADT value used, will be selected from the one intersection approach leg with the highest bi-directional ADT. See Figure 9 for a sample intersection, where the screening will use the 13,000 east leg ADT volume, for the overall intersection value in the screening.

Figure 8: NCHRP 672 Exhibit 3-12



In addition, the intersections will be further screened with a volume adjustment factor to better evaluate the likelihood of a single lane roundabout working at the given location. The following system is proposed for each location under the 25,000 ADT threshold:

Table 1 ADT Range & Volume Adjustment Factors

ADT Range		Factor
0	10,000	1.00
10,000	12,000	0.90
12,000	14,000	0.75
14,000	15,000	0.50
15,000	17,000	0.25
17,000	25,000	0.10
25,000	>	0.00

As shown above, locations above 25,000 ADT are essentially eliminated from further consideration.

Intersections with ADT less than 10,000 are assured to be roundabout ready locations based upon capacity, and the value of 1 is proposed. While the NCHRP Exhibit 3-12 shows 15,000 ADT to be a threshold, using the proposed adjustment factors provides a very high level of confidence in the operational capacity of the intersections being converted to single lane roundabouts. Also, it is important to note that the volume data being used for the screening efforts are existing traffic volume counts from a variety of sources. The ADT values are not adjusted to future forecasted volumes. Therefore, if there is anticipated growth in volumes, using the factor helps account for some anticipated growth and ensures that a single lane roundabout is a good candidate for the screened intersections for further planning and development into an improvement project.

These volume adjustment factors will be utilized in an overall intersection scoring system applied to all 8,158 intersections, as presented in the following sections.

Figure 9: Sample Intersection Diagram with Volumes

Step 3: Geometry of Intersection

Each of the screened intersections will be fitted with a nominal 120-foot diameter circle to determine the potential fit of the circle at each of the screened intersections. The fitment will be done entirely in GIS mapping and use tools to place the circle at the GIS determined center of the intersection while depicting intersection features available in the mapping including Right Of Way (ROW), buildings and other features. Where possible, shifting the 120-foot diameter circle to avoid a ROW or building impact will be considered unless additional impacts are incurred during the Desktop Review Step.

The following will be considered in the review of the intersection geometry overlaid with the circle:

- In locations where the overlaid circle extends into ROW, the GIS system will generate an area of ROW and building impact which will be summarized per location.
- The impacted ROW will be listed as to ownership criteria: private, municipal, State
- Locations with impacts to private ROW greater than 2,000 square feet will be eliminated
- Locations with impacts to private buildings greater than 200 square feet will be eliminated if the roundabout cannot be adjusted to avoid the impact
- For locations with ROW and building impacts less than the noted thresholds, a summary of the impacts at these locations will be provided.

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Figure 10: Sample Fitment – Intersection of Newington Avenue at John Downey Drive, New Britain

The geometric fitting test will be summarized with a list of locations that work and a summary graphic.

The following scoring system is proposed to evaluate the impacts to ROW and buildings with locations that have zero impacts given a total factor of 1.00.

ROW Impact:	2,000	-	x square feet
Building Impact:	200	-	x square feet
Total ROW Impact Factor:	(sum)/2,200		

Locations with no impact will have a factor of 1.0, all others will be less than 1.0, and any locations with negative scores will be given a score of 0.0 and thereby eliminated from further consideration.

Sample Intersection Calculation (Newington Ave. & John Downey Drive in New Britain):

Private parcel ROW impact = 1,050.7 square feet

Building impact = 42

Total ROW Impact Factor = (1050.7+42)/2,200 = .50

SUMMARY OF STEP 1, 2, and 3 SCORING

To rank the top locations using the above 3 screening steps; a scoring system is used combining the Step 1 weighted crash score, Step 2 volume adjustment factor, and Step 3, Total ROW Impact score. This provides the crash, volume, ROW score (CRV Score) using the following calculation:

CVR Score = Weighted Crash Score * Volume Adjustment Factor * Total ROW Impact Factor

KABC Filter

For the purposes of ranking, only potential sites with 6 or more KABC (injury related crashes) crashes over the 3-year analysis period, were included in the final ranking. The KABC filter was applied to focus on sites with high benefit/cost ratios for a proposed improvement.

Figure 10 Example CVR Score Calculation (Newington Avenue at John Downey Drive in New Britain):

Step 1:	Weighted Crash Score of 33.33
Step 2:	Volume Adjustment Factor = 0.75
	(ADT of the highest volume leg, east leg = 13,000)
Step 3:	Total ROW Impact Factor = .50

CVR Score Calculation: CVR Score = 33.33 * 0.75 * 0.50 = 12.5

Step 4: Known Congestion/Operational Hotspots

Intersections that do not meet the screening criteria but are intersections with known congestion, operational problems and locations suggested by the CRCOG Transportation Committee members via the survey email to municipalities will also be reviewed and screened for consideration.

If these locations were previously eliminated from the crash and volume screening, they will be reviewed for geometry fitting of the roundabout and considered in the screening process.

Step 5: Desktop Reviews

Using the highest CVR scores resulting after Step 3, the list will then be adjusted to include intersections as noted in Step 4. The top ranked locations, with the 100 highest CVR scores will be reviewed at the desktop level to determine if conversion of the intersection to a roundabout is feasible considering obvious site condition impacts that would result from the physical construction of the roundabout.

The desktop reviews of existing site conditions will be conducted to identify obvious major constraints, such as adjacent buildings, major utilities, or significant historic structures based on available GIS data and aerial mapping. The desktop reviews will include a graphical and tabulated summary of the locations with the roundabout locations to be considered for future design projects.

In addition, the screening process will consider an effort to ensure that all CRCOG communities are represented with at least one roundabout location.

The 100 screened locations will be summarized by location and will provide a summary of key criteria at each intersection location (e.g., number of crashes in 3-year period, ADT, state or local ownership, etc.)

Analysis of Potential Crash Reductions

After the completion of the desktop reviews, the roundabout locations will be reviewed for potential crash reductions using AASHTO and NCHRP procedures. This analysis step will be the final step in the screening process to document the screening of the top 100 locations and supplemented with a crash reduction summary.

These procedures will be used to demonstrate the safety benefits of the recommended roundabout locations.

i. Use procedures from the AASHTO Highway Safety Manual (HSM) to predict expected changes in crash frequency based on conversion of intersections to roundabouts. These procedures include using the Empirical Bayes (EB) method to determine the expected crash frequency for the identified candidate signalized/unsignalized intersections and then using the appropriate Crash Modification Factor from the Crash Modification Factor Clearinghouse to determine the expected crash frequency with the roundabout. The EB method is implemented through the use of HSM spreadsheet tools developed by AASHTO and/or safety performance factors calibrated by CTDOT, if available. Figure 11 below is a sample screenshot of the AASHTO spreadsheet tool, which allows a user to input existing geometric and traffic volumes for the signalized/unsignalized intersection, generating an output for the expected number of crashes. Separate spreadsheets are available for different location types: rural two-lane roads, rural multi-lane highways, and urban and suburban arterials. The Enhanced Interchange Safety Analysis Tool (ISATe) is also available from AASHTO to analyze ramp termini.

ii. The CMF Clearinghouse lists a variety of CMFs that show the potential reduction in the frequency of crashes as a result of a conversion of an intersection to a roundabout. Each CMF is assigned a star value to indicate the quality of the data used to establish the CMF and its standard error. Where possible, CMFs with higher star ratings are to be used. The CMF Clearinghouse also groups roundabout CMFs based on the conversion to single-lane roundabouts (separate CMFs are available for multi-lane roundabouts):

- Intersection to single-lane roundabout
- Stop-Controlled intersection to single-lane roundabout
- No control/yield intersection to single-lane roundabout
- Two-way stop-controlled intersection to single-lane roundabout
- All-way stop-controlled intersection to single-lane roundabout
- Signalized intersection to modern roundabout
- Unsignalized intersection to single-lane roundabout

iii. Each CMF includes parameters that indicate the applicability of the CMF. Such parameters include:

- Urban or rural location
- Crash severity the CMF addresses
- Type of crash the CMF addresses
- Roadway geometry
- Minimum and maximum traffic volume

iv. Figure 12 below shows how various CMFs in the Clearinghouse can be compared and illustrates the various parameters behind each CMF. The project team will use the CMF comparison tool to select an appropriate set of CMFs to be consistently applied to the top sites to determine the expected percent reduction in crashes. While the HSM has a listing of roundabout CMFs, these are also included in the CMF Clearinghouse – therefore, the Clearinghouse has the best set of CMFs available for use.

v. Identify potential economic benefit of crash reductions based on the outcomes of the EB analysis and applying economic benefit values used and calibrated by CTDOT as appropriate.

vi. Determine a threshold value of number of crashes reduced over a 3-year period, to be considered for additional roundabout screening, or eliminated from screening.

Figure 11: AASHTO Spreadsheet Tool

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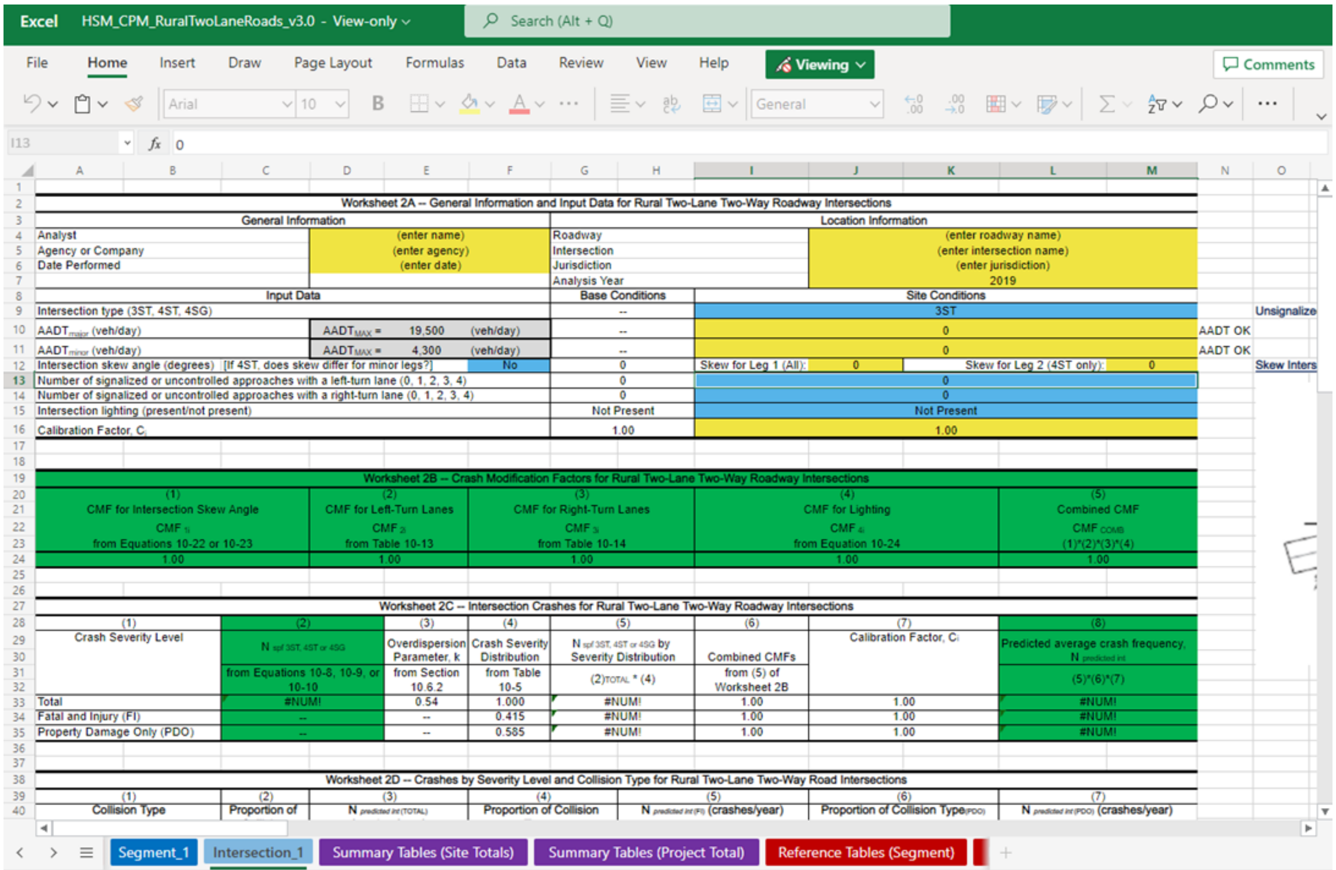

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Figure 12: Clearinghouse CMF Example

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Countermeasure Name	Conversion of stop-controlled intersection into single-lane roundabout	Conversion of stop-controlled intersection into single-lane roundabout	Convert all-way, stop-controlled intersection to roundabout	Convert all-way, stop-controlled intersection to roundabout
CMF ID	206	207	242	4933
CMF	0.28	0.42	1.03	0.544
Study Reference	PERSAUD ET AL., 2001	PERSAUD ET AL., 2001	RODEGERDTS ET AL., 2007	QIN ET AL., 2013
Unadjusted Standard Error CMF	*0.06*	*0.07*	*0.15*	*0.196*
CMFunction				
Star Rating	★★★★☆	★★★★☆	★★☆☆☆	★★☆☆☆
Rating Score Total	*130*	*130*	*55*	*45*
Crash Type	All	All	All	All
Crash Severity	*All*	*All*	*All*	*Fatal,Serious injury,Minor injury*
Crash Time of Day				*All*
Area Type	*Urban*	*Rural*	*All*	*All*
Road Division Type				*All*
Road Type	Not specified	Not specified	Not Specified	Not specified
Number of Lanes			*1 or 2*	*2,4*
Intersection Type	Roadway/roadway (not interchange related)	Roadway/roadway (not interchange related)	Roadway/roadway (not interchange related)	Roadway/roadway (not interchange related)
Intersection Geometry	*Not specified*	*Not specified*	*4-leg*	*3-leg,4-leg*
Traffic Control	Stop-controlled	Stop-controlled	Stop-controlled	Stop-controlled
Speed Limit				
Study Type	2	2	2	2
Years From				*1994*
Years To				*2010*
Traffic Volume Unit	*Annual Average Daily Traffic (AADT)*	*Annual Average Daily Traffic (AADT)*	*Unit Unknown*	*Annual Average Daily Traffic (AADT)*
Min Traffic Volume				
Max Traffic Volume				
Min Major Rd Volume				*4100 (total entering)*
Max Major Rd Volume				*48100 (total entering)*
Min Minor Rd Volume				
Max Minor Rd Volume				
Avg Traffic Volume				
Avg Major Rd Volume				
Avg Minor Rd Volume				
State of Origin				WI
Municipality				*Statewide*
Country				*USA*
Comments				*- Study included three-year before and after crash data for each site.- Reported traffic volume is total entering volume.*

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Summary

As noted in the foregoing screening methodology, this memorandum provides a comprehensive screening process for reviewing intersections in the CRCOG region for potential conversion to a modern single lane roundabout, using the available traffic volume and crash data from CTDOT and CRCOG sources.

The process includes a hierarchy of weighted crash score, volume adjustment factor, and right of way impact factor. A score is developed in order to rank the locations with the greatest potential to convert to a modern single lane roundabout.

These ranked locations will then be reviewed at the "desktop" level, using available online mapping and GIS resource data, as well as local knowledge. This desktop engineering review of these locations will provide a final determination on viability.

The basis for this screening effort is data. Using the available data in this 5 step screening process, appropriate single lane roundabout locations were identified in a very efficient and defined process.

An overall roundabout screening methodology for the CRCOG region needs to be dynamic, and can be modified in the future as conditions warrant, such as providing additional locations where mini-roundabouts and/or multilane roundabouts may be appropriate. However, the goal of this particular screening effort is to identify locations that can be considered for future funding of additional studies and design leading to construction of the safest form of intersection control: modern single lane roundabouts.

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Appendix

Adjusted EPDO Weighting Summary

Adjusted EPDO Weighting Summary

The equivalent property damage only (EPDO) method used by UCONN in its CRSMS tool calculates a combined frequency and severity score for each site by assigning weighting factors to crashes by crash severity and monetary consequences. The weighting factors are based on the costs of property damage only crashes, and the calculated score accounts for the severity of crashes and the expected crash costs for each site. The initial weighting factors are estimated by the Federal Highway Administration (FHWA) using the 2001 dollar values and documented in the **"Safety Analyst User Manual"** based on the mean comprehensive monetary costs for each severity level. Level K has a mean comprehensive cost equal to $5,800,000 per crash, and a weight factor equal to 1450; level A has a mean comprehensive cost equal to $402,000 per crash, and a weight factor equal to 100; level B has a mean comprehensive cost equal to $80,000 per crash, and a weight factor equal to 20; level C has a mean comprehensive cost equal to $42,000 per crash, and a weight factor equal to 10; level PDO has a mean comprehensive cost equal to $4,000 per crash, and a weight factor equal to 1. The EPDO score is weighted to the per mile per year unit for segments and per year for intersections and is then used for ranking sites. However, the 2001 dollar values might not be representative to the current values due to the inflation. Therefore, the weighting factors of crash severities used in this study are adjusted to the current economic situation using the Consumer Price Index (CPI) and Employment Cost Index (ECI) released by the U.S. Bureau of Labor Statistics (BLS). BLS releases the CPI and ECI monthly. However, the monthly changes of CPI and ECI are very small and UCONN decided to update the weighting factors for EPDO analysis once a year. **The latest EPDO weights used in the CRSMS from December 2020 are**:

K – Weight Factor = 574 ,
A – Weight Factor = 30,
B – Weight Factor = 11,
C – Weight Factor = 6,
O – Weight Factor = 1

These weights are different than those used in the previous CRCOG RTSP study as VHB determined weights in that study based off FHWA's **national guidance** ((https://safety.fhwa.dot.gov/hsip/docs/fhwasa17071.pdf) and adjusted them for Connecticut, rather than using UCONN's approach of adjusting the values in the Safety Analyst tool. Using the RTSP approach Level K has a mean comprehensive cost equal to $16,185,746 per crash, and a weight factor equal to 949; level A has a mean comprehensive cost equal to $938,535 per crash, and a weight factor equal to 55; level B has a mean comprehensive cost equal to $284,430 per crash, and a weight factor equal to 17; level C has a mean comprehensive cost equal to $179,924 per crash, and a weight factor equal to 11; level PDO has a mean comprehensive cost equal to $17,061 per crash, and a weight factor equal to 1.

December 2020 CRSMS User Manual					June 2019 CRSMS User Manual					CRCOG RTSP Weights			
Severity	**Value**	**Ratio**	**Weight**		Severity	Value	Ratio	Weight		Severity	Value	Ratio	Weight
K	**$ 6,415,389**	**573.5195**	**574**		K	$ 5,800,000	1450	1450		K	$ 16,185,746	948.6986	949
A	**$ 338,576**	**30.26783**	**30**		A	$ 402,000	100.5	100		A	$ 938,535	55.01055	55
B	**$ 123,646**	**11.05364**	**11**		B	$ 80,000	20	20		B	$ 284,430	16.67136	17
C	**$ 69,541**	**6.216789**	**6**		C	$ 42,000	10.5	10		C	$ 179,924	10.54592	11
O	**$ 11,186**	**1**	**1**		O	$ 4,000	1	1		O	$ 17,061		1