Tompkins County SS4A Joint Safety Action Plan

Data Analysis Approach

prepared for

Tompkins County Joint Safety Action Plan Project Team

prepared by

Cambridge Systematics, Inc.

with

Sam Schwartz Engineering

FHI Studio

Planning4Places

April 11, 2024

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Introduction

The Consultant Team will conduct a complete and thorough analysis to “tell the story” through data tables and figures about where, when and why crashes are occurring in Tompkins County. The following municipalities are partners with Tompkins County for this Joint Safety Action Plan:

- City of Ithaca
- Town of Ithaca
- Town of Caroline
- Town of Danby
- Town of Dryden
- Village of Dryden
- Town of Newfield
- Village of Lansing
- Town of Lansing
- Village of Cayuga Heights

This analysis will include five key areas:

- Historical Trends
- Emphasis Areas
- Network Screening
- Equity Priority Areas
- Priority Safety Network

The Consultant Team will utilize a comprehensive menu of safety analyses in studying past safety performance and conducting risk assessment for future crashes. This preliminary memorandum summarizing the analysis approach, including the data sources, general methodologies, expected outcomes, and how it supports future planning applications. The proposed analyses are presented for review by Tompkins County and its partners to finalize the approach.

1.0 Data Inventory

The first step in achieving the safety goals of Tompkins County is to understand the key factors affecting safety outcomes throughout the transportation network. CS will work directly with the New York State Department of Transportation (NYSDOT), Tompkins County, and local municipalities to gain access to any geospatial datasets that could be utilized in the systems evaluation.

Table 1.1 identifies existing transportation safety and roadway datasets including their ownership, coverage, and intended use. The Consultant Team will review these sets for the level of effort needed to prepare and clean the data for analysis, application to the system evaluation, and how they could be beneficial to investigate and integrate in future iterations of the analysis.

Table 1.1 Data Inventory

Owner	Data Set	Coverage	Hosted Layer (if applicable	Notes
City of Ithaca	Construction Projects	City	Annual Planned Construction Projects	
	Sidewalks		Existing Sidewalks	
	Zoning		Zoning	
Tompkins County	Construction Projects	County		
	Counts			County-owned facilities
Towns/Villages	Locations of Concern			Stakeholder-provided safety concerns
Tompkins Consolidated Area Transit	Bus Stops	County	National Transit Map - Stops	
	Bus Routes		National Transit Map - Routes	
Ithaca-Tompkins County Transportation Council (ITCTC)	Roadway Inventory	County		
	FFYs 2023-227 Transportation Improvement Program			
	Priority Trails			
Center for Community Transportation	Bike Share Hubs	Service Area		
	Bike Share Trips			X, Y Coordinates by month
NYSDOT	Crashes	Statewide		Crash Location and Engineering Analysis Repository (CLEAR)
	Roadway Inventory System			
	Intersections			
	Traffic Data Viewer		Traffic Data Viewer	Will supplement data in CLEAR Safety App

Source: Compiled by Consultant Team

2.0 Historical Trends

The Consultant Team will using various datasets that provide insightful contextual information about the crashes affecting all users that occurred on all roads in Tompkins County, regardless of ownership the CS team will examine factors that have historically contributed to safety issues and those that may lead to severe or fatal crashes in the future. This trend analysis will inform future tasks, such as network screening.

The approach will **review crash data from at least the latest 10 complete years** for most common and highest density crash types and contributing circumstances normalized by key factors such location, mode, Vehicle Miles Traveled (VMT), population, and other transportation-related quantifiable measures. This effort will be supported by GIS analysis and contextual information from the transportation system such as roadway functional class, rural vs urban, land use, traffic controls, non-motorist generators, and more.

The performance measures for both the Highway Safety Improvement Program (Table 2.1) and the Highway Safety Plan (Table 2.2), by NYSDOT and the Governor's Traffic Safety Council, respectively will be calculated for Tompkins County. These measures, in their entirety or a select set, including others proposed during the planning process, will be included in the final plan.

Table 2.1 NYS Highway Safety Improvement Program Performance Measures

Performance Measure	Data Source(s)
Number of Fatalities	FARS
Fatalities per 100M/VMT	FARS
Number of Serious Injuries	TSSR
Serious Injuries per 100M/VMT	TSSR
Number of Non-Motorized Fatalities and Serious Injuries	FARS and TSSR

Sources: NYSDOT Highway Safety Improvement Program Annual Report; Fatality Analysis Reporting System (FARS); Traffic Safety Statistical Repository (TSSR)

Notes: Fatality and Serious Injury Rates computed using Vehicle-Miles Traveled (VMT) from FHWA Highway Statistics Series, Table VM-2

Table 2.2 NYS Highway Safety Plan Performance Measures

	Performance Measure	Data Source(s)
C-1	Traffic Fatalities	FARS
C-2	Serious Injuries in Traffic Crashes	TSSR
C-3	Fatalities per 100M VMT	FARS
C-4	Unrestrained Passenger Vehicle Occupant Fatalities, All Seat Positions	FARS
C-5	Alcohol-Impaired Driving Fatalities	FARS
C-6	Speeding-Related Fatalities	FARS
C-7	Motorcyclist Fatalities	FARS
C-8	Unhelmeted Motorcycle Fatalities	FARS

	Performance Measure	Data Source(s)
C-9	Drivers Aged 20 and Younger involved in Fatal Crashes	FARS
C-10	Pedestrian Fatalities	FARS
C-11	Bicyclist Fatalities	FARS
B-1	Observed Seat Belt Use Rate for Passenger Vehicles, Front Seat Outboard Occupants	State Survey
NYS-1	Persons Injured in Alcohol-Related Crashes	TSSR
NYS-2	Fatalities in Drug-Related Crashes	TSSR
NYS-3	Fatal & PI Crashes Involving Cell Phone Use and Texting	TSSR
NYS-4	Motorcyclists Injured in Crashes	TSSR
NYS-5	F&PI Crashes Involving a Motorcycle and Another Vehicle in High-Risk Counties	TSSR
NYS-6	Pedestrians Injured in Crashes	TSSR
NYS-7	Bicyclists Injured in Crashes	TSSR

Source: NYS FFY 2024-2026 Triennial Highway Safety Plan; Fatality Analysis Reporting System (FARS); Traffic Safety Statistical Repository (TSSR)

Notes: Fatality Rate computed using Vehicle-Miles Traveled (VMT) from FHWA Highway Statistics Series, Table VM-2

3.0 Emphasis Areas

The Consultant Team will analyze ten-years of crashes to identify contributors to fatalities and serious injuries in Tompkins County and develop Emphasis Areas that will guide policy, program and project recommendations in the final plan. The initial set of Emphasis Areas will be derived from the NYSDOT *2023-2027 Strategic Highway Safety Plan* (SHSP). The SHSP uses data-driven analysis to identify a state's safety needs and allocate investments in safety projects and programs. Table 3.1 provides an overview of the Emphasis Areas and the related crash types that comprise each Area.

Table 3.1 NYS SHSP Emphasis Areas

Emphasis Area	Crash Types
Intersections	(All)
Vulnerable Road Users	Bicyclists
	Pedestrian
	Road Worker
Road User Behavior	Alcohol
	Drugs
	Cell Phones
Roadway Departures	Roadway Departures
	Head-On Collisions
	Sideswipe

Emphasis Area	Crash Types
Alternate Road Vehicles	Motorcycles
	Trucks
	Buses
	Micromobility
Age Related	65+
	<=20
Aggressive Driving	Unsafe Speed
	Aggressive Driving/Road Rage
	Following Too Closely
	Traffic Control Disregarded

Source: NYS 2023-2027 SHSP

Table 5.1 includes a full glossary of the Emphasis Areas, their definitions, and query parameters using the NYSDOT CLEAR Data Viewer.

A refined set of Emphasis Areas that reflect the particular crash history of Tompkins County or the creation of new areas will be considered with feedback from the project partners. Following the selection of the Emphasis Areas, additional analysis will be provided to identify overrepresented contributing factors. Final emphasis areas and accompanying information on these factors will be shared with the Consultant Team to lead the discussion on potential recommendations and investment strategies for each Area.

4.0 Equity Analysis

4.1 Equity Priority Areas

The Consultant Team will seek to identify historical underserved communities and those disproportionately impacted by roadway crashes through data analysis in collaboration with stakeholders and the public. Equity Priority Areas will be identified based on concentration and severity of burdens relevant to traffic safety.

Equity Priority Areas will be analyzed based upon a range of socio-economic, environmental, and other factors. They will be assessed for their relation to communities overrepresented in the impacts of crashes. These factors will build upon City, County, ITCTC Title VI and Environmental Justice analyses to include criteria included in the indices for Justice40 and the New York State Disadvantaged Communities.

The Equity Priority Areas will help identifying safety priorities at first through the valence of burdened communities rather than simply crash types, as traditionally done in the Strategic Highway Safety Plan. By creating unique problem statements for these communities, both geographically-identified and regionwide, analysis can be recast to focus on them and strategies customized to meet their respective needs.

Incorporating equity considerations at the fore of the plan's data analysis will ensure this plan more accurately representing existing challenges and opportunities. Carrying this strong equity component in the countermeasures and project prioritization process will place a greater emphasis on equitable implementation.

4.2 Indicators

The following demographic factors from the 2018-2022 American Community Survey 5-Year Estimates (US Census Bureau) will be first considered:

- Race
- Low-Income
- Youth population (under 20 years of age)
- Elderly population (65 years of age or older)
- Limited English Proficiency
- Disability

- Foreign-born
- Zero-Car households
- Female single-parent households

The Consultant Team will also review the following indices to identify potential additional indicators used to identify disadvantaged communities at both the Federal and State levels:

1. Climate and Economic Justice Screening Tool (Justice40, Council on Environmental Quality, Executive Office of the President of the United States)
2. Disadvantaged Communities (New York State Climate Justice Working Group)

4.3 LOCUS

The Consultant team also offers safety data through an extension of Cambridge Systematics' LOCUS data platform, a location-based service capturing multimodal travel flows at a Census Block Group level. When analyzing crash data, exposure information can be used to calculate crash rates, which provides a measure of the relative risk of crashes occurring in each area and for respective travel modes.

The source data for the platform delivers metrics that are based on the frequencies with which a user travels to and from their destinations. The percent of population and household will be calculated based on the surrounding population and households for each corridor or intersection.

LOCUS data will help address the limitations of using Average Annual Daily Traffic (AADT) for crash rate calculations. It is mainly collected for motor vehicles on arterial roadways and does not provide contextual information about origins and destinations, traveler demographics, and types of trips. Further, it also does not include measures of non-motorized travel. This limits analysts' ability to identify areas with high densities of crashes and their varying degrees of exposure, along with the systemic contextual information about the locations. By using LOCUS, the Consultant Team is able to analyze risk among different types of road users and patterns within the local transportation network, including vulnerable road users and communities identified by equity considerations.

The respective crash density normalized by trip density (both all modes and active transportation) will be graphed and mapped into four quadrants:

1. High trip density and high crash density
2. High trip density and low crash density
3. Low trip density and high crash density
4. Low trip density and low crash density

5.0 Network Screening

The Consultant Team will utilize the recently deployed NYSDOT Crash Location and Engineering Analysis Repository (CLEAR) Safety App for screening the entire roadway network for corridors, intersections, and ramps. The screening will consider the safety of all roadway facilities in the region, regardless of ownership.

Per the NYSDOT *Highway Safety Improvement Program Procedures and Techniques* (Red Book), the Safety App will be used to identify locations using both **Hotspot** and **Systemic** methods:

5.1 Hotspot Screening

The goal of Hotspot Screening is to identify sites with a **Potential for Safety Improvement** (PSI). PSI is the primary performance measure for network screening, which is based on a comparison of the site-specific safety performance to the statewide average of similar facilities. NYSDOT has calibrated specific Safety Performance Functions (SPFs) for each of the 70 Facility Types (Red Book, Appendix A).

The PSI will be able to be calculated in CLEAR Safety using the Excess Expected Crash Frequency with Empirical Bayes Adjustment. This methodology allows for calculations to account for both differences in traffic volumes and possible bias due to regression-to-the-mean, accounting for changes to crash totals over specific years included in the analysis.

The CLEAR Hotspot screening is conducted by a sliding windows analysis, which analyzes a .3 mile window that moves at .1 mile increments across the roadway network. Contiguous segments, intersections, and ramps that have a PSI greater than 0 will be identified in the tool.

The screening results will be broken into four categories based on the Level of Service of Safety (LOSS), with respect to the difference between the expected crashes and the predicted crash frequency. Accounts for differences in traffic volume among sites and the nonlinear relationship between crash frequency and traffic volume because it is based on the calibrated SPFs. The following stratification boundaries are used in the CLEAR Safety App to define the four LOSS categories:

- Level 4: > 90th percentile indicates high potential for crash reduction
- Level 3: 50th to 90th percentile indicates moderate to high potential for crash reduction
- Level 2: 10th to 50th percentile indicates low to moderate potential for crash reduction
- Level 1: <10th indicates low potential for crash reduction

During the Data Review subtask, the CS team will review the availability of local counts not included in the NYSDOT Traffic Data Viewer. In the Site Analysis module of CLEAR Safety, AADT can manually input for individual investigations. If there are not counts available for a particular corridor in the CLEAR Safety App, the Consultant Team will use the locally provided counts to consider revised PSI calculations prior to including the facility in the Priority Safety Network.

5.1.1 Bicycle and Pedestrian Crash Prediction

The crash prediction models in the SPFs, both nationally and those calibrated by NYSDOT, are most suited for estimating expected frequencies of multiple- and single-vehicle motor vehicle crashes, excluding pedestrian and bicycle crashes. These models estimate pedestrian and bicycle crash totals based on the proportion of pedestrian and bicycle crashes to motor vehicle crashes. There is not, at the current time, predictive models at the statewide level that are sensitive to site-specific conditions that influence pedestrian and bicycle crashes (including exposure and infrastructure). Future improvements to CLEAR Safety may include approaches to collecting data and developing SPFs for those modes on particular categories of roadway segments and intersections.

5.2 Systemic Screening

The Systemic Screening process seeks to identify facilities based on high-risk roadway features correlated with fatal and severe injury crashes. Using risk factors as the basis for screening, the Consultant Team will identify sites, using the CLEAR Safety App, that have specific geometric and operational characteristics as candidate locations for further investigation and potential safety improvements. These candidate locations will be assigned a level of risk based on the site-specific factors.

Crash trees will be developed using the four-step process:

1. Identify focus crash types
    - Intersections
    - Roadway Departures
    - Speed-Related
    - Pedestrian
2. Identify focus facility types
3. Identify risk factors
4. Screen network

The results of the Systemic Screening will identify a set of prioritized sites for further investigation. These have the potential to reduce fatalities and serious injuries by proactively addressing the facilities that have similar identified risk factors.

5.3 Priority Safety Network

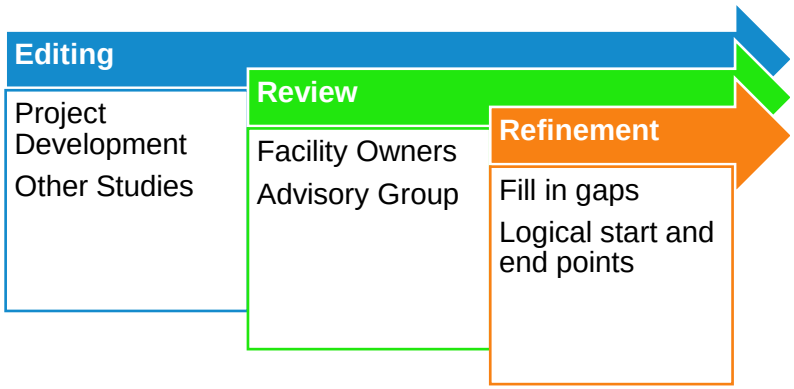
The Consultant Team, in consultation with local jurisdictions and NYSDOT-Region 3, will overlay the results of the Network Screening process with other roadway and area data to develop a comprehensive Priority Safety Network. The network is intended to be a synthesized set of priority corridors and intersections that will be the focus of future implementation efforts of the Safety Action Plan. This could include both near-term investigations and corridors studies or long-term capital projects.

Figure 5.1 Priority Safety Network Overlays

Figure 5.1 illustrates the data that will be overlaid to create the draft Priority Safety Network. The Consultant Team will work with the Advisory Group to review the criteria, scoring, and weights to be used to calculate a single index value. Multiple scenarios will be run based upon the Advisory Group's feedback until a preliminary network can be agreed upon.

The preliminary network will be the basis of extension coordination with the Advisory Group. Figure 5.2 shows the three key steps to ensure that the final Priority Safety Network is the consensus priority of the stakeholders. The Consultant Team will review the preliminary network with facility owners is geographically consistent, logical, and account for the latest study efforts.

Figure 5.2 Priority Safety Network Coordination Steps



Appendix A. Crash Data Access

Local governments and agencies have been provided access to the Crash Location and Engineering Analysis Repository (CLEAR) applications by the New York State Department of Transportation through a NY.gov ID, including:

- CLEAR Data Viewer (CDV)
- CLEAR Safety
- Interactive Crash Editor (ICE)

Government staff in NYS, can access CLEAR by completing the CLEAR Access Form - Government Access. It includes a signed acknowledgement that staff have read, and will abide by, all prohibitions on release of personal information as outlined in the federal Driver's Privacy Protection Act (DPPA; 18 USC 2721), and sections 96 and 96-a of the New York Personal Privacy Protection Law (PPPL; Public Officers Law, Article 6-A, Sections 96 and 96-a).

Attribution

CLEAR crash data is owned by New York State. All MPO and local government planning products using crash data queries and/or screening results should include an attribution to NYSDOT and CLEAR. A recommended attribution follows:

- "Citation: Crash data provided by the NYS Department of Transportation's Crash Location and Engineering Analysis Repository (CLEAR)."

Disclaimer

Transportation plans are provided qualified immunity from legal claims and do not constitute official written notice for facility owners. MPO and local government planning products that incorporate crash data and/or analyses from CLEAR should include a disclaimer, such as:

> "Protection of Data from Discovery Admission into Evidence:
>
> 23 USC 407 states "Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data."

Redacted Information

Per the DPAA and PPPL, for any Police Accident Reports (MV-104A forms) accessed by CDV, personal information related to both the driver(s) and police officers must be redacted before the information is shared. Personal information includes the following:

- Driver License Number(s)
- Driver Name(s)
- Address(es)
- Date(s) of Birth
- License Plate Number(s)
- Reporting Officer Name
- Reviewing Officer Name

Appendix B. SHSP Emphasis Area Glossary

Table 5.1 SHSP Emphasis Area Glossary

Emphasis Areas	Categories	Definition	CLEAR Field	Attribute(s)
Intersections	(All)	Crashes occurring within 100 feet of the physical intersection	[Intersection Indicator]	At Intersection, or Intersection Related
Vulnerable Road Users	Bicyclists	Crashes involving at least one bicycle and one motor vehicle.	[Crash Type]	Collision with Bicyclist
	Pedestrian	Crashes involving at least one pedestrian and one motor vehicle.	[Crash Type]	Collision with Pedestrian
	Road Worker	Crashes involving at least one pedestrian and one motor vehicle in a designated work zone.	[Crash Type]	Collision with Pedestrian, or Collision with Other Pedestrian
			[Traffic Control]	Highway Work Area, or Maintenance Work Area
Road User Behavior	Alcohol	Crashes involving at least one driver suspected to be under the influence of alcohol	[Apparent Factor]	Alcohol Involvement
	Drugs	Crashes involving at least one driver suspected to be under the influence of illegal drugs	[Apparent Factor]	Drugs (Illegal)
	Cell Phones	Crashes involving at least one driver operating a cell phone	[Apparent Factor]	Cell Phone (Hand held), or Cell Phone (Hands free)
	Distracted	Crashes involving at least one driver distracted, other than cell phone	[Apparent Factor]	Driver Inattention, or Eating or Drinking
	Falling Asleep	Crashes involving at least one driver that had fallen asleep or reported fatigue	[Apparent Factor]	Fatigued/Drowsy, or Fell Asleep

Emphasis Areas	Categories	Definition	CLEAR Field	Attribute(s)
Roadway Departures	Roadway Departures	Crashes where the impact occurred on the shoulder, beyond the shoulder or in the median of the roadway.	[Crash Type]	Coll. W/Earth Ele./Rock Cut/Ditch, Coll. W/Light Support/Utility Pole, Collision With Bridge Structure, Collision With Building/Wall, Collision With Crash Cushion, Collision With Culvert/Headwall, Collision With Curbing, Collision With Fence, Collision With Fire Hydrant, Collision With Guide Rail, Collision With Guiderail - End, Collision with Median/Barrier Collision With Median/Barrier - End, Collision With Other Barrier, Collision With Other Fixed Object, Collision With Sign Post, Collision With Snow Embankment, Collision With Tree, and Ran Off Road Only
			[Apparent Factor]	**NOT** Alcohol Involvement
			[Intersection Indicator]	**NOT** At Intersection, or Intersection Related
	Head-On Collisions	Crashes involving two vehicles going straight, that were traveling in opposite directions prior to impact.	[Collision Type]	Head On
	Sideswipe	Crashes involving two vehicles going straight, that were traveling in the same direction prior to impact.	[Collision Type]	Side Swipe
Alternate Road Vehicles	Motorcycles	Crashes involving at least one motorcycle.	[Vehicle Type]	Motorcycle
	Trucks	Crashes involving at least one large truck, defined as a truck tractor or semi-trailer.	[Vehicle Type]	Truck
	Buses	Crashes involving at least one bus.	[Vehicle Type]	Bus
	Micromobility	Crashes involving a low-speed motorized transportation device such as an e-bike or scooter.	[Vehicle Type]	Motorized Micromobility

Emphasis Areas	Categories	Definition	CLEAR Field	Attribute(s)
Age Related	65+	A crash involving at least one driver age 65 or older	[Person Type]	Driver
			[Driver Age]	>=65
	<=20	A crash involving at least one driver 16-20 years of age	[Person Type]	Driver
			[Driver Age]	<20
Aggressive Driving	Unsafe Speed	A crash involving at least one driver reported to be speeding above the limit or driving at an unsafe speed below the limit	[Apparent Factor]	Unsafe Speed
	Aggressive Driving	A crash involving at least one driver reported to be operating in a deliberate and aggressive manner	[Apparent Factor]	Aggressive Driving/Road Rage
	Following Too Closely	A crash involving at least one driver reported not to have maintained a safe distance from the car in front.	[Apparent Factor]	Following Too Closely
	Traffic Control Devices Disregarded	A crash involving at least one driver reported not to have complied with a traffic control device.	[Apparent Factor]	Traffic Control Devices Disregarded

Source: NYSDOT *2023-2027 SHSP*; CLEAR Data Viewer